Technical assistance in realisation of the 4th report on progress of renewable energy in the EU

- Final report -

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“The analysis presented in this report is based on the policy landscape until December 2018. Modelling results are based on the progress reports submitted by the Member States and policy updates until May 2018.”

Executive summary

At an EU-level, the shares of renewable energy sources (RES) in total, renewable electricity (RES-E), heating and cooling (RES-H&C), and to a lesser extent also transport (RES-T) have been continuously increasing over the past years. In 2016, the EU reached a share of 17% of RES in gross final energy consumption, the target for 2020 being 20%, as defined in the RES Directive 2009/28/EC (RED). The EU-28 has been comfortably above the indicative trajectory set in the RED, and the EU as a whole has also been above the slightly more ambitious trajectory defined by Member States (MS) themselves in their National Renewable Energy Action Plans (NREAPs)[1]. With regard to individual sectors, the RES-E and the RES-H&C sectors are well on track, while the RES-T sector stays just below the NREAP planned share (7.13% actual versus 7.14% planned).

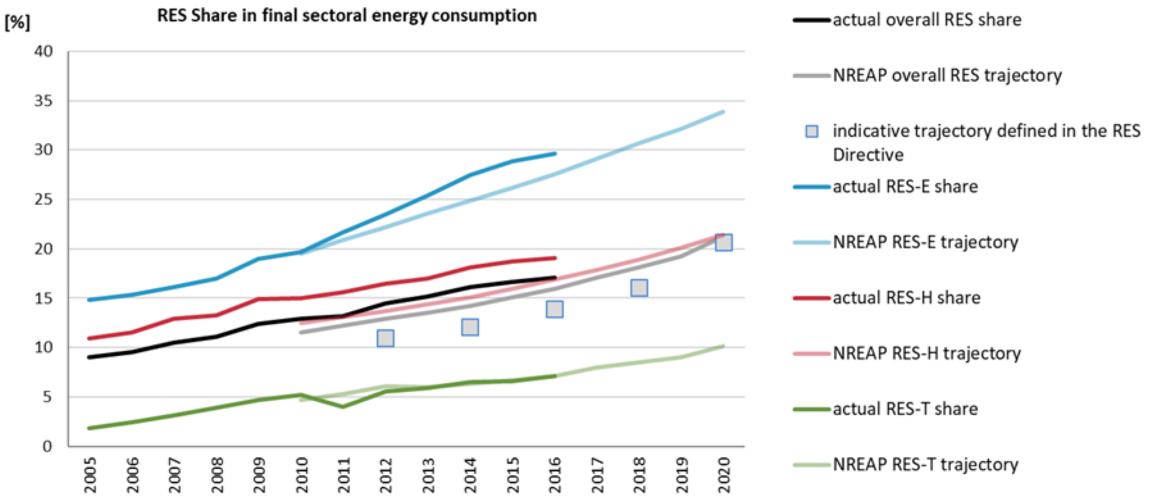

Figure 1. Actual and planned RES shares for the EU-28 (%). Source: Eurostat, NREAPs

23 MS were comfortably above their indicative trajectories for 2015/2016 as defined in the RED. Only France, Luxembourg and the Netherlands were below their indicative trajectories. The largest positive deviations from their indicative trajectories can be observed in Croatia, Hungary and Italy. Ireland and Poland still surpassed their indicative trajectories, albeit by only a slight margin of less than 1%. 19 MS were also above or on track of their (more ambitious) NREAP trajectories.

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[1] In accordance with Article 4 of the RED each MS has submitted an NREAP to the European Commission in 2010 or later. In the NREAPs, the MS provide detailed roadmaps describing how they will meet their legally binding 2020 targets. The roadmaps contain sectoral shares, the technology mix they expect to use and the trajectory they will follow.

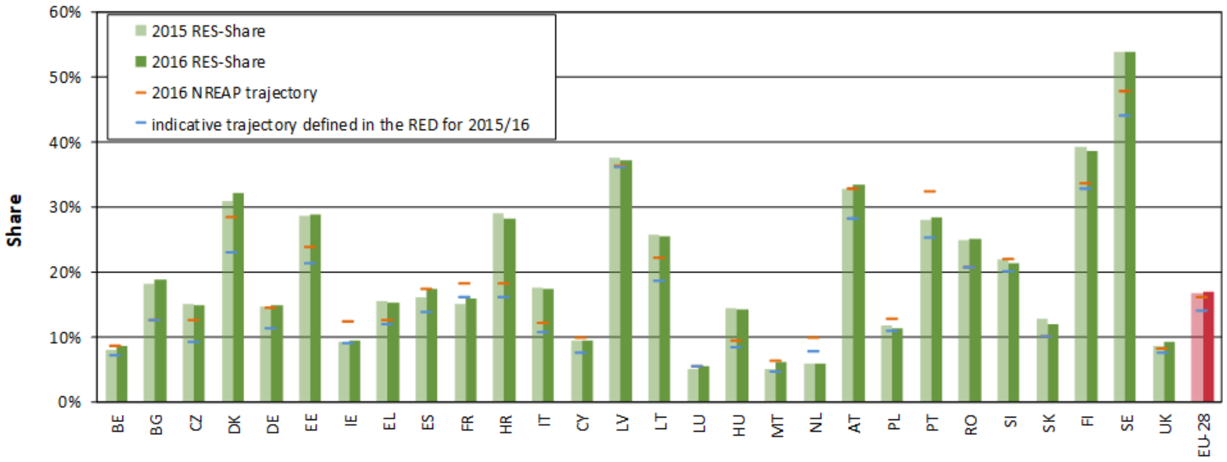

Figure 2. Actual renewable energy shares in 2015 and 2016 compared to indicative trajectories set in RES Directive and NREAP. Source: Eurostat[2]

For RES-E, there is a variety in the types of support schemes used and most MS even have multiple support schemes in parallel. The dominant trend in RES-E support schemes in recent years is the switch to auctions, in most cases combined with feed-in premiums. In most MS that introduced auctions, support levels decreased, which reflects increased competitive pressure (with some exceptions) but also falling technology costs and lower interest rates (financing costs). In some MS, support schemes have been on hold or the transition towards an auction-based RES-E support scheme was a lengthy process. In these cases, no support was available for new investment for one or several years (e.g. in Latvia, Croatia, Portugal, Hungary, Ireland, Slovenia).

In comparison with the RES-E sector, the RES-H&C sector shows a limited but stable support scheme portfolio. The most commonly applied form of support among MS are investment grants. The support instruments that are in place usually apply to a broad range of technologies. The most popular technologies are biogas and solid biomass for heating systems.

The most common support scheme for RES-T in the EU is a biofuel quota obligation. Several MS adjusted their quota schemes and related policies after the implementation of the ILUC Directive in 2015, introducing a cap on conventional biofuels and a sub-target for advanced biofuels. The latter has not yet been implemented in all MS. In the period up until the transposition of the ILUC Directive (which had to be transposed by September 2017), this led to a temporary freeze of the obligation scheme in some MS (e.g. UK), causing a delay in RES-T deployment.

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[2] Quantitative assessments for Malta in this report are based on the National Renewable Energy Action Plan submitted in 2012. Malta submitted a new NREAP in June 2017.

At EU-level a RES share in the range between 18.1% to 20.7% can be expected in 2020 with current and planned RES policy initiatives[3]. This estimate is based on the modelling methodology described in Chapter 3 of this report, which is applied to several scenarios and sensitivities. In the case that MS do not implement their planned policy measures, the RES share would not change considerably and would still range between 18.1% to 20.6% (Current Policy Initiatives - CPI scenario). The majority of MS met their indicative RED trajectories for 2016 and are expected to perform well against their 2017/2018 trajectories, and also in meeting their binding 2020 RES target. However, in seven of these MS, namely Austria, Germany, Spain, Latvia, Romania, Slovenia, and Slovakia there is some uncertainty related to achieving the binding national 2020 RES target: if demand increases substantially in forthcoming years, the likelihood of MS achieving their 2020 RES targets decreases[4].

According to the scenario calculations, in the remainder of MS, namely Belgium, Ireland, Greece, France, Cyprus, Luxembourg, Malta, the Netherlands, Poland, Portugal and the United Kingdom, currently implemented RES policies and already planned RES policy initiatives appear insufficient to trigger the RES deployment needed to meet their binding national 2020 RES target if only domestic supply is considered[5]. The situation differs however from MS to MS. Results show that Ireland, Greece, Cyprus, Malta and Portugal may have only a comparatively small deficit (less than 20% deviation from the RES deployment required for their 2020 binding RES target). Belgium, France, Luxembourg, the Netherlands, Poland and the United Kingdom may face a comparatively larger gap (i.e. larger than 20% of required deployment) by 2020, at least under the pessimistic scenarios (and not considering cooperation mechanisms). Thus, cooperation with other MS and/or third countries represents a viable option for them to meet their binding 2020 RES targets, assuming that domestic RES potentials are comparatively costly or difficult to mobilise when needed. However, as of December 2018, only Luxembourg has signed agreements with other MS (Estonia and Lithuania) to close its expected gap in RES deployment by making use of statistical transfers. With these agreements, Luxembourg is likely to meet its binding national 2020 RES target.

Generally, the significant RES deployment deficit in some countries may also reflect deficits in financial support for RES and/or non-economic barriers. Complementary to targeted measures for an accelerated RES development, the success in improving energy efficiency and thereby reducing overall energy demand represents another important pillar for achieving the binding 2020 RES targets, since they are defined as RES shares, i.e. put in direct relation to demand (growth).

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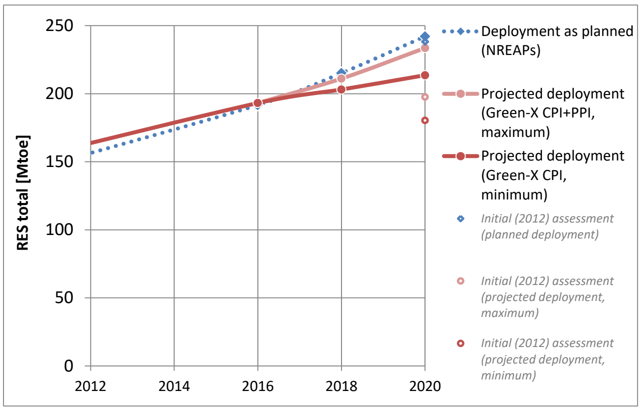
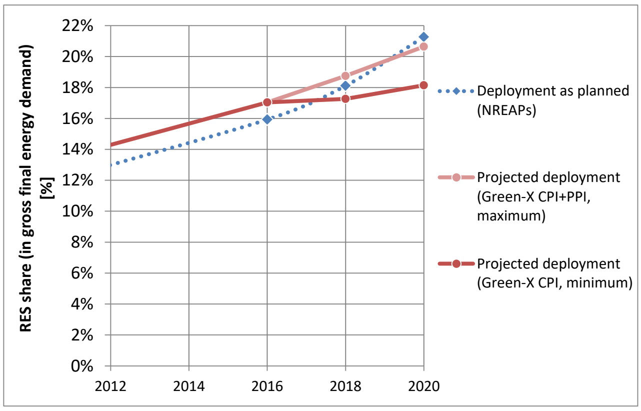
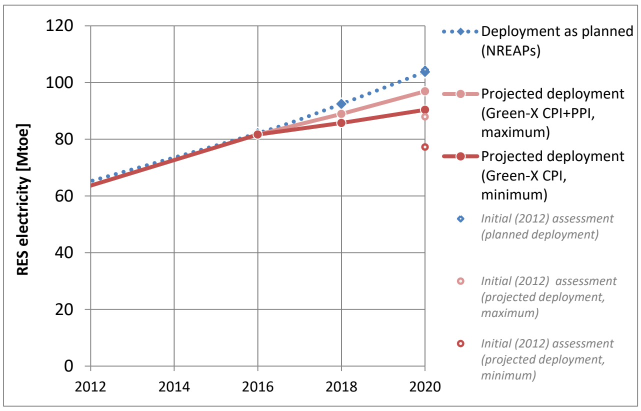
[3] Note that the range indicates the uncertainty related to key input parameter for the model-based assessment of future RES progress. Future energy demand (growth) and the policy implementation play a decisive role in this respect. The report considers policy updates until May 2018.

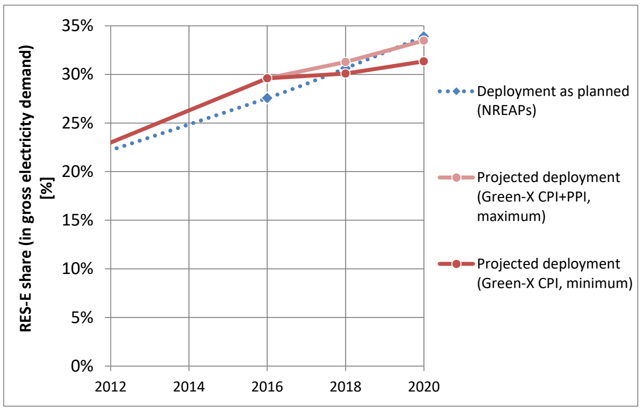
[4] Within the model-based RES prospect analysis expectations on future energy demand are taken from the latest EU reference scenario (EC, 2016) as derived by PRIMES modelling but have been compared with actual data for the status quo (2015 and 2016) and corrected, respectively. It turned out that default PRIMES data indicates generally a higher demand growth than observable in actual statistics. The default demand trend derived from PRIMES was consequently classified as high demand trend and used within this assessment to indicate the lower boundary concerning future RES target achievement. The corrected demand trend serves as basis for the optimistic case of future RES deployment.

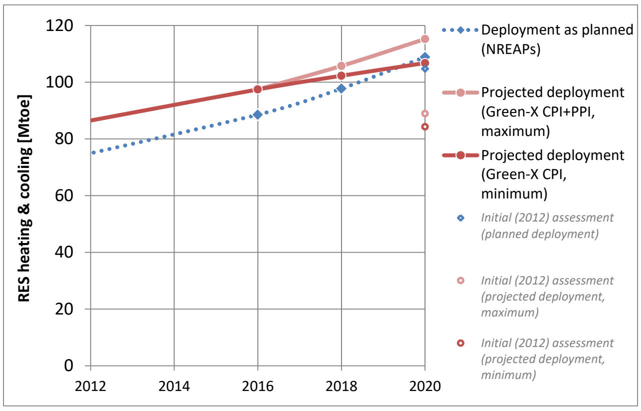
[5] Luxembourg is likely to meet its 2020 RES target when taking into account planned statistical transfers, see below.

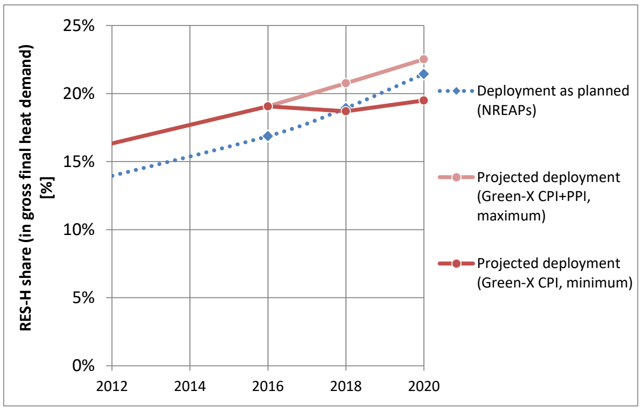

RES total [Mtoe]
250
200
150
100
50
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


RES share (in gross final energy demand) [%]
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


RES electricity [Mtoe]
120
100
80
60
40
20
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


RES-E share (in gross electricity demand) [%]
35%
30%
25%
20%
15%
10%
5%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


RES heating & cooling [Mtoe]
120
100
80
60
40
20
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


RES-H share (in gross final heat demand) [%]
25%
20%
15%
10%
5%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)

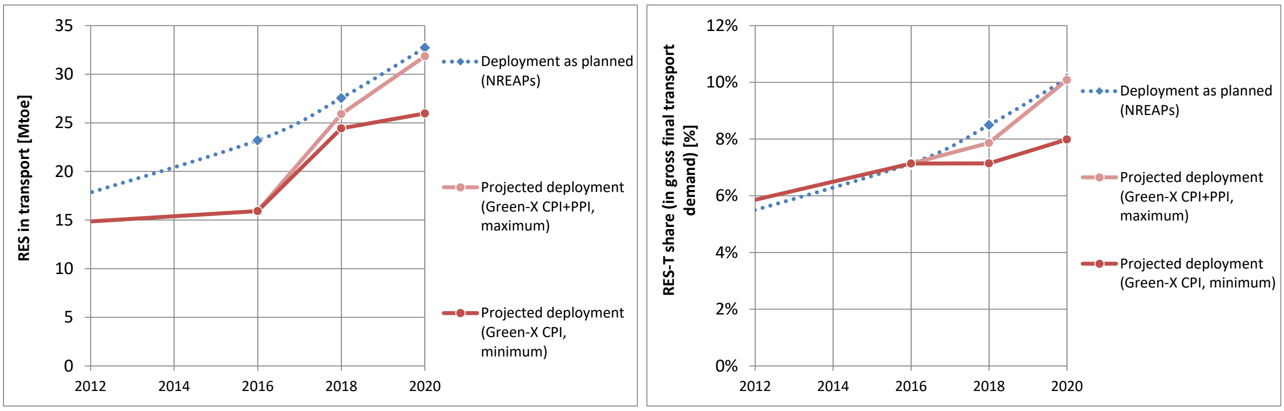


Figure 3. Historic, projected and planned sector-specific RES deployment at EU-level by 2016, 2018 and 2020 in absolute terms (Mtoe, left) and in relative terms (as RES share in corresponding demand, right). Projections based on Green-X modelling

Generally, the RES-E sector shows a comparatively larger gap towards 2020 in comparison to the NREAP sectoral trajectories, ranging from 6.2% to 12.4% as a percentage deviation from the planned 2020 NREAP sectoral trajectory (corresponding with 6.5 to 12.9 Mtoe). Thanks to the strong deployment of photovoltaics in several MS, RES-E was fully in line with NREAP sectoral trajectories in 2016. Due to a slowdown of past progress in several MS, a small deficit (3.4% to 6.7%, equivalent to 3.2 Mtoe to 6.2 Mtoe) can be expected compared to the 2018 NREAP trajectory, and this trend is assumed to continue up to 2020.

The RES-H&C sector is performing the best against the NREAP sectoral trajectories. According to the modelling done in this study, the majority of Member States will be able to meet (and significantly surpass) their planned 2018 NREAP deployment trajectory for RES-H&C. This positive outlook cannot be fully extended to 2020, as some MS may not maintain the same level of progress they had in 2018.

According to the modelling results for the RES-T sector, seven MS will be able to meet (or surpass) their planned 2018 NREAP trajectory (mostly through biofuels), but some will only do so under the more positive scenarios. At EU-level a deficit of 7% to 15% deployment arises, corresponding to a European RES-T share between 7.1% and 7.9% in 2018. In contrast to other sectors and technologies, it can, however, be expected that the situation will improve towards 2020. Thanks to the expected uptake of e-mobility and biofuels (driven by stronger blending shares in several MS), the gap to the planned RES-T deployment is projected to decline to 0.4% at EU-level, still reaching the sum of the binding 2020 RES-T targets of the MS.

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Abbreviations

CHP	Combined Heat and Power
CPI	Current Policy Initiatives
DNI	Direct normal irradiance
EC	European Commission
GHG	Greenhouse gas
ILUC	Indirect Land Use Change
ILUC Directive	DIRECTIVE (EU) 2015/1513
LCOE	Levelised cost of electricity
MS	Member State(s)
NREAP	National Renewable Energy Action Plans
PPI	Planned Policy Initiatives
RED or RES Directive	DIRECTIVE 2009/28/EC
RES	Renewable Energy Sources
RES-E	Renewable Energy Share in Electricity sector
RES-H&C	Renewable Energy Share in Heating and Cooling sector
RES-T	Renewable Energy Share in Transport sector

1 Introduction

The goal of this project is to provide technical assistance to the Commission in realisation of the 2018 Progress Report on renewable energy. This report provides the results from data collection, analysis and assessment of the progress in deployment of renewable energy, and national measures promoting such deployment, in the 28 EU Member States.

This study not only analyses past progress, but also models future progress as to identify sectors and Member States (MS) where action is required to ensure target achievement. This analysis is based on MS National Renewable Energy Action Plans, renewable energy Progress Reports submitted in 2017 by MS, SHARES and Eurostat statistics, other reports and studies, and additional research[6]. The results presented in this report are based on the policy landscape of September/October 2018. An additional review of main changes in the last part of 2018 was included in the qualitative sections describing the Member States and their achievements. This later review was not included in the modelling results as presented in this report.

In accordance with Article 4 of RES Directive each MS has submitted an NREAP to the European Commission in 2010 or later. In its NREAP, each MS provides a detailed roadmap describing how it will meet its legally binding national 2020 RES target. In addition, most MS define slightly more ambitious non-mandatory 2020 NREAP targets. The roadmaps contain indicative sectoral trajectories and the technology mix they expect to use. Every two years, each MS has to submit a report on the developments in RES compared with the trajectories in its NREAP ("Progress Reports").

In Chapter 2, we present an overview of the past progress of the 28 MS and the EU on deployment of renewable energy, also split by the three sectors electricity, heating & cooling and transport. We also present trends in policy measures planned and implemented and progress on non-economic barriers to renewable energy deployment. We end the Chapter with an overview of MS progress in relation to the 2016 indicative trajectories.

In Chapter 3, we assess how feasible the achievement of the 2020 nationally binding RES targets appears under two different scenarios. We not only model the projected future progress of the renewable energy share overall, but also by energy sector and MS.

In Chapter 4, we present a set of recommendations for the MS projected not to achieve their binding national 2020 RES target on possible actions that could be taken to alter this path. Finally, in Chapter 5 we present a summary and conclusions.

In the annexes we additionally present:

- Detailed quantitative progress of all MS per sector and per technology;
- Detailed assessments of planned and implemented measures and policies per MS;
- Detailed analysis of non-economic barriers per MS.

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[6] The results presented in this report are based on the policy landscape of September/October 2018.

2 Progress in deploying renewable energy sources in the EU and the Member States

2.1 Introduction

Historic progress of RES from 2010 to 2016 per MS is based on the database SHARES of Eurostat[7]. Monitoring of progress by technology relies on information provided by MS in their Progress Reports, which include data up to 2016. A brief description of the methodology to assess the progress of the different MS in deploying RES is provided in the Annex of the report (Appendix A).

In the following sections we provide main findings on EU-level and from the MS assessments on:

- Quantitative progress (overall, per sector and technology-specific findings);
- Trends in support schemes;
- Progress on policy commitments by the Member States.

In the Annex, we provide detailed descriptions of each MS and their progress on quantitative growth split over sectors and technologies (Appendix A), policy measures (Appendix B) and non-economic barriers (Appendix C).

2.2 Quantitative progress (overall, per sector and technology-specific findings)

This Chapter presents MS' progress in deploying RES up to 2016. We are comparing the progress achieved by MS in 2016 with two trajectories set out in the NREAP: the indicative 2015/2016 indicative trajectory defined by the RES Directive and the 2016 trajectory planned in the NREAPs.

2.2.1 Approach and data sources

To monitor the progress in RES, shares and trends of overall RES and RES in sectors are depicted, for the EU and by MS. Furthermore, data on development of RES technologies is provided. Specifically, this includes illustrations as listed below:

(1) Two overview graphs indicating the trend in overall EU renewables shares.
(2) MS-specific overview of 2015 and 2016 actual shares versus 2016 NREAP trajectories and 2015/2016 indicative trajectories as set in the RES Directive.
(3) MS-specific deviation from 2016 indicative RED trajectory in %.
(4) Total generation, or consumption, and growth of RES by sector, technology and MS.

For the overall RES development, information is provided according to (1), (2) and (3). For each of the three separate RES sectors, i.e. RES-E, RES-H&C and RES-T, figures of type (2) and (3) are provided (shown in Appendix A), in addition to data tables on actual deployment and growth (4). Furthermore, the development of

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[7] http://ec.europa.eu/eurostat/web/energy/data/shares

individual technologies is presented in Appendix A. It includes technologies as listed in Table 1. For these individual technologies, figures of type (3) are shown.

Table 1. Overview RES technologies presented in Appendix A

Renewable electricity (RES-E)	Renewable heating and cooling (RES-H&C)	Renewable energy in transport (RES-T)
Offshore wind	Solar thermal	Bioethanol/Bio-ETBE
Onshore wind	Solid biomass	Biodiesel
Solid biomass	Biogas	Electricity in transport
Biogas	Heat pumps	Other biofuels[8]
Photovoltaics	Geothermal	Hydrogen
Small hydro	Bioliquids	
Large hydro		
Mixed hydro		
Geothermal		
Bioliquids		
Concentrated solar power		
Tide, wave and ocean energy		

This report is based on five data sources:

- The targets and the indicative trajectories are derived from two sources:
  - **RES Directive: the indicative trajectories up to 2020 are defined in the RES Directive.**
  - **NREAPs:** The trajectories planned for each RES technology until 2020 have been taken from the NREAPs which MS submitted to the European Commission in 2010 (hyperlink to NREAPs).
- The past progress in RES deployment has been analysed on basis of three data sources:
  - **Eurostat shares:** RES shares published by Eurostat for those graphs displaying RES overall shares or RES sector shares. The Eurostat shares are available for the EU-28. The latest shares are of 2016.
  - **Member State Progress Reports**: Used for those graphs and tables detailing technology-specific progress. MS submitted their fourth Progress Reports to the Commission in early 2018, to monitor compliance with their planned trajectories and measures. The latest reports cover the period 2015-2016.
  - **Eurostat energy balance, national data sources**: Eurostat technology data from energy balances, and national data for selected MS, is used for comparison and verification purposes only.

Any gaps or serious discrepancies between data sources are mentioned either in the analysis text or in a footnote below the respective figure.

For the overall shares and sector shares, NREAP table 3 (in Chapter 2.2.3) was compared to the shares published by Eurostat.

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[8] All other liquid or gaseous (synthetic) biofuels.

2.2.2 Overall trends EU

At an EU-level, the shares of RES in total, renewable electricity (RES-E) and heating and cooling (RES-H) have been continuously increasing over the past years. In 2016, the EU reached a share of 17% of RES in gross final energy consumption, the target for 2020 being 20%. Figure 4 shows a rise in shares since 2005 – with the exception of RES-T which decreased in 2011, due to the requirements on sustainability following from the transposition of the RES Directive[9]. The overall RES share increased by 0.37% from 2015 to 2016. On average, it has been increasing by about 0.7% per year since 2009, which corresponds to the linear interpolation of progress needed to reach the 20% target by 2020.

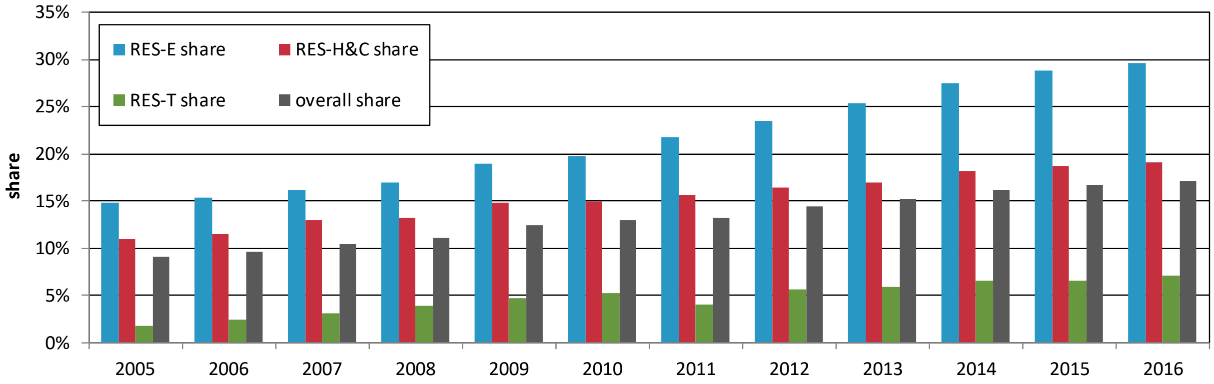

Figure 4. EU-28 RES shares from 2005-2016 (%). Source: Eurostat

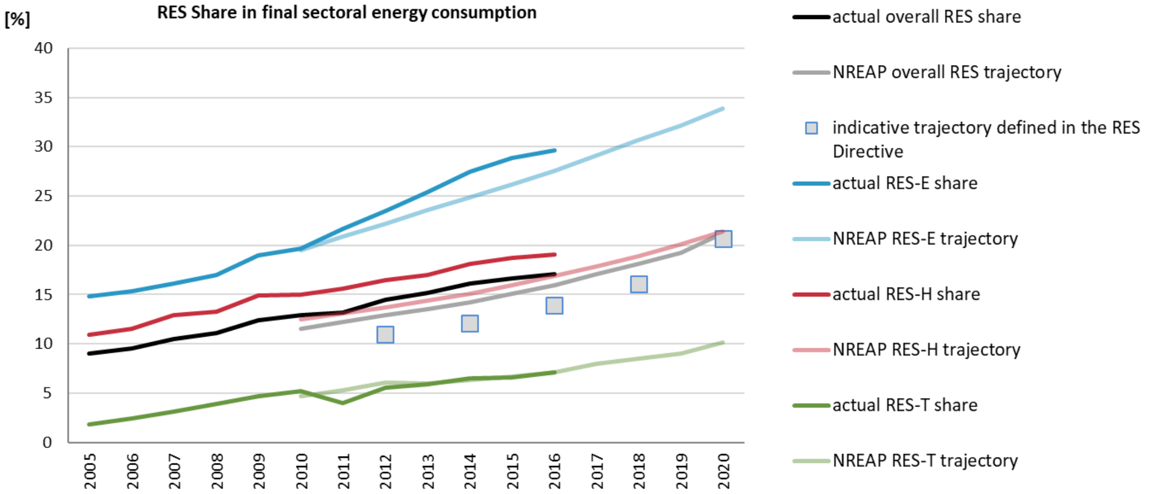

Figure 5. Actual and planned RES shares for the EU-28 (%). Source: Eurostat, NREAPs

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[9] Regarding the consumption of bioliquids and biofuels (as defined in Article 2 of RES Directive), there is a sudden decrease in consumption from 2010 to 2011, after which it rises again. This has an especially strong effect on the RES-T share. The issue is caused by a methodological break in the time series in statistics for biofuels due to the transposition and implementation of RES Directive by Member States, rather than by actual fluctuations in consumption: to be eligible for the RES target, biofuels and bioliquids must be compliant with sustainability criteria and verification procedures specified under Articles 17 and 18 of the RES Directive. This legislation was fully transposed only after 2010. Until then (until reference year 2010), all biofuels were counted towards the RES and RES-T shares. From 2011, Member States were allowed to report “as compliant only those biofuels and bioliquids for which compliance with Article 17 as well as Article 18 can be fully demonstrated”. As Member States gradually improved the implementation of the RES Directive and also increased the quantity of compliant biofuels, the RES-T share rose again (and to smaller extent, overall RES also increased).

Figure 5 compares historic shares up to 2016 to the trajectories set out in MS' NREAPs, as well as to the indicative trajectory defined in the RES Directive. Up to 2016 the EU-28 has been comfortably above the indicative trajectory set in the RES Directive, defined as the average values of 2011/2012, 2013/2014, and 2015/2016, respectively. The EU as a whole is also above the slightly more ambitious trajectory defined by MS themselves in their NREAPs. With regard to individual sectors, the RES-E and the RES-H&C sectors are well on track, while the RES-T sector stays just below the planned share (7.13% actual versus 7.14% planned). It is thus the higher than planned share of the RES-E and RES-H&C sectors, which leads to the overall RES sector being slightly above the indicative trajectory of the RED as well as the planned NREAP trajectory.

Key reasons for the higher share from the RES-E sector are:

- Higher growth than expected from solar PV, and to a lesser extent from biogas;
- Lower electricity demand than expected in NREAP energy efficiency scenario.

Key reasons for the good performance of the RES-H sector are:

- Higher growth than expected from solid biomass, biogas and geothermal heat pumps;
- Lower heat demand than expected in the NREAP energy efficiency scenario.

2.2.3 Overall trends by Member States

Individual MS' RES shares in 2016 differed greatly, largely reflecting the different starting positions and national targets defined in the RES Directive. In 2016 Sweden held the highest RES share (53.8%), while the lowest shares of renewables were seen in Luxembourg (5.4%), Malta[10] and the Netherlands (6% in both cases). Figure 6 depicts actual RES shares by MS and compares them to the indicative trajectory set in the RES Directive for 2015/16 and the NREAP trajectory for 2016.

Figure 7 shows each MS' deviation from the 2015/2016 indicative RED trajectory as percentage of the value. Table 2 lists RES shares, trajectories and the 2020 target per MS.

A comparison of actual RES shares to the indicative trajectories set in the RES Directive and the NREAPs shows that:

- 23 MS can be considered to be comfortably above their indicative RED trajectory for 2015/2016. France, Luxembourg and the Netherlands are below their indicative RED trajectories;
- The largest positive deviations from their indicative RED trajectories can be observed in Croatia, Hungary and Italy.
- Ireland and Poland still surpass their indicative RED trajectories, albeit by only a slight margin of less than 1%.

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[10] Malta adapted its NREAP in the year 2017 specifying targets regarding overall RES and sectoral shares. For RES-E, Malta's 2017 NREAP does not contain specific trajectories on technological level. For RES-E, Malta focusses entirely on PV setting all other technologies to 0%. Therefore, the 2017 NREAP is only used for figures containing sectoral data and technological data for RES. For RES-H&C and RES-T, data from the previous NREAP is used.

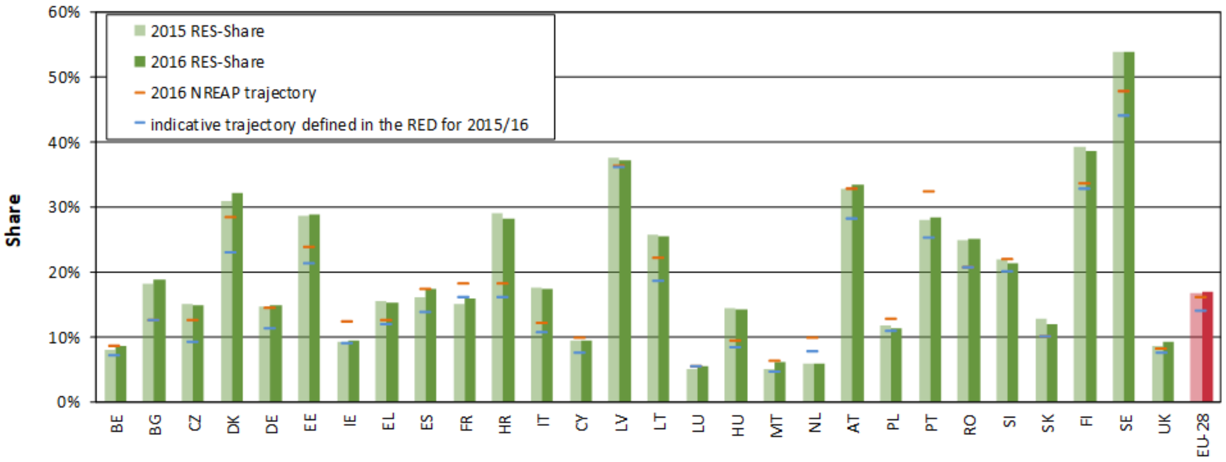

Figure 6. Actual renewable energy shares in 2015 and 2016 compared to indicative trajectories set in RES Directive and NREAP. Source: Eurostat[11]

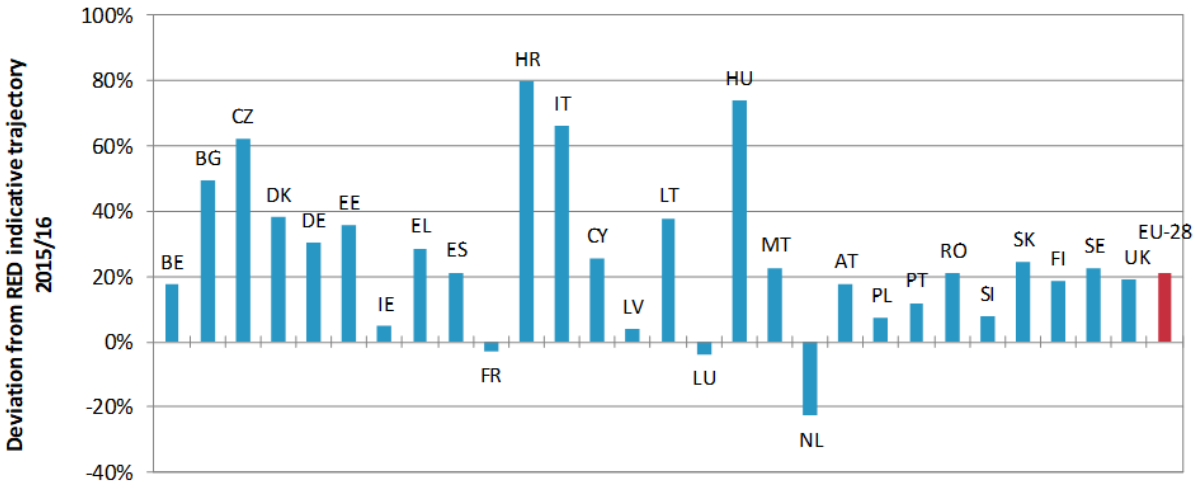

Figure 7. Deviation of actual RES shares in 2015/2016 (two-year average) from 2015/2016 indicative trajectory set in RES Directive [change in %]

Source: Eurostat

- Croatia, Hungary and Italy far exceeded their planned RES-H&C shares, Croatia and Italy also their planned RES-E share (as indicated in their NREAPs).
- Looking at those MS that were only slightly above their indicative RED trajectory, Ireland stayed below its planned sectoral NREAP trajectory in all three sectors, having achieved sectoral RES shares of 27.2% in electricity, 6.8% in heating & cooling and 5% in transport. Poland stayed significantly below its planned RES-T share, reaching only 3.9% RES share in transport.

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[11] Quantitative assessments for Malta in this report are based on the National Renewable Energy Action Plan submitted in 2012. Malta submitted a new NREAP in June 2017.

- The Netherlands show the largest gap, with an actual average share of 5.9% for 2015/2016 versus an indicative RED trajectory of 7.6%. The gap to the planned NREAP share of 9.7% RES in 2016 is even larger (see Table 2). The country is far behind its planned RES-E trajectory and also somewhat delayed regarding its planned RES-T development.
- Luxembourg and France stayed slightly below their indicative RED trajectory for 2015/16. Luxembourg deployed lower amounts of RES-E than planned in the NREAP. In France the RES-E and RES-H&C deployment developed slower than planned in the NREAP.

Table 2. Actual (Eurostat) and planned RES shares according to the NREAPs and indicative trajectories from the RES Directive

Member State	2016 RES Share [%]	2015/2016 RES share (average) [%]	2016 NREAP trajectory for RES [%]	2015/2016 indicative trajectory (RES Directive) [%]	Binding 2020 RES target (RES Directive) [%]
Belgium	8.7	8.3	8.6	7.1	13.0
Bulgaria	18.8	18.5	12.4	12.4	16.0
Czech Republic	14.9	14.9	12.4	9.2	13.0
Denmark	32.2	31.6	28.2	22.9	30.0
Germany	14.8	14.7	14.4	11.3	18.0
Estonia	28.8	28.7	23.7	21.2	25.0
Ireland	9.5	9.3	12.2	8.9	16.0
Greece	15.2	15.3	12.4	11.9	18.0
Spain	17.3	16.7	17.3	13.8	20.0
France	16.0	15.6	18.0	16.0	23.0
Croatia	28.3	28.6	18.1	15.9	20.0
Italy	17.4	17.5	12.0	10.5	17.0
Cyprus	9.3	9.4	9.7	7.4	13.0
Latvia	37.2	37.4	36.3	35.9	40.0
Lithuania	25.6	25.7	22.0	18.6	23.0
Luxembourg	5.4	5.2	5.4	5.4	11.0
Hungary	14.2	14.3	9.3	8.2	13.0
Malta	6.0	5.5	6.1	4.5	10.0
Netherlands	6.0	5.9	9.7	7.6	14.0
Austria	33.5	33.2	32.4	28.1	34.0
Poland	11.3	11.5	12.7	10.7	15.9
Portugal	28.5	28.2	32.2[12]	25.2	31
Romania	25.0	24.9	20.6	20.6	24.0
Slovenia	21.3	21.6	21.8	20.1	25.0
Slovakia	12.0	12.4	10.0	10.0	14.0
Finland	38.7	38.9	33.6	32.8	38.0
Sweden	53.8	53.8	47.7	43.9	49.0
United Kingdom	9.3	8.9	8.0	7.5	15.0
EU-28 (calculated)	17.0 (Eurostat SHARES)	16.9 (Eurostat SHARES)	15.9	13.9[13]	20.7[14]

🟩	Average 2015/2016 share is >1 percentage point above indicative RED trajectory
🟨	Average 2015/2016 share is 0-1 percentage point above indicative RED trajectory
🟥	Average 2015/2016 share is below indicative RED trajectory

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[12] NREAP targets presented for Portugal in this report are based on the redefined NREAP that Portugal adopted in 2013. The redefined NREAP is in accordance with a scenario based on reduced electricity demand, taking into consideration the effects of energy efficiency measures of the so-called Additional Energy Efficiency Scenario stipulated in the National Energy Efficiency Action Plan 2016.

[13] This value indicates the sum of RES generated across all MS compared to the sum of total consumption.

[14] This value indicates the sum of RES generated across all MS compared to the sum of total consumption; it is 0.7 percentage points above the RES Directive target for 2020.

Figure 8 shows the overall over- and underperformance with regard to the sectoral trajectories defined in the NREAPs for 2016 on the basis of table 2. A comparison of actual RES shares to the indicative NREAP targets and trajectories shows that ten out of 28 EU MS had already reached or surpassed the level of their 2020 NREAP RES targets at the time of 2016 (however, this does not mean that these countries will automatically achieve their 2020 targets: up to 2020, gross final energy consumption – which defines the denominator of the target share – could still increase, or RES production could decrease). Another nine MS were on track of their 2016 NREAP trajectories. Nine MS were lagging behind their NREAP trajectories for the overall RES share.

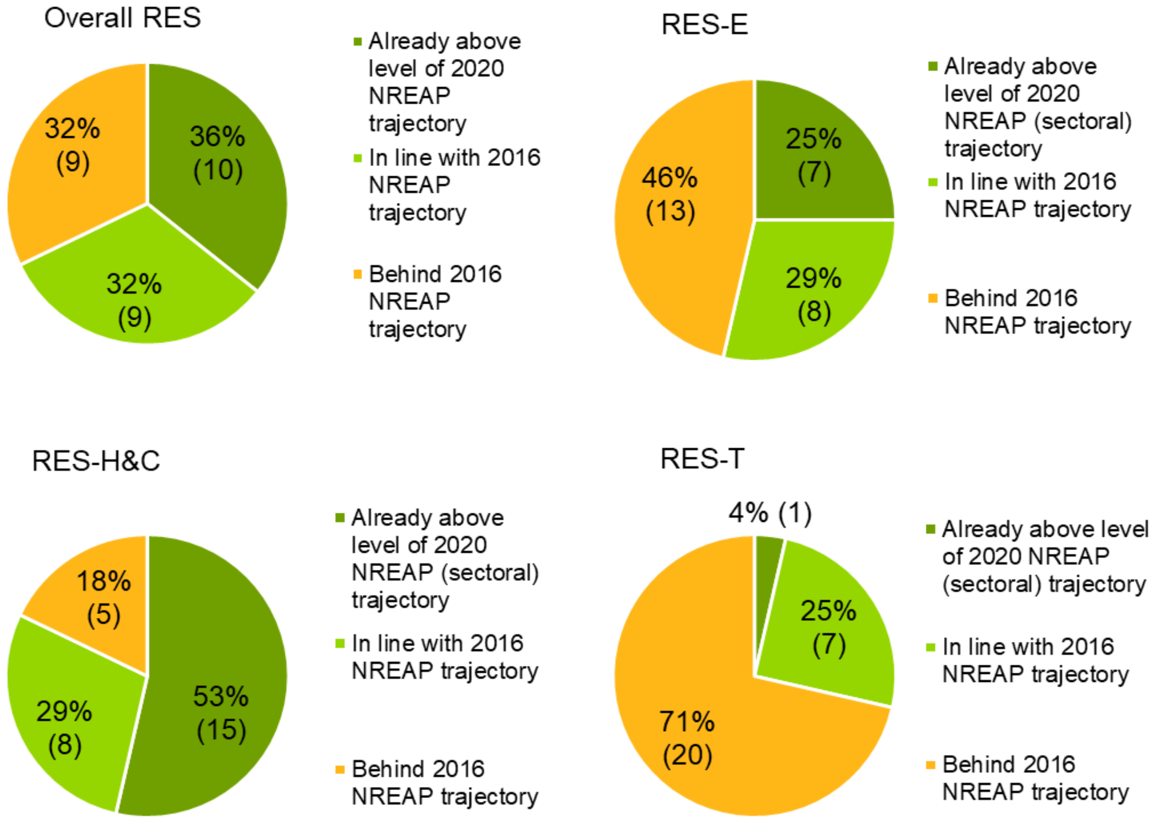

Figure 8. Overview of over- and underperformance compared to the 2016 NREAP trajectories (number of Member States in brackets)

When looking at the different RES sectors, the picture becomes more differentiated:

- Regarding RES-E, seven MS had already reached the level of the 2020 RES-E share planned in their NREAPs. Eight MS were on track of their 2016 NREAP RES-E trajectory and 13 were behind their 2016 NREAP trajectory.
- Regarding RES-H&C**,** 15 MS had already exceeded the 2020 RES-H&C share planned in their NREAPs, while eight other MS were in line with their 2016 NREAP trajectory. Five MS were behind their 2016 NREAP trajectory.
- The progress regarding RES-T is less advanced. Only Sweden was significantly above the 2020 RES-T share defined in its NREAP. Seven MS were in line with their 2016 NREAP trajectory, and 20 MS were below their NREAP trajectory, in many cases substantially.

2.2.4 Estimated potential for cooperation mechanisms

In section 11 of the Progress Reports, MS are required to report on their actual and estimated excess and/or deficit production of energy from RES compared to the indicative RED trajectory which could be transferred to or imported from other MS. Table 3 shows actual and estimated excess and/or deficit production of RES in ktoe as reported by the MS. Lithuania and the UK report the excess of energy from RES in %, not in ktoe, see Table 4[15].

Overall, 12,564 ktoe excess production of RES in 2020 are estimated by the MS listed in Table 3. The main contributors to this excess are Germany, Italy and Sweden, each estimating an excess of more than 3,000 ktoe for 2020. Ten MS (Belgium, France, Cyprus, Malta, Netherlands, Austria, Romania, Slovenia, Slovakia, Finland) report an excess production of zero ktoe in 2020, indicating that they estimate to exactly reach their target. Latvia, Hungary, Lithuania and the UK do not provide an estimation for 2020. A deficit production in 2020 is only estimated by Ireland (-366 ktoe) and Luxembourg (-120 ktoe).

Bulgaria, Denmark, Estonia and Romania indicate that they consider cooperation mechanisms as an option to make statistical transfers to other MS experiencing a deficit of energy from RES. In addition, Slovakia reports it is holding talks with other MS on statistical transfers and Hungary reports it is open to cooperating with other MS to transfer excess renewables production statistically and to establish common support schemes.

Currently, Sweden, Germany, Denmark, Luxembourg, Estonia and Lithuania are already making use of cooperation mechanisms. Sweden and Norway have agreed upon a joint support scheme for renewable electricity production by means of a common market for electricity certificates, which was introduced on 1 January 2012. In late 2016, Germany and Denmark held pilot calls for tender for ground-mounted PV installations that were open to participation by both MS. PV installations in both Germany and Denmark were able to participate in these first cross-border tenders in Europe. In Germany, an open tender with a volume of 50 MW was conducted, in which five projects situated in Denmark submitted successful bids. Denmark tendered a total capacity of 20 MW, of which up to 2.4 MW were open for competition from bidders in Germany. Only Danish projects were awarded. In 2017, Luxembourg signed agreements for statistical transfer with Lithuania and Estonia. The agreements stipulate that Luxembourg will be provided statistical transfers for the period 2018 - 2020 in order to meet its 2020 RED target.

According to the modelling performed for this report, the currently implemented RES policies of several MS appear insufficient to trigger the required RES volumes to reach their minimum binding 2020 targets as defined in the RED (see chapter 4.2): Belgium, Ireland, Greece, France, Cyprus, Luxembourg, Malta, Netherlands, Poland, Portugal and United Kingdom. Based on the modelling performed, Spain is at risk of not reaching the binding 2020 targets in the scenarios including current policy measures, and only just reaching the 2020 target in the scenario including planned policy measures. Of these MS, Belgium, Ireland, Greece, Poland and the UK give no indication as to whether they consider making use of statistical transfer in case they fall short of their 2020 target. France, Malta and Cyprus are not planning to make use of statistical transfer or other forms of cooperation mechanisms at this stage, but do not rule out statistical transfers as a contingency measure in case they fall short of their planned production. Portugal indicates that negotiations are already underway about the possibility of an agreement with another MS for statistical transfer. The Netherlands plans to achieve the RES targets according to its estimates. However, it indicates that if it turns out at a later date that the Netherlands may be at risk of an energy shortfall, then cooperation mechanisms

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[15] At the time of preparation, Croatia has not provided its 4th Progress Report. Results for Croatia are therefore not reflected in table 4.

may be considered in order to make up for this shortfall. It should be noted, however, that there is minimal political support for the use of cooperation mechanisms in the Netherlands.

Table 3. Actual and estimated excess and/or deficit production of RES in MS compared to the indicative RED trajectory which could be transferred to/from other MS and/or third countries (ktoe). (Source: Table 7 of the Progress Reports)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Belgium			0	0	0	0	0	0	0	0	0	0
Bulgaria		372	357	528	641	601	610	691	420	471	411	341
Czech Republic		0	0	0	0	1145	1039	947	863	892	678	643
Denmark			694	834	1123	1106	1223	1452	552	619		63
Germany			6895	8436	6546	9390	7272	7911	4130	5976		3065
Estonia	101	117	135	122	75	94	154	163	186	235	279	296
Ireland				93	-14	111	79	26	-142	-12	-239	-366
Greece		137	201	320	242	195	137	-162	737	743	683	529
Spain			2290	3083	2720	3357	1990	2963	2049	2793		839
France		-641	-2708	-1877	-1565	-3721	-4048	-4075	0	0	0	0
Italy	8324	8613	7405	10011	10937	9343	9468	7789	7259	5828	4462	3397
Cyprus	0	-11	28	44	45	43	29	29	57	34	21	0
Latvia[16]							-69	-127				
Luxembourg	0	0	0	0	0	0	0	0	0	-50		-120
Hungary		968	1150	1213	1295	883	970	803				
Malta							4	10				0
Netherlands							0	0	0	0	0	0
Austria	0	0	0	0	0	0	0	0	0	0	0	0
Poland		543	729	929	530	93	174	-260[17]	968	968		587
Portugal			83	82	84	144	128	154	81	131	-4	50
Romania	1153	1306	794	942	645	692	1089	886	258	405	263	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia			302	254	142	222	305	364	90	110		0
Finland	0	0	0	0	0	0	0	0	0	0	0	0
Sweden	2407	2141	2482	3318	3214	3335	3347	3475	3215	3610	3428	3241
Total sum	**11985**	**13544**	**20838**	**28332**	**26660**	**27033**	**23901**	**23038**	**20722**	**22752**	**9982**	**12564**

Table 4. Excess of energy from RES in Lithuania and UK compared to the indicative RED trajectory which can be transferred to other MS and/or third countries (in %). (Source: table 7 of the Progress Reports)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Lithuania		3.72%	3.23%	3.72%	3.95%	3.86%	4.77%	3.46%				
UK			0.20%	0.70%	0.60%	1.00%	1.50%	1.20%				

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[16] Please note that Latvia is ahead of their indicative RED and planned NREAP trajectory for 2015/2016, but this is due to a lower energy consumption. They have (as indicated in their progress report) not reached the levels of gross RES consumption as planned, shown by the negative numbers in this table.

[17] Poland reported actual gross RES consumption negative compared to the planned value for 2016. Percentage wise they are also below their NREAP planned trajectory. However their achievement in percentages shows that they are above the indicative trajectory as specified in the RED for 2015/2016. A cause could be a lower overall energy consumption then planned.

2.3 Trends in support schemes

This Chapter outlines the most important trends in the RES support schemes in all three sectors: electricity, heating & cooling and transport. For more detail on the individual MS' policies and support instruments, please see Appendix B.

Trends have been identified based on regulatory changes as well as the implementation of new support schemes as reported in the MS' 4th Progress Reports. Additional sources were taken into account to complement the information provided in each of the Progress Reports, for example official government websites and legal texts as well as assessments thereof. The analysis focused on the main support schemes in the individual sectors. As specific support volumes are often not reported, the analysis is rather qualitative than quantitative.

2.3.1 Policy trends RES-E

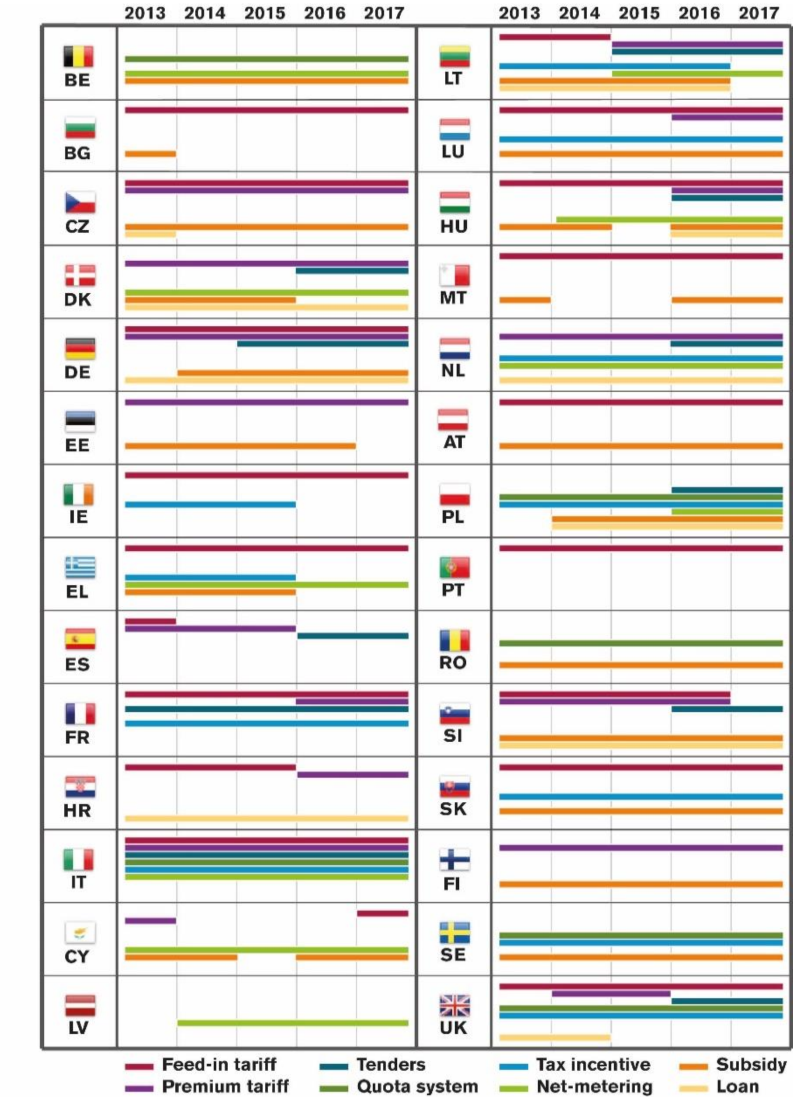

Figure 9. Overview of the support schemes in the RES-E sector between 2013 and 2017

Figure 9 visualises the portfolio of support schemes for RES-E in the EU-28 between 2013 and 2017. The overview highlights the variety of support scheme combinations implemented in the EU-28.

Almost all MS have applied at least two different support schemes between 2013 and 2017.

In several MS (e.g. Latvia, Croatia, Portugal, Hungary, Ireland, Slovenia), the RES-E support schemes have been on hold (see Appendix B for more detail). Latvia's RES-E support has been on hold since 2011. In Slovenia, no auction has been held in the period of March 2014 to October 2016 under the new auction scheme. Hungary introduced a new support scheme in early 2017, however, no tenders have as yet been published. Ireland is a similar case. Since January 2016 there is no support scheme available and the introduction of a new scheme is pending.

Other MS stand out through the volatility of their support schemes. This is, for example, the case of Spain, which successively implemented a feed-in tariff and premium tariff (both running in parallel), a support moratorium and then an auction scheme. Cyprus also implemented several support instruments for short periods of time.

Malta also stands out as it is the only MS that only supports a single RES-E technology, in this case solar PV. While in the original NREAP Malta planned to produce 254.49 GWh (4.1% of the 10% RES 2020 target) from wind energy, the updated plan intends to rely solely on solar PV for RES-E. In Malta other technologies such as wind energy, geothermal, wave, tidal and hydro power as well as biomass are no longer being considered for 2020 due to perceived negative impact on the environment or cost-effectiveness[18].

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[18] Malta, revised NREAP 2016/2017, p. 114
https://www.timesofmalta.com/articles/view/20161103/local/wind-power-ditched-in-favour-of-solar-as-government-revisits-renewable.629952

The dominant trend in RES-E support schemes in recent years is the switch to auctions. As shown in Figure 10, 15 MS had implemented competitive bidding schemes (mostly auctions) for their main RES-E technologies by 2018, while 8 further MS are planning or considering their implementation. Furthermore, many MS have changed the remuneration of new RES-E installations from administratively set feed-in tariffs to feed-in premiums. In in most cases premiums are determined through the competitive bidding schemes.

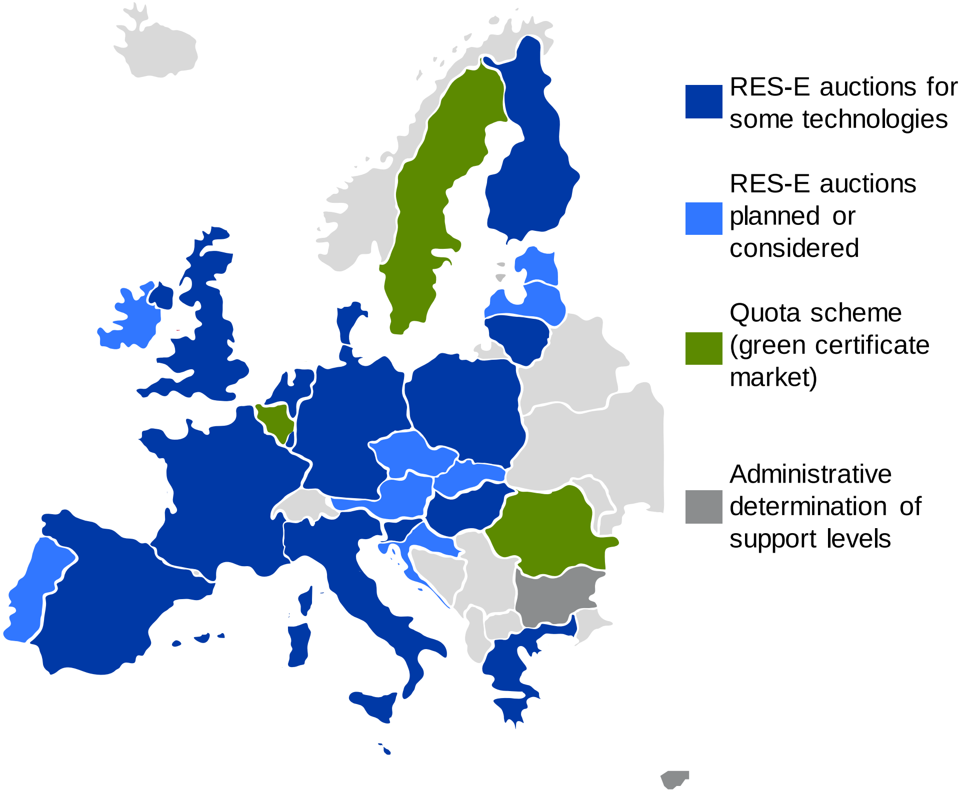

Figure 10. Overview of RES-E auction implementation status in the EU in 2018. Source: Ecofys

The trend towards auctioning has multiple causes. With the implementation of competition-based schemes for the allocation of support, MS thrive to lower the costs of renewables support and to maintain an effective control either of the volume of new installations or the total budget spent. In addition, the implementation of auctions and premiums has been promoted by the European Commission’s Guidelines on state aid for environmental protection and energy (2014/C 200/01) adopted in 2014.

Most MS chose to implement technology-specific auctions rather than technology-neutral or multi-technology auctions. Between July 2014 and May 2018, 15 MS have received in total 25 state aid approvals of changes in their RES-E support schemes. Out of the 25 notified support schemes, two feature technology-neutral auctions (Estonia and Hungary). So far, no auctions have taken place under these two schemes. In fifteen notification cases, support schemes qualified as technology specific. This is the case for support schemes in Finland, Denmark, Netherlands, Italy, Portugal, France, Germany, Poland and Greece. The remaining 8 notifications feature elements of technology-neutral auctions by applying multi-technology auctions partly with additional differentiating elements (United Kingdom, Malta, Slovenia, Germany, France, Spain, Poland). Some MS are combining technology-specific with multi-technology auctions that have additional elements. This is, for example, the case in Germany, France, the Netherlands and Poland. In some MS, multi-technology auctions have a pilot character (e.g. Germany). The need for technology diversification was mentioned in most cases as reason to make an exception from the principle of technology-neutrality. It remains to be seen whether multi-technology auctions will be implemented at a larger scale and in more MS in the coming years.

In most MS that introduced auctions, support levels decreased, which reflects increased competitive pressure (with some exceptions) but also falling technology costs and low-interest rates (financing costs). For example, support levels for PV in Germany fell by almost 50% between 2015 and 2017. Offshore tenders in the Netherlands and Germany resulted in subsidy-free offshore bids. However, the downward trend in competitively determined support levels can also reverse as a result of changes in financing and technology costs, the competitive landscape as well as the auction design. Average bid levels in onshore wind auctions in Germany, for example, fell from 5.71 ct/kWh in May 2017 to 3.82 ct/kWh in November 2017 and increased again to 6.16 ct/kWh in August 2018.

There is a risk that the transition towards an auction-based RES-E support might temporarily slow down RES-E deployment in individual cases. Such an effect may only be visible in the coming years, depending on the transition phase towards the scheme. The deployment gap can occur for two reasons. First, in some Member States, the transition phase itself – the time between closing the old scheme and implementing the new scheme – is taking time, which leaves investors with no possibilities to receive support for new installations and hence little incentive to finalize new installations in that period. Slovenia is one of the Member States in which RES-E deployment has been on hold for a long time (more than two years) due to the policy switch. Second, bidders that succeed in an auction need time to realise the project (usually two or more years, depending on the technology and auction design). In addition, some MS have implemented an auction scheme but have not yet held auctions. Also, some MS do not publish an auction schedule that provides a clear outlook on auction volumes and thus deployment levels in the coming years.

The trend towards auctions as the main instrument of allocating support is expected to continue. However, quota schemes continue being the main support instrument in Sweden, Belgium and Romania, whereas Italy, Poland and the United Kingdom have closed their certificate scheme to the award of new capacities in 2016 and 2017 respectively.

Next to feed-in tariffs or premiums, some MS grant additional support options, e.g. in the form of net metering, which is in place in Denmark, Greece, Spain, Italy, Latvia, Lithuania, Cyprus, Hungary and Slovenia. Net metering is a billing arrangement that allows electricity consumers who also generate electricity, e.g. households with a solar PV installation, to ‘virtually’ consume their self-generated electricity at any time. This means, for example, that a household is able to feed excess solar power of the midday back into the distribution grid and receive a credit for it which is then offset with electricity consumed form the grid, e.g. in the evening when the own solar installation does not generate electricity. There are various sorts of net metering schemes which vary in the details.

2.3.2 Policy trends RES-H&C

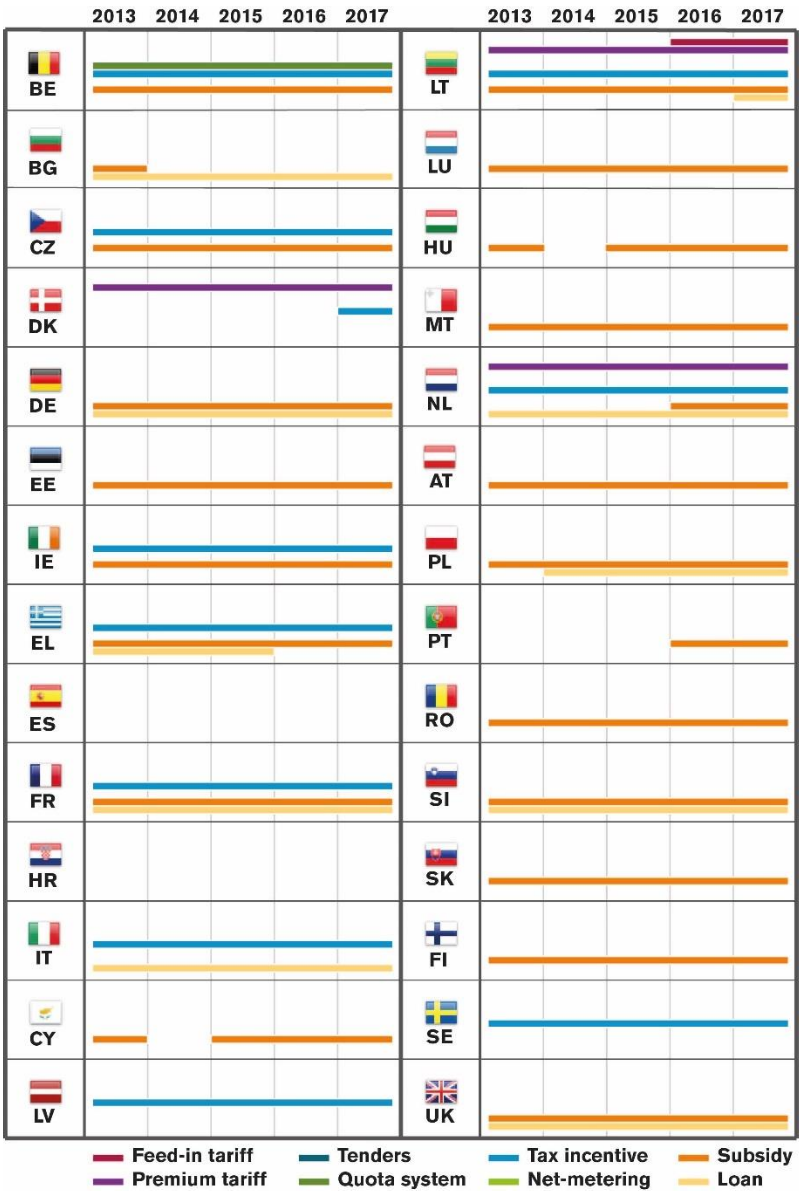

Figure 11. Overview of the support schemes in the RES-H&C sector between 2013 and 2017

Figure 11 visualises the portfolio of support schemes for RES-H&C in the EU-28 between 2013 and 2017. In comparison with the electricity sector, this overview underlines the more limited support scheme options implemented. While, on average three (2.9) different types of support scheme per MS were applicable in the RES-E sector in 2017, RES-H&C support was based on less than two (1.6) instruments per MS on average. The most commonly applied form of support among MS are investment grants (listed under subsidies). In 21 MS, some sort of subsidy is available. Other forms of commonly provided support are loans, tax deductions and feed-in premiums.

The support instruments that are in place usually apply to a broad range of technologies. Most popular technologies are biogas and biomass plants. In addition, commonly supported technologies are geothermal, aerothermal and hydrothermal heat pumps as well as solar thermal plants.

Spain, Croatia and Portugal are the only three MS which had no support scheme for RES-H&C between 2013 and 2017, whereas many other MS implemented one single support instrument (12 MS in total). In addition, the majority of the MS is characterised by the longevity of their support scheme, being in place at least from2013to 2017. No major changes occurred in RES-H&C policy over the last years. Also, no major changes in the support scheme landscape for RES-H&C are expected for the coming years.

Belgium, France, Lithuania and the Netherlands are characterised both by the longevity and the diversity of their support scheme portfolio, with at least three support instruments offered continually since 2013.

2.3.3 Policy trends RES-T

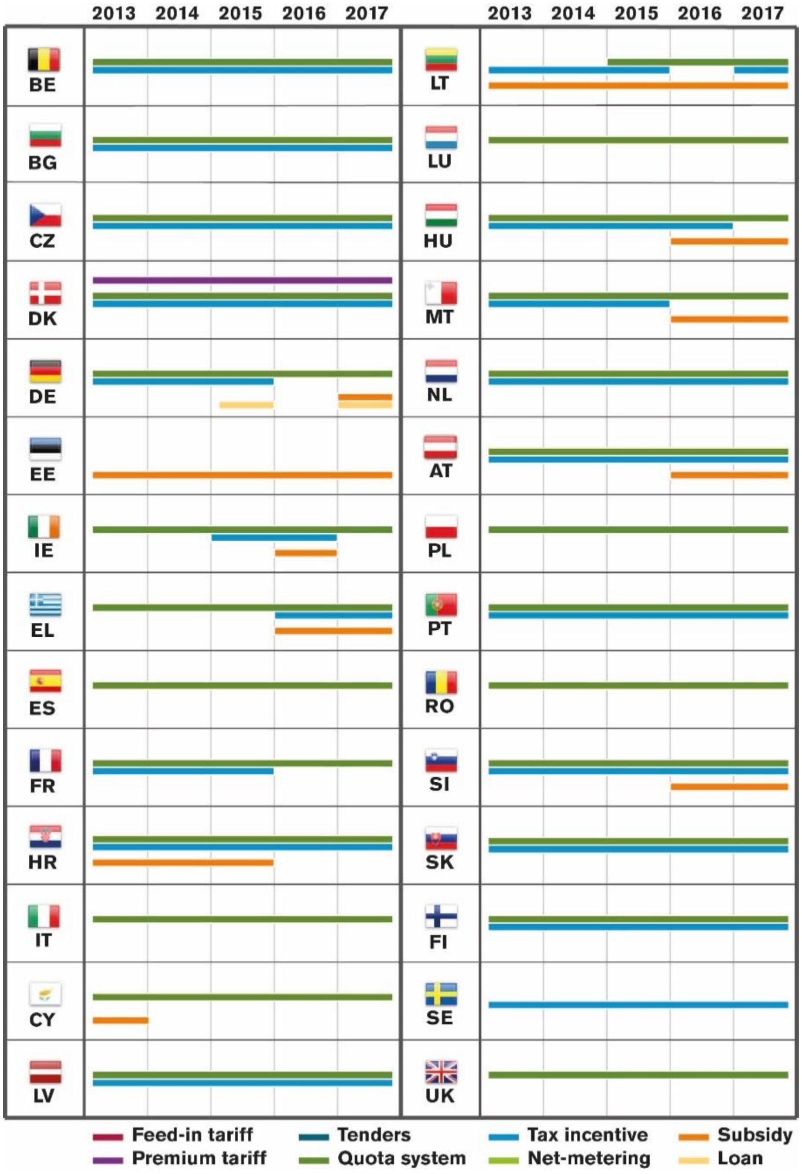

Figure 12. Overview of support schemes in the RES-T sector between 2013 and 2017

Figure 12 visualises the portfolio of support schemes for RES-T in the EU- 28 between 2013 and 2017. The RES-T sector stands out by the rather comparable portfolio of support instruments implemented by each Member State. The majority of the MS is characterised by the longevity of their support scheme, being in place at least from 2013 to 2017.

The most common support scheme for RES-T in the EU is a biofuel quota obligation. Until 2018, some sort of obligation scheme has been the main RES-T policy measure in all MS, except for Sweden and Estonia. Sweden and Estonia implemented a quota in 2018.

The quota schemes differ in detail, but they generally oblige fuel suppliers to include a certain share of biofuels in their fuel. Most of the schemes have an increasing quota, often targeting a 10% share by 2020. The required shares for 2018 range from 2.4% in Cyprus to 15% in Finland. Germany and Sweden do not impose an increasing share of biofuel content, but demand increasing GHG emissions reductions by fuel suppliers, which has a similar effect in the end. Several MS are adjusting their quota schemes and related policies after the implementation of the ILUC Directive in 2015 which had to be transposed by September 2017, introducing a cap on conventional biofuels and a sub-target for advanced biofuels. In some MS (like the UK) this led to a temporary freeze of the obligation scheme.

In addition to biofuel quota systems, tax incentives and/or subsidies are the most common support instruments. Tax exemptions are granted for various taxes, such as consumption tax, CO_2 tax, income tax (for biofuel producers), excise and environmental pollution taxes. Some MS also have subsidies in place to support biofuel infrastructure, such as Estonia, which provides support for the supply of biomethane in fuel filling stations.

Germany is the only MS which has implemented a loan, however only for a short period of time. Denmark is the only MS having a premium tariff, which is paid for the use of biogas in transportation. Approximately one third of the MS deploys a single support instrument, mainly a quota system. The remaining MS mostly have two support schemes, comprising a combination of quota system and tax incentives, in a few cases complemented with subsidies or loans.

In addition to the instruments supporting the use of biofuels, Member States are increasingly promoting e-mobility options or are currently planning to implement subsidies for e-mobility. Among those Member States that already have support instruments in place are Denmark, Germany, Ireland, Croatia, Italy, Latvia, Malta, Austria, Romania, Sweden and the United Kingdom. Most MS incentivise the purchase of electric or plug-in vehicles through grants or tax exemptions.

2.4 Overview of policy commitment of Member States

Table 5 presents an overview of MS fulfilment of earlier policy commitments as well as an assessment of the long-term security of support instruments for each sector.

The overview indicates for each MS, whether it has adopted the planned measures as indicated in its NREAP and 1st, 2nd and 3rd Progress Report. The evaluation of the fulfilment of earlier commitments (Yes/No/Partially) is based on the implementation of measures, not on the progress made in terms of renewables deployment and thus likeliness of target achievement. The evaluation therefore deviates significantly from the assessment of target progress. Reasons for not or only partially fulfilling earlier commitments can be manifold, e.g. the non-implementation, non-enforcement, change or cancellation of related policies or allocated budget. Some MS are already overshooting their binding overall 2020 RES targets as defined in the RES Directive and have reduced their policy commitments (e.g. Bulgaria, Czech Republic and Croatia). More details can be found in Appendix B, which contains descriptions of each MS policy framework.

The evaluation of the long-term stability of the support instruments (High/Low/Moderate) reflects the continuity and reliability of support policies and budgets. More specifically it reflects whether MS provide a clear outlook for future deployment, e.g. by defining credible long-term policy goals and providing a schedule for the allocation of support over the coming years. Such schedules increase the planning certainty for investors. In order to provide ‘moderate’ or ‘high’ long-term security of support, a clear schedule for the allocation of support at least until end of 2020 had to be provided. ‘High’ also implies that there is some sort of longer-term support perspective. In addition, it is taken into consideration whether MS RES support framework has seen many regulatory changes in the past, which can impact regulatory and market stability. In cases where retroactive changes occurred, investor confidence and long-term security of support schemes is significantly undermined.

The evaluation of policy commitments and long-term security for RES-T is largely based on the implementation of a quota scheme. By 2018, some sort of quota has been implemented in all MS, thus basically fulfilling their commitment. However, some MS only partially fulfil their RES-T commitments as their implementation of the quota is either belated, ineffective (e.g. quota too low or lack of enforcement) or they have failed on the implementation of other RES-T policy commitments. Most MS define target quotas only until end of 2020, creating uncertainty for post-2020. However, MS should ideally publish blending obligations for several years in advance and provide clarity, especially in the surrounding system of options to demonstrate compliance and types of biofuel allowed to reach the quota in order to create a stable outlook to fuel suppliers. Only those MS (Lithuania, Slovakia, Sweden and UK) that have defined target quotas beyond 2020 are evaluated as providing a high long-term stability.

Table 5. Overview of Member States' fulfilment of NREAP policy commitments and evaluation of long-term stability of support

	RES-E		RES-H&C		RES-T	
Country	**Fulfilment of policy commitments**	**Long-term security of support**	**Fulfilment of policy commitments**	**Long-term security of support**	**Fulfilment of policy commitments**	**Long-term security of support**
BE*	Yes	Moderate	Yes	Moderate	Yes	Moderate
BG	Partially	Low	Partially	Moderate	Yes	Moderate
CZ	Partially	Low	Yes	Moderate	Yes	Moderate
DK	Yes	High	Yes	High	Yes	Moderate
DE	Yes	High	Yes	High	Yes	Moderate
EE	Yes	Moderate	Yes	Moderate	Yes	Moderate
IE*	No	Low	Partially	Moderate	Yes	Moderate
GR*	Partially	Moderate	Yes	Moderate	Yes	Moderate
ES*	No	Low	Partially	Low	Partially	Moderate
FR*	Yes	High	Yes	Moderate	Yes	Moderate
HR	Partially	Moderate	No	Low	Partially	Moderate
IT	Yes	Moderate	Yes	Moderate	Yes	Moderate
CY*	Partially	Moderate	Yes	Moderate	Partially	Moderate
LV	Partially	Low	Partially	Moderate	Partially	Moderate
LT	Yes	High	Yes	High	Yes	High
LU	Yes	High	Yes	High	Partially	Moderate
HU	Partially	Moderate	Partially	Moderate	Yes	Moderate
MT*	Partially	High	Partially	Moderate	Yes	Moderate
NL*	Yes	High	Yes	High	Partially	Moderate
AT	Yes	High	Yes	High	Yes	Moderate
PL*	Partially	Low	not applicable	Moderate	Yes	Moderate
PT*	Partially	Moderate	No	Low	Yes	Moderate
RO	Yes	Moderate	Partially	Moderate	Yes	Moderate
SI	Partially	Moderate	Yes	High	Yes	Moderate
SK	Partially	Moderate	Yes	Moderate	Yes	Moderate
FI	Yes	Moderate	Yes	Moderate	Yes	Moderate
SE	Yes	High	Yes	High	Yes	High
UK*	Yes	Moderate	Partially	Moderate	Yes	High

MS marked with * are projected to miss their 2020 overall RES target as defined in the RED according to the modelling performed for this report

3 Feasibility of 2020 target achievement considering current progress

3.1 Introduction

This Chapter is looking forward, dedicated to provide a model-based assessment to what extent currently implemented RES policies (Current Policy Initiatives (CPI)), complemented by Planned Policy Initiatives (CPI+PPI) appear sufficient to trigger the targeted RES deployment in subsequent years up to 2020 at the Member State level. The scenario calculation was done by application of the Green-X model, a well-established simulation tool for policy instruments in the European RES market indicating consequences of policy choices on deployment and cost of RES technologies in a comprehensive manner. Additionally, within the analysis the RES contributions to/from MS based on the use of cooperation mechanisms, e.g. joint projects, joint support schemes and statistical transfers are included to the extent that these are included in the MS current or planned policies.

Results show projected future progress in the short term (2018[19]) and for 2020, indicating by MS the likeliness of delivering the binding national targets for overall RES deployment set by the RES Directive and the indicative NREAP trajectory (in total, by sector and by technology).

The modelling work performed is closely linked to other parts of this study. Thus, the assessment of future progress builds on the analysis of past progress (Chapter 2) and reflects findings gained with respect to achieved progress in mitigating non-economic barriers (Appendix C). Obviously, this quantitative assessment is also closely linked to the overall qualitative RES policy assessment (Appendix B), building on the collected policy information and providing input to the overall policy analysis.

3.1.1 Methodology and data sources

The method of approach and the related key assumptions for the prospective assessment undertaken are discussed in detail subsequently. We start with a description of the modelling tool used for performing the quantitative assessment, followed by a clear characterisation of the approach applied for evaluating on progress. Finally, data sources are named.

As in previous projects, such as FORRES 2020, OPTRES or PREBS 2012 and PREBS 2014, the Green-X model was applied to perform a detailed quantitative scenario assessment of the future deployment of renewable energies on country-, sector- as well as technology level. The core strength of this tool lies on the detailed RES and technology representation accompanied by a thorough energy policy description, which allows assessing various policy options with respect to resulting costs and benefits. A short characterisation of the model is given below, while for a detailed description we refer to www.green-x.at. Note that key assumptions on potentials and cost for RES in MS are taken from the Green-X database as for example discussed in (Resch et al., 2014).

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[19] For measuring short-term progress against the 2017/2018 indicative trajectory (as set out by the RE directive) also the expected RES deployment in 2017 is taken into consideration, i.e. the average of the expected 2017 and 2018 RES share is compared to the indicative trajectory for 2017/2018 at MS and at EU level. Please note that the main part of the analysis was done mid-2018, based on information from the MS Progress Reports covering 2015-2016.

Short characterisation of the Green-X model:

The model Green-X has been developed by the Energy Economics Group (EEG) at the Vienna University of Technology under the EU research project “Green-X–Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricity market" (Contract No. ENG2-CT-2002-00607). Initially focused on the electricity sector, this modelling tool, and its database on RES potentials and costs, has been extended to incorporate renewable energy technologies within all energy sectors.

Green-X covers geographically the EU28 as well as neighbouring countries and regions (e.g. the Contracting Parties of the Energy Community, Northern African countries, Norway, Switzerland). It allows the investigation of the future deployment of RES as well as the accompanying costs (including capital expenditures, additional generation cost of RES compared to conventional options, consumer expenditures due to applied supporting policies) and benefits (for instance, avoidance of fossil fuels and corresponding carbon emission savings). Results are calculated at both a country- and technology-level on a yearly basis. The time-horizon allows for in-depth assessments up to 2020, accompanied by concise outlooks for the period beyond 2020 (up to 2030).

The Green-X model develops nationally specific dynamic cost-resource curves for all key RES technologies, including for renewable electricity, biogas, biomass, biowaste, on- and offshore wind, large- and small-scale hydropower, solar thermal electricity, photovoltaic, tidal stream and wave power, geothermal electricity; for renewable heat, biomass, sub-divided into log wood, wood chips, pellets, grid-connected heat, geothermal grid-connected heat, heat pumps and solar thermal heat; and, for renewable transport fuels, first generation biofuels (biodiesel and bioethanol), second generation biofuels (lignocellulosic bioethanol, biomass to liquid), as well as the impact of biofuel imports. Besides the formal description of RES potentials and costs, Green-X provides a detailed representation of dynamic aspects such as technological learning and technology diffusion.

Through its in-depth energy policy representation, the Green-X model allows an assessment of the impact of applying (combinations of) different energy policy instruments (for instance, quota obligations based on tradeable green certificates/guarantees of origin, (premium) feed-in tariffs, tax incentives, investment incentives, impact of emission trading on reference energy prices) at both MS or European level in a dynamic framework. Sensitivity investigations on key input parameters such as non-economic barriers (influencing the technology diffusion), conventional energy prices, energy demand developments or technological progress (technological learning) typically complement a policy assessment.

Within the Green-X model, the allocation of biomass feedstock to feasible technologies and sectors is fully internalised into the overall calculation procedure. For each feedstock category, technology options (and their corresponding demands) are ranked based on the feasible revenue streams as available to a possible investor under the conditioned, scenario-specific energy policy framework that may change on a yearly basis. Recently, a module for intra-European trade of biomass feedstock has been added to Green-X that operates on the same principle as outlined above but at a European rather than at a purely national level. Thus, associated transport costs and GHG emissions reflect the outcomes of a detailed logistic model. Consequently, competition on biomass supply and demand arising within a MS from the conditioned support incentives for heat and electricity as well as between countries can be reflected. In other words, the supporting framework at MS level may have a significant impact on the resulting biomass allocation and use as well as associated trade.

Moreover, Green-X was recently extended to allow an endogenous modelling of sustainability regulations for the energetic use of biomass. This comprises specifically the application of GHG constraints that exclude technology/feedstock combinations not complying with conditioned thresholds. The model allows flexibility in applying such limitations, that is to say, the user can select which technology clusters and feedstock categories are affected by the regulation both at national and EU-level, and, additionally, applied parameters may change over time.

3.1.2 General approach and scenario definition

The general approach used for this analysis of expected MS' future progress is to conduct a model-based quantitative assessment of future RES deployment in absolute (i.e. GWh produced, MW installed) and relative terms (i.e. RES shares on gross demands), reflecting assumptions also on future energy demand, comprising short-term expectations (2018 and 2017/2018, respectively) and trend expectations for 2020.

In order to illustrate uncertainty adequately, for 2020 two policy tracks are taken into account, complemented by a sensitivity analysis on key input parameter (and related uncertainties within these).

From the policy perspective **assessed cases** include:

- Current Policy Initiatives (CPI): This scenario assumes a continuation of currently implemented RES support policies, commonly specified also as "business-as-usual" case. Note that it also reflects a "business-as-usual" world with respect to non-economic RES barriers as currently applicable in the different MS.
- Current Policy Initiatives complemented by Planned Policy Initiatives (CPI+PPI): In addition to above, planned measures as proposed by the MS in their Progress Reports will be taken into account. The list of planned measures comprised this time incentives that either affect the support framework or that mitigate currently applicable non-economic barriers – but within the model implementation it appeared appropriate to translate these into their impact on the technology diffusion, generally accelerating deployment of affected technologies.

Note that an **extended sensitivity analysis** has been performed, relating to the following aspects:

- Expected future energy demand (growth).
- Policy Transformation, related to the transformation of information provided by MS on implemented and planned measures into the modelling logic[20].
- Country-specific financing risk that may remain or, alternatively, that thanks to a proactive mitigation an alignment of financing conditions may take place across MS in forthcoming years.

As a general concept for the sensitivity analysis the impact of each aspect as described above was assessed individually, and, later on, for the CPI policy scenario a combination was derived, leading to one combined pessimistic and one combined optimistic case (e.g. assuming an optimistic variant with respect to future demand growth[21] and the overall policy transformation). That finally translates into a minimum and maximum path of future RES deployment (min-max). In contrast to CPI, for the CPI+PPI scenario, indicating conceptually the upper boundary of feasible RES deployment in the 2020 context, minimum and maximum values reflect assessed differences in financing conditions (i.e. with or without alignment across the EU) but generally build on an optimistic view concerning future demand growth and the policy transformation.

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[20] Particular attention had to paid in this respect to the following aspect: Due to a paradigm shift in supporting RES technologies in the electricity sector auctions became the predominant scheme across the EU in recent years. This caused changes of supporting practices in many MS that may either lead to a discontinuity in market penetration of affected technologies (pessimistic view), or, if implemented appropriately, allow for a smooth transition process that avoids massive market interruptions (optimistic view).

[21] An optimistic energy demand scenario translates into a low demand trend since that implies at the same level of RES deployment in absolute terms a higher RES share.

Please note further that a cross-check of modelled RES deployment with recent draft statistics on early 2017 deployment estimates has been performed. For this purpose, provisional statistics provided by EEA and Eurostat have been used.

The data sources as used in this assessment are the following:

- Information on *Current (RE) Policy Initiatives (CPI)* was originally based on “RES country profiles” as developed throughout the RE-Shaping study (with its last update in December 2011, see Rathmann et al. (2011)) and later on updated based on information taken from the RES-legal database (see www.res-legal.eu). Within this study a cross-check of the derived database with policy information reported by MS in their Progress Reports submitted at the end of 2017 was made.
- Information on *Planned Policy Initiatives (PPI)* was collected from MS Progress Reports[22] but needed to be processed for incorporating in modelling. For details on the approach taken in this respect we refer to Appendix D of this report.
- In order to ensure maximum consistency with existing EU scenarios and projections, the key input parameters of the scenarios presented in this report are derived from PRIMES modelling regarding overall energy demand and fossil fuel price developments and from the Green-X database with respect to the potentials and costs of RES technologies. Thus, expectations on future energy demand are taken from the latest EU reference scenario (EC, 2016) as derived by PRIMES modelling but have been compared with actual data for the status quo (2015 and 2016) and corrected, respectively. It turned out that default PRIMES data indicates generally[23] a higher demand growth than observable in actual statistics. The default demand trend derived from PRIMES was consequently classified as *high demand trend* and used within this assessment to indicate the lower boundary concerning future RES target achievement. Contrarily, the modified/corrected demand trend serves generally as basis for the optimistic case of future RES deployment[24].

Note that all policy information and related background sources were retrieved in the period February to May 2018 (and the MS progress reports are pre-2018). This implies that more recent policy changes that were not reported as planned measures in the respective progress reports, are not taken into account in the modelling.

Complementary to Chapter 2 this section indicates expectations on the MS progress in deploying RES-E, RES-H&C and RES-T in forthcoming years. We are comparing both short-term expectations, i.e. the expected deployment for the year 2018 (and 2017/2018, respectively), and trend expectations for 2020 with two targets set out in the RED (binding national targets on RES overall and RES-T) and the trajectories as presented in the NREAPs25: their expected progress against indicative 2017/2018 and 2020 trajectories as set out by the RED and against their planned progress for 2018 and 2020 as set in their NREAP trajectories.

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[22] For further details on the applied approach we refer to Appendix D of this report.

[23] Exceptions for this general observation are for example demand trends for Malta or Cyprus: here PRIMES predicted a lower demand growth than recently observed.

[24] Please note that generally a lower overall energy demand leads to a lower RES share and vice versa – if RES deployment in absolute terms remains unaffected.

[25] Please note that for Mala the submitted NREAP version as of 24 May 2011 was used. The resubmitted version of June 2017 does not include necessary details concerning technology specific contributions (i.e. on installed capacity, gross electricity generation) expected from each renewable energy technology in Malta for meeting the binding 2020 targets and the indicative interim trajectory. Specifically the according to the EC template prescribed Table 10.a, Table 10.b, Table 11 and Table 12 of the NREAP Template (see Decision 2009/548/EC) were not included in the resubmitted version.

For RES overall, two figures will be presented for 2018 (and 2017/2018, respectively) as well as for 2020:

1) Overview figure comparing MS' and the EU's expected RES deployment with indicative RED trajectory, and national binding 2020 RES targets and indicative NREAP trajectory (i.e. planned progress).
2) MS and the EU's deviation from planned deployment, i.e. the indicative NREAP trajectory as set for 2018 and 2020.

Complementary to above, technology insights are discussed at EU-level, comparing the expected with the planned deployment by RES technology at EU-level for 2018 and for 2020. All data on expected RES deployment stems from Green-X modelling, in particular the "Current Policy Initiatives (CPI)" and the "CPI plus planned measures (CPI+PPI)" scenarios. While for 2018 currently implemented policy initiatives (CPI) are taken into account, for 2020 also Planned Policy Initiatives (CPI+PPI) as reported by MS in their Progress Report. In order to illustrate uncertainty adequately, the policy variation is complemented by a set of sensitivity investigations as discussed above.

For the three sectors RES-E, RES-H&C, and RES-T, we present overview figures (see paragraph 1 above) and figures on the deviation (2) as well but since no targets are prescribed at sector or technology-level expected deployment is only compared to the NREAP sectoral trajectories.

For each of the three sectors we present the deviation from indicative NREAP sectoral trajectories (the Figure (2)) for the technologies in this section. A quick overview of all technologies covered is given in Table 6, which follows largely the same categorisation as in the assessment of past progress (Chapter 2 and Appendix A). A few deviations were however necessary due to limitations of the Green-X model and its database:

- "Bioliquids" are summarised under "Biomass", including solid and liquid fuels as well as the biodegradable fraction of municipal solid waste;
- Hydropower is split only into large- (i.e. above 10 MW) and small-scale, applying the default distinction as used in statistical accounting;
- For the transport sector Green-X is only capable to model biofuel deployment but not electro mobility. For calculating the expected overall RES-T share for 2018 and 2020, including the contribution of electro mobility, a simplified approach was followed: actual historic trends on the use of electricity in transport were extrapolated until 2020.

Table 6. Overview RES technologies presented in the report

RES-E	RES-H&C	RES-T
Offshore wind	Solar thermal	First generation biofuels
Onshore wind	Biomass (i.e. solid and liquid, incl. biowaste)	Second generation biofuels
Biomass (i.e. solid and liquid, incl. biowaste)	Biogas	Electricity in transport
Biogas	Heat pumps	
Photovoltaics	Geothermal	
Small hydro		
Large hydro		
Geothermal		
Concentrated solar power		
Tide, wave and ocean energy		

3.2 Results from the modelling of feasibility of 2020 targets

3.2.1 Projected future progress in RES overall

3.2.1.1 Cross-country comparison excluding cooperation mechanisms

(1) Overview of expected deployment vs. indicative trajectory (set out in the RED) and the indicative (NREAP) trajectory by 2018 (and 2017/2018, respectively) and by 2020

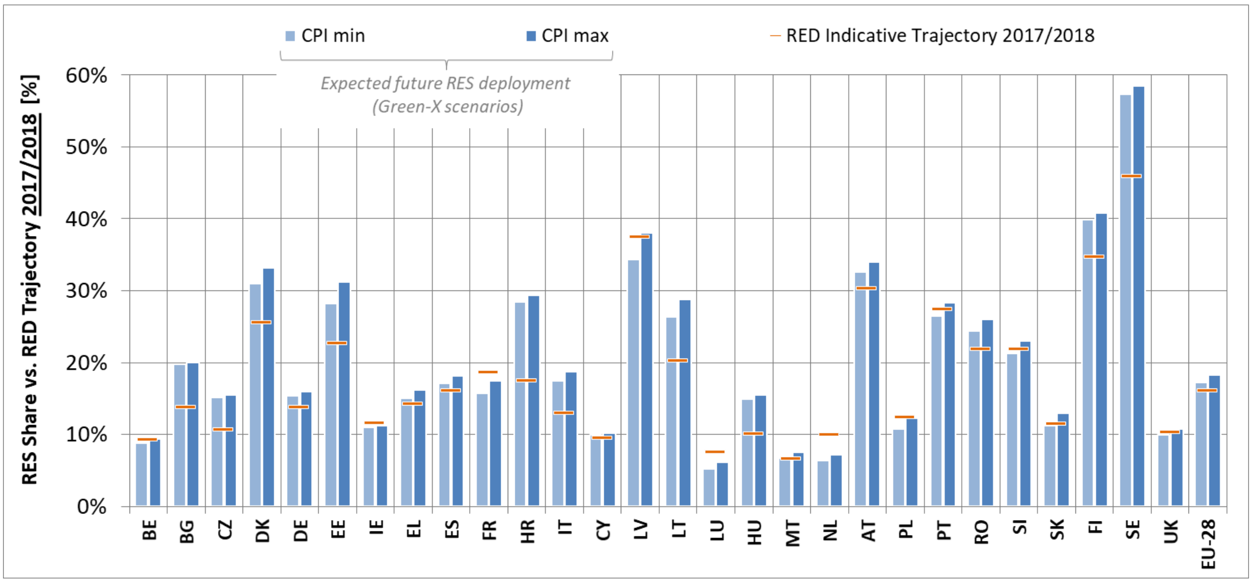

Figure 13. Expected RES share in 2017/2018 vs. 2017/2018 RED indicative trajectory (%)

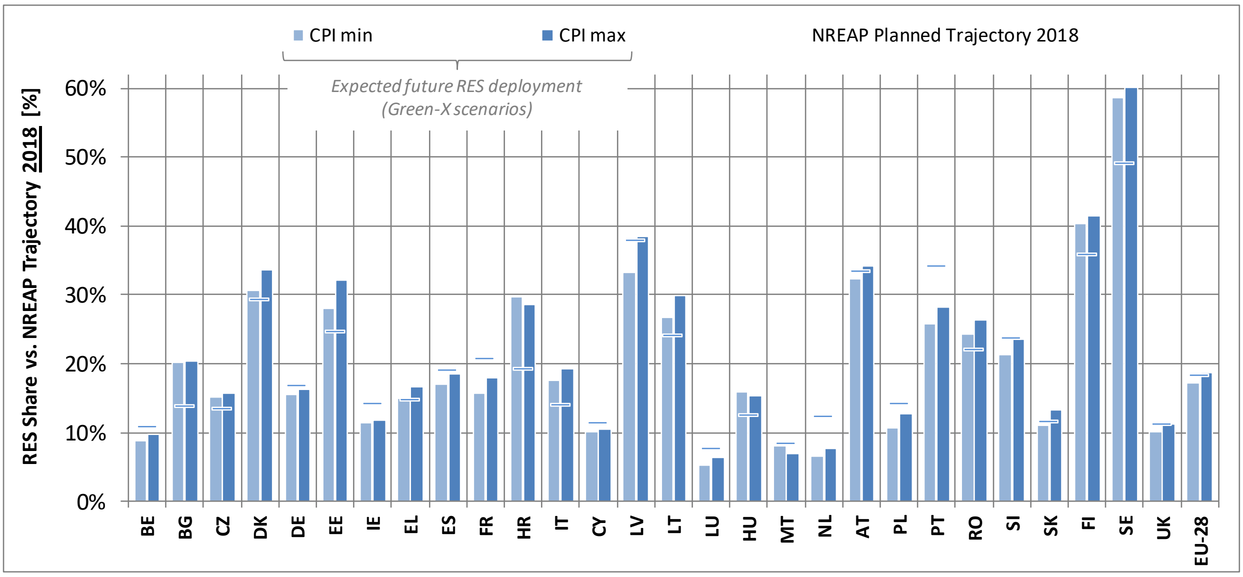

Figure 14. Expected RES share in 2018 vs. 2018 indicative NREAP trajectory (%)

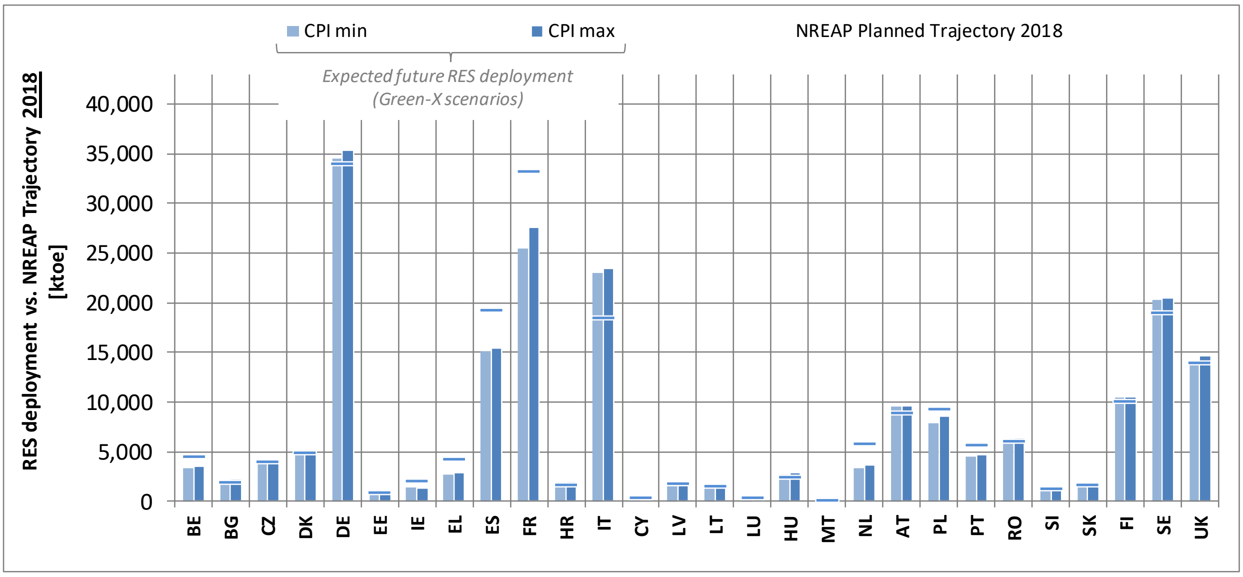

Figure 15. Expected RES deployment (in absolute terms) in 2018 vs. 2018 indicative NREAP trajectory

An illustration of the expected (according to Green-X scenarios) and the indicative trajectory short-term progress in 2017/2018 is given in Figure 13, showing RES deployment in relative terms, that is as share in gross final consumption of energy. Complementary to this, Figure 14 allows for a comparison of the expected and the according to the indicative NREAP trajectory planned short-term progress in the contribution of RES to meet energy demand, indicating the 2018 RES share in gross final energy consumption by MS and at EU-level. Please be aware that NREAP trajectories set by MS within their NREAPs build on demand projections that take additional energy efficiency policy measures into account whereas modelled expected RES deployment builds either on pure demand trend expectations taken from PRIMES modelling (PRIMES reference scenario) or on a combination of that with actual demand data taken from statistics.

The complementary data in absolute terms, i.e. the produced electricity, heat and transport fuels that stem from RES, is shown in Figure 15. Note that data on expected and planned RES shares in 2017/2018 is expressed also in Table 7.

Table 7. Expected and planned RES shares in 2017/2018

RES share in gross final energy demand by 2017/2018	Expected RES share 2017/2018 (average) (CPI scenario)		RED indicative trajectory - RES share 2017/2018	Deviation of expected from indicative RED trajectory 2017/2018		Expected RES share 2018 (CPI scenario)		NREAP-planned trajectory - RES share 2018	Deviation of expected from planned NREAP trajectory 2018	
	Min.	Max.		Min.	Max.	Min.	Max.		Min.	Max.
Member State	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Belgium	8.8%	9.4%	9.2%	-4.9%	1.9%	8.8%	9.6%	10.7%	-17.7%	-9.9%
Bulgaria	19.8%	20.0%	13.7%	44.8%	45.8%	20.2%	20.4%	13.7%	47.2%	48.6%
Czech Republic	15.1%	15.5%	10.6%	42.6%	46.6%	15.2%	15.7%	13.3%	14.0%	18.2%
Denmark	31.0%	33.2%	25.5%	21.7%	30.6%	30.6%	33.6%	29.1%	5.1%	15.4%
Germany	15.3%	15.9%	13.7%	11.7%	16.0%	15.5%	16.3%	16.7%	-7.1%	-2.4%
Estonia	28.2%	31.3%	22.6%	25.3%	38.6%	28.1%	32.1%	24.5%	14.5%	30.9%
Ireland	11.0%	11.2%	11.5%	-4.6%	-2.3%	11.4%	11.8%	14.0%	-18.3%	-15.7%
Greece	15.0%	16.2%	14.1%	6.2%	15.1%	14.9%	16.6%	14.6%	2.2%	13.6%
Spain	17.1%	18.2%	16.0%	6.8%	13.2%	17.1%	18.5%	18.9%	-9.6%	-2.4%
France	15.8%	17.5%	18.6%	-15.0%	-5.7%	15.7%	18.0%	20.5%	-23.4%	-12.2%
Croatia	28.5%	29.4%	17.4%	63.5%	68.7%	28.5%	29.7%	19.1%	49.4%	55.7%
Italy	17.5%	18.7%	12.9%	36.1%	45.5%	17.6%	19.2%	13.8%	26.8%	38.5%
Cyprus	9.9%	10.2%	9.5%	4.9%	7.5%	10.1%	10.5%	11.2%	-9.6%	-6.7%
Latvia	34.3%	38.1%	37.4%	-8.4%	1.8%	33.3%	38.4%	37.7%	-11.6%	1.9%
Lithuania	26.4%	28.8%	20.2%	30.5%	42.6%	26.6%	29.9%	24.0%	10.9%	24.5%
Luxembourg	5.2%	6.1%	7.5%	-29.8%	-18.2%	5.2%	6.3%	7.5%	-31.0%	-15.6%
Hungary	15.5%	15.5%	10.0%	55.3%	55.8%	15.9%	16.0%	12.3%	29.2%	29.7%
Malta	6.8%	7.5%	6.5%	4.1%	15.7%	7.0%	8.0%	8.3%	-15.3%	-3.1%
Netherlands	6.4%	7.2%	9.9%	-36.1%	-27.6%	6.5%	7.6%	12.1%	-46.4%	-37.2%
Austria	32.5%	34.0%	30.3%	7.6%	12.3%	32.2%	34.1%	33.3%	-3.2%	2.6%
Poland	10.8%	12.3%	12.3%	-11.9%	0.4%	10.6%	12.7%	14.1%	-24.4%	-10.2%
Portugal	26.4%	28.3%	27.3%	-3.3%	3.7%	25.7%	28.3%	34.0%	-24.3%	-16.8%
Romania	24.4%	26.0%	21.8%	11.8%	19.2%	24.2%	26.4%	21.8%	10.9%	20.7%
Slovenia	21.3%	23.0%	21.9%	-2.4%	5.1%	21.3%	23.5%	23.6%	-9.6%	-0.3%
Slovakia	11.3%	12.9%	11.4%	-1.5%	12.7%	11.0%	13.2%	11.4%	-3.2%	15.9%
Finland	39.9%	40.8%	34.7%	15.0%	17.6%	40.3%	41.5%	35.7%	12.8%	16.1%
Sweden	57.4%	58.5%	45.8%	25.3%	27.8%	58.5%	60.1%	49.0%	19.5%	22.6%
United Kingdom	9.9%	10.8%	10.2%	-2.9%	5.7%	10.1%	11.3%	11.0%	-8.0%	2.6%
European Union	**17.2%**	**18.3%**	**16.1%**	**7.2%**	**14.1%**	**17.3%**	**18.8%**	**18.1%**	**-4.7%**	**3.6%**

The majority of MS set their indicative NREAP trajectory (i.e. the planned RES deployment as presented in their NREAP) higher than the indicative trajectory values as determined according to a standard formula given in Annex B of the RED. As a consequence, the majority of MS is expected to reach and partly significantly exceed their indicative RED trajectory in 2018. In contrast to above, for the Netherlands, Luxembourg[26] and France it can be expected that a gap will arise, potentially of significant magnitude. For other MS like Belgium, Ireland, Latvia, Poland, Portugal, Slovenia and the United Kingdom uncertainty suggest that they may either shortly surpass their 2017/2018 indicative RED trajectory or that a small gap may remain. The list of MS that are expected to fail is getting longer when own plans as expressed in their NREAPs are taken into consideration: Ireland, Spain, France, Cyprus, Luxembourg, Malta, the Netherlands, Poland, Portugal and Slovenia will according to modelling not achieve their planned NREAP RES share in 2018, and uncertainty on NREAP trajectory achievement remains for Germany, Greece, Latvia, Austria, Slovakia and the United Kingdom as well as the EU28 in total. The corresponding outcomes for 2020 are discussed next. Figure 16, indicating expected and planned RES deployment in relative terms (i.e. RES share in gross final energy demand), and Figure 17, showing RES deployment in absolute terms, provide a graphical illustration of the expected progress up to 2020 according to currently implemented and also planned RES policy initiatives. Table 8 lists all data on expected and planned RES shares (presenting planned indicative trajectories both from the RED as well as from the NREAPs).

A comparison of expected with planned RES deployment by 2020 indicates that the EU would come close to or succeed in meeting its binding 2020 RES target: At EU-level a RES share of 18.1% to 20.7% can be expected with currently implemented and planned RES policy initiatives[27]. In case MS deviate from their planned policy measures, the feasible RES share would decrease slightly to 18.1% to 20.6% (CPI scenario). The majority of MS is expected to perform well with meeting the indicative trajectory, not only today (2016) and in the near future (2017/2018) but also in meeting their binding 2020 RES targets. 17 of the assessed 28 MS, including Bulgaria, the Czech Republic, Croatia, Denmark, Italy, Estonia, Finland, Lithuania or Sweden, may succeed in (over)fulfilling their 2020 binding national RES targets with implemented and planned RES policies. In seven of these MS, namely Austria, Germany, Spain, Latvia, Romania, Slovenia, Slovakia there is some uncertainty related to achieving the binding 2020 RES target: if a high demand growth would arise in forthcoming years that brings energy consumption back in line with the original trend indicated by the latest EU reference scenario, the likelihood of their 2020 RES target achievement can be questioned.

In the remainder of MS, namely Belgium, Ireland, Greece, France, Cyprus, Luxembourg, Malta, the Netherlands, Poland, Portugal and the United Kingdom, currently implemented RES policies and already planned RES policy initiatives appear insufficient to trigger the required RES volumes to reach the binding 2020 RES targets purely domestically. The situation differs however from MS to MS: while results show that Ireland and Greece, Cyprus. Malta and Portugal may have only a comparatively small deficit of less than 20% (i.e. as percentage deviation to required RES deployment) even under pessimistic circumstances (i.e. high demand growth), MS like Belgium, France, Luxembourg, the Netherlands, Poland and the United Kingdom may face a comparatively larger gap (i.e. larger than 20%) by 2020 at least under pessimistic circumstances. Thus, proactive behaviour to initiate RES cooperation with other MS and/or third countries represents a viable option for them to meet their binding 2020 RES

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[26] In 2017, Luxembourg signed agreements for statistical transfer with Lithuania and Estonia. The agreements stipulate that Luxembourg will be provided statistic transfers for the period 2018 - 2020 in order to meet its 2020 RED target.

[27] Note that the range indicates the uncertainty related to key input parameter for the model-based assessment of future RES progress. Remarkably, future energy demand (growth) and the policy implementation play a decisive role in this respect.

targets, assuming that domestic RES potentials are insufficient, comparatively costly or hardly to be mobilised in time.

However, up to now (until September 2018) only Luxembourg has already signed treaties with Estonia and Lithuania to close their expected gap in RES deployment by making use of cooperation mechanisms in the form of statistical transfer. Please be aware that the impact of RES cooperation on expected 2020 RES deployment is shown and discussed in section 3.2.1.1. Generally, the partly significant deficit in required RES deployment may however also reflect deficits in the financial support for RES and/or the required mitigation steps related to non-economic barriers that hinder an accelerated domestic RES diffusion. Complementary to targeted measures for an accelerated RES development, the success in improving energy efficiency and consequently reducing overall energy demand growth represents another important pillar for achieving the binding 2020 RES targets, since they are defined as RES shares, i.e. put in direct relation to demand (growth).

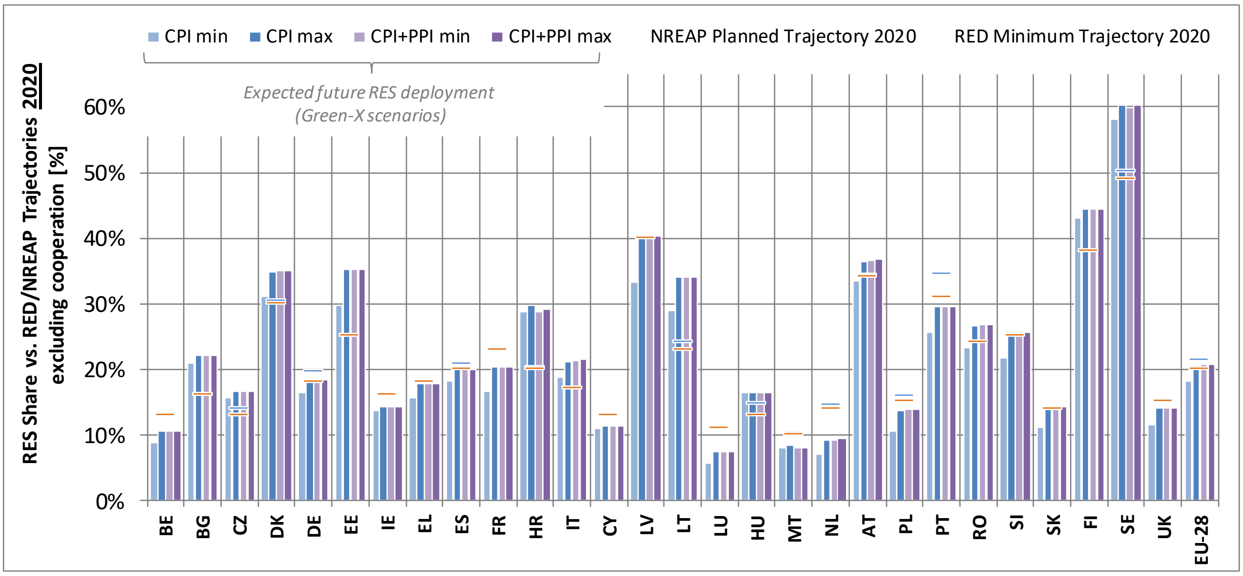

Figure 16. Expected RES share in 2020 vs. 2020 RES targets and indicative 2020 NREAP target (%) excluding cooperation mechanisms

Next, a closer look is taken on the expected progress in meeting planned (i.e. according to NREAPs trajectories) RES deployment by 2020. Since MS indicative 2020 NREAP targets (i.e. planned deployment) are generally higher[28] than their 2020 RES targets from the RED, the number of MS that are expected to meet their planned NREAP trajectory in 2020 is lower compared to above – i.e. 15 (instead of 17) MS are expected to meet their indicative 2020 NREAP targets. Thereby optimistic framework conditions are assumed and planned RES policy initiatives in addition to currently implemented ones are taken into consideration. If a more pessimistic view is taken with respect to key assumptions (including demand growth and the policy implementation), the number of well performing MS is decreasing down further.

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[28] Adding up planned performance as expressed by MS's in their NREAP trajectories leads to an indicative 2020 RES trajectory of 21.3% for the EU (similar to the binding EU target of 20% RES by 2020 measured as RES share in gross final energy consumption).

Table 8. Expected, planned and required RES shares in 2020 excluding cooperation mechanisms

RES share in gross final energy demand by 2020	**Expected RES share 2020 (CPI scenario)**		**Expected RES share 2020 (CPI+PPI scenario)**		**Binding RED 2020 RES targets -**	**2020 NREAP target**	**Deviation of expected from binding RED 2020 RES targets (CPI and CPI+PPI scenario[29])**		**Deviation of expected from 2020 NREAP target (CPI and CPI+PPI scenario)**	
	Min.	**Max.**	**Min.**	**Max.**			**Min.**	**Max.**	**Min.**	**Max.**
Member State	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Belgium	8.8%	10.6%	10.6%	10.6%	13.0%	13.0%	-32.0%	-18.1%	-32.0%	-18.1%
Bulgaria	21.0%	22.1%	22.2%	22.2%	16.0%	16.0%	31.2%	38.9%	31.2%	38.9%
Czech Republic	15.7%	16.7%	16.6%	16.7%	13.0%	14.0%	20.5%	28.8%	11.9%	19.6%
Denmark	31.2%	34.9%	35.0%	35.0%	30.0%	30.4%	4.0%	16.6%	2.6%	15.0%
Germany	16.4%	18.3%	18.2%	18.4%	18.0%	19.6%	-8.8%	2.2%	-16.2%	-6.2%
Estonia	29.7%	35.3%	35.3%	35.3%	25.0%	25.0%	18.7%	41.1%	18.7%	41.1%
Ireland	13.8%	14.3%	14.3%	14.4%	16.0%	16.0%	-13.7%	-10.0%	-13.7%	-10.0%
Greece	15.6%	17.8%	17.7%	17.9%	18.0%	18.0%	-13.4%	-0.5%	-13.4%	-0.5%
Spain	18.3%	19.9%	20.0%	20.0%	20.0%	20.8%	-8.5%	0.2%	-12.0%	-3.7%
France	16.6%	20.4%	20.5%	20.5%	23.0%	23.0%	-27.9%	-11.0%	-27.9%	-11.0%
Croatia	28.7%	29.7%	28.7%	29.3%	20.0%	20.1%	43.5%	48.6%	42.7%	47.9%
Italy	18.9%	21.2%	21.4%	21.6%	17.0%	17.0%	11.2%	26.8%	11.2%	26.8%
Cyprus	11.0%	11.4%	11.4%	11.5%	13.0%	13.0%	-15.7%	-11.9%	-15.7%	-11.9%
Latvia	33.2%	40.2%	40.3%	40.3%	40.0%	40.0%	-17.0%	0.6%	-17.0%	0.6%
Lithuania	28.9%	34.1%	34.1%	34.1%	23.0%	24.0%	25.8%	48.2%	20.6%	42.1%
Luxembourg	5.7%	7.4%	7.5%	7.5%	11.0%	11.0%	-48.5%	-31.9%	-48.5%	-31.9%
Hungary	16.5%	16.5%	16.5%	16.5%	13.0%	14.7%	26.6%	27.3%	12.4%	12.9%
Malta	8.1%	8.5%	8.1%	8.1%	10.0%	10.0%	-18.9%	-14.7%	-19.2%	-15.1%
Netherlands	7.1%	9.3%	9.3%	9.3%	14.0%	14.5%	-49.0%	-33.6%	-50.8%	-35.8%
Austria	33.5%	36.4%	36.6%	36.7%	34.0%	34.2%	-1.4%	8.0%	-2.0%	7.4%
Poland	10.6%	13.7%	13.8%	13.9%	15.0%	15.9%	-29.1%	-7.1%	-32.9%	-12.0%
Portugal	25.7%	29.5%	29.5%	29.6%	31.0%	34.5%	-17.0%	-4.4%	-25.4%	-14.1%
Romania	23.3%	26.7%	26.7%	26.8%	24.0%	24.0%	-2.7%	11.8%	-2.7%	11.8%
Slovenia	21.8%	25.5%	25.6%	25.6%	25.0%	25.3%	-13.0%	2.3%	-14.0%	1.1%
Slovakia	11.2%	14.4%	14.4%	14.4%	14.0%	14.0%	-19.8%	2.8%	-19.8%	2.8%
Finland	43.0%	44.4%	44.4%	44.5%	38.0%	38.0%	13.1%	17.0%	13.1%	17.0%
Sweden	58.2%	60.3%	59.9%	60.3%	49.0%	50.2%	18.7%	23.0%	15.9%	20.0%
United Kingdom	11.5%	14.1%	14.1%	14.1%	15.0%	15.0%	-23.1%	-5.7%	-23.1%	-5.7%
European Union	18.1%	20.6%	20.7%	20.7%	20.0%	21.3%	-9.3%	3.5%	-14.7%	-2.7%

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[29] Please note that for indicating the deviation of the expected 2020 RES shares from the binding national RES targets as well as from the according to NREAPs planned RES trajectories minimum and maximum shares are taken from the set of available modelled scenarios, including CPI and CPI+PPI scenarios. In practice this means that the for calculating the expected minimum 2020 RES share, expressed as “Min. Deviation”, the CPI scenario with the lowest RES share was used whereas for the expected maximum RES share and consequently the “Max. Deviation” generally the CPI+PPI scenario with the strongest RES contribution was taken.

A comparison of planned and expected (from the indicative 2020 NREAP targets) 2020 RES deployment in absolute terms as shown in Figure 17 helps to gain further insights and to possibly identify some specifics:

- First, it becomes apparent that large MS like Germany, France, Italy, Sweden, Spain and the United Kingdom have a decisive role for the likelihood of achieving planned performance at EU-level.
- Second, as applicable in the case of Germany and Romania, expectations on future developments of energy demand may differ and appear decisive with respect to achievement of their NREAP trajectory.

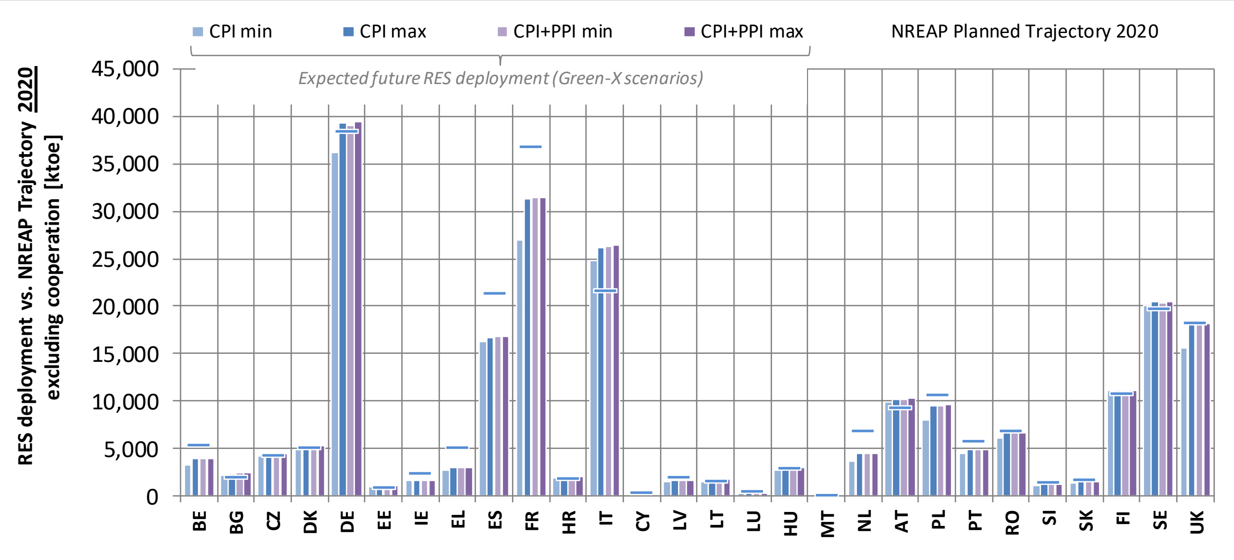

Figure 17. Expected RES deployment (in absolute terms) in 2020 vs. indicative 2020 NREAP target excluding cooperation

(2) Deviation from 2018 and 2020 NREAP trajectories

Figure 18 and Figure 19 illustrate the deviation of expected RES deployment from the indicative NREAP trajectories. More precisely, Figure 18 shows for 2018 the deviation under business-as-usual conditions, taking into account only currently implemented RES policy initiatives. The complementary depiction for 2020 is given in Figure 19 whereby also planned improvements are taken into consideration. In both figures uncertainty related to key input parameters of the related model-based assessment is reflected, where the outcomes of the corresponding sensitivity assessment are used to define lower (i.e. CPI min, CPI+PPI min) and upper levels (CPI max, CPI+PPI max) of expected RES shares in energy demand.

For the majority of MS it can be expected that they succeed in meeting their 2018 NREAP trajectory – but for some of these uncertainty remains that also a gap may occur. At EU-level an ambiguous picture needs to be drawn: either a gap (of at maximum 4.7%) or a surplus (of at maximum 3.5%) may arise when comparing expected RES shares with the sum of the indicative 2020 NREAP targets. On the one hand, with deviations above 20%, most significant surpluses occur in Bulgaria, Croatia, Italy, Hungary and Sweden. On the other hand, a few MS may face in 2018 a large gap compared to their deployment based on their indicative 2020 NREAP targets. Expected RES deployment is significantly lower compared to the NREAP trajectories in the Netherlands, Malta, Luxembourg, France, Belgium and Portugal.

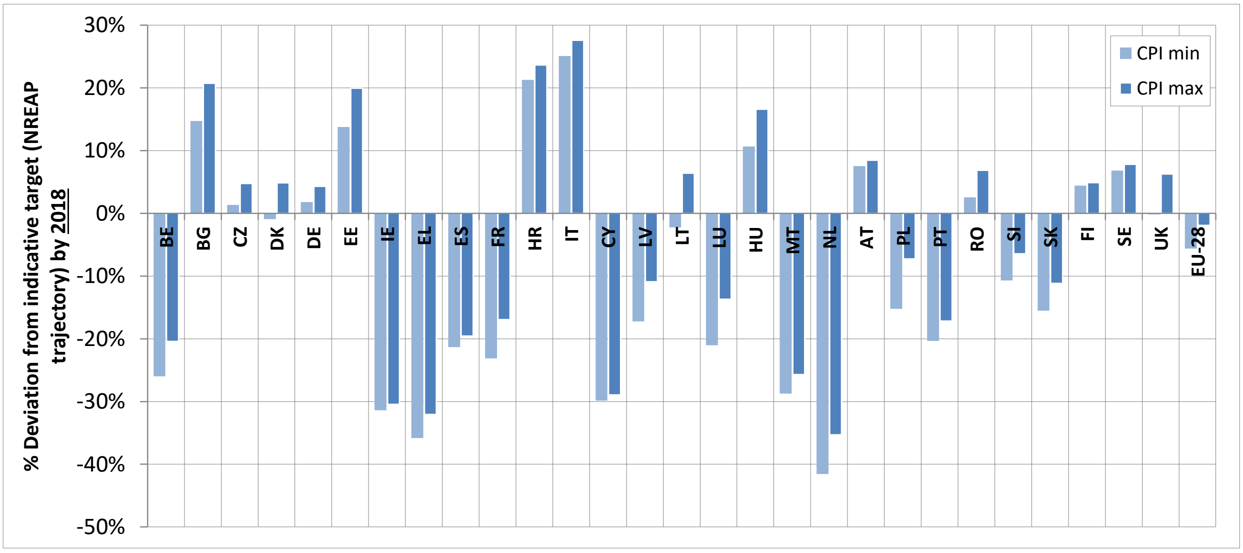

Figure 18. Deviation of expected RES shares (Green-X scenarios) from indicative NREAP trajectories by 2018

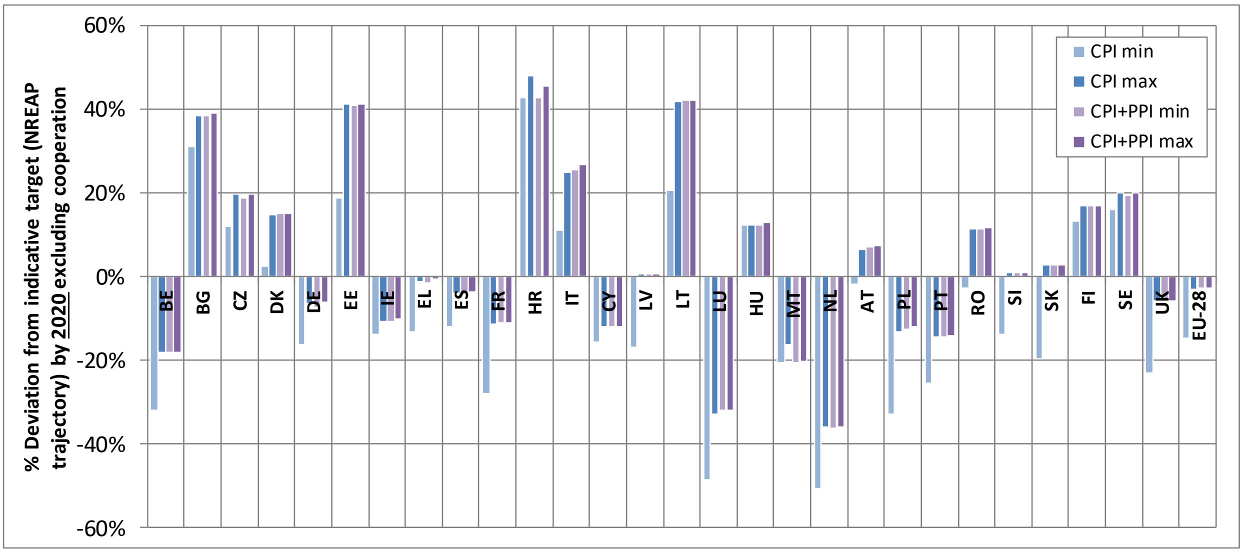

Figure 19. Deviation of expected RES shares (Green-X scenarios) from indicative 2020 NREAP targets by 2020 excluding cooperation mechanisms

The picture changes for the worse looking at 2020. Half of all MS are expected to meet their indicated 2020 NREAP targets. Thus, 14 MS are expected to meet and over-fulfil their NREAP plans under optimistic framework conditions while under pessimistic ones the number of well performing MS decreases to ten. High surpluses (with deviations above 20%) can be expected in Bulgaria, Estonia, Croatia and Lithuania under all cases and under specific circumstances also in Italy and Sweden. The negative ranking includes 14 to 18 MS that are expected to fail in meeting their indicative 2020 NREAP targets, depending on the assumed framework conditions and whether planned policy initiatives are considered or not. The highest deficits (with deviations above 20%) can be expected in the Netherlands, Luxembourg and Malta. Out of these MS only Luxembourg has already signed treaties with Estonia and Lithuania to make up for its expected deficit by making use of cooperation mechanisms. See the detailed results including cooperation mechanisms in the following section (Section 3.2.1.2).

3.2.1.2 Projected future progress in RES overall including cooperation mechanisms

Until now two contracts on cooperation agreements on the statistical transfer of renewable energy amounts were signed. Both agreements help Luxembourg achieve its binding national RES target for 2020 by receiving statistical transfers of a specified amount of renewable energy produced in Lithuania[30] and Estonia[31]. Both agreements refer to minimum values and also stipulate the possibility of transferring additional amounts, which Luxembourg could potentially use. Both agreements therefore make it possible to cover the amounts foreseen in its NREAP trajectory. It should also be noted that Luxembourg is the first MS, which uses the cooperation mechanism in order to meet its binding national 2020 RES target and send a clear signal in the interest of closer European cooperation in the area of renewable energies (4th Progress Report of Luxembourg, Paragraph 11.1).

Luxembourg - Lithuania: Luxembourg signed a statistical transfer agreement with Lithuania for 700 GWh, or more if needed, between 2018 and 2020[32].

Luxembourg - Estonia: Sales will be carried out between 2018 and 2020, with 300 GWh of transfers planned for next year and 400 GWh for 2020. Optional: 600 GWh for the renewable energy target in the year 2018, 2019 and 2020[33].

In the following, outcomes for 2020 are presented including and excluding the stipulated use of statistical transfer agreements. The “CPI min” and “CPI+PPI min” cases assume a statistical transfer of 1100 GWh from Estonia (400 GWh) and Lithuania (700 GWh) to Luxembourg. The “CPI max” and “CPI+PPI max” cases assume a statistical transfer of 1700 GWh from Estonia (1000 GWh) and Lithuania (700 GWh) to Luxembourg. The statistical transfer of Lithuania to Luxembourg is held constant despite the option of a higher transfer in both cases, as the information on the exact optional volumes are not yet publicly available.

Figure 20 is indicating expected, required and planned RES deployment in relative terms (i.e. RES share in gross final energy consumption), including the use of cooperation mechanisms set-up under the RES Directive. Figure 21 show the % deviation from indicative NREAP trajectory by 2020 including cooperation. As the absolute amounts of energy transferred are relatively small compared to the absolute deployment of RES in other MS, the difference of including and excluding the statistical transfers is hardly visible when Figure 21 is compared to Figure 17 showing the absolute RES deployment excluding cooperation mechanisms in Section 3.2.1. Figure 22 showing RES deployment in absolute terms, provide a graphical illustration of the expected progress up to 2020 according to currently implemented and also planned RES policy initiatives. Table 9 lists all data on expected, planned and required (by RED targets) RES shares, again including the use of cooperation mechanisms.

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[30] Agreement on statistical transfers of renewable energy amounts between Lithuania and Luxembourg. Source: https://ec.europa.eu/info/news/agreement-statistical-transfers-renewable-energy-amounts-between-lithuania-and-Luxembourg-2017-oct-26_en

[31] Second agreement on statistical transfers of renewable energy amounts between Estonia and Luxembourg. Source: https://ec.europa.eu/info/news/second-agreement-statistical-transfers-renewable-energy-amounts-between-estonia-and-Luxembourg-2017-nov-13_en

[32] Estonia to help Luxembourg meet 2020 renewables goal – report. Source: https://renewablesnow.com/news/estonia-to-help-Luxembourg-meet-2020-renewables-goal-report-590343/

[33] Agreement between the Republic of Estonia and the Grand Duchy of Luxembourg on the establishment of a framework for the statistical transfer of energy from renewable sources for target compliance purposes under the RES Directive. Source: https://www.riigiteataja.ee/aktilisa/2280/3201/8003/Lux_agreement.pdf

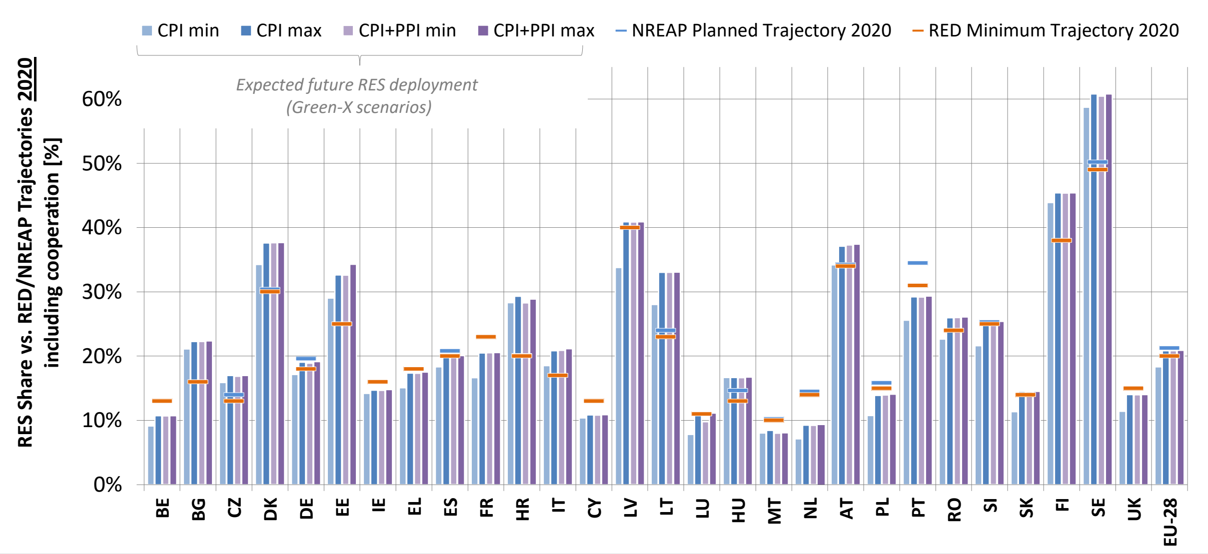


Figure 20. Expected RES share in 2020 vs. 2020 RED targets and 2020 indicative NREAP target including cooperation mechanisms (%)

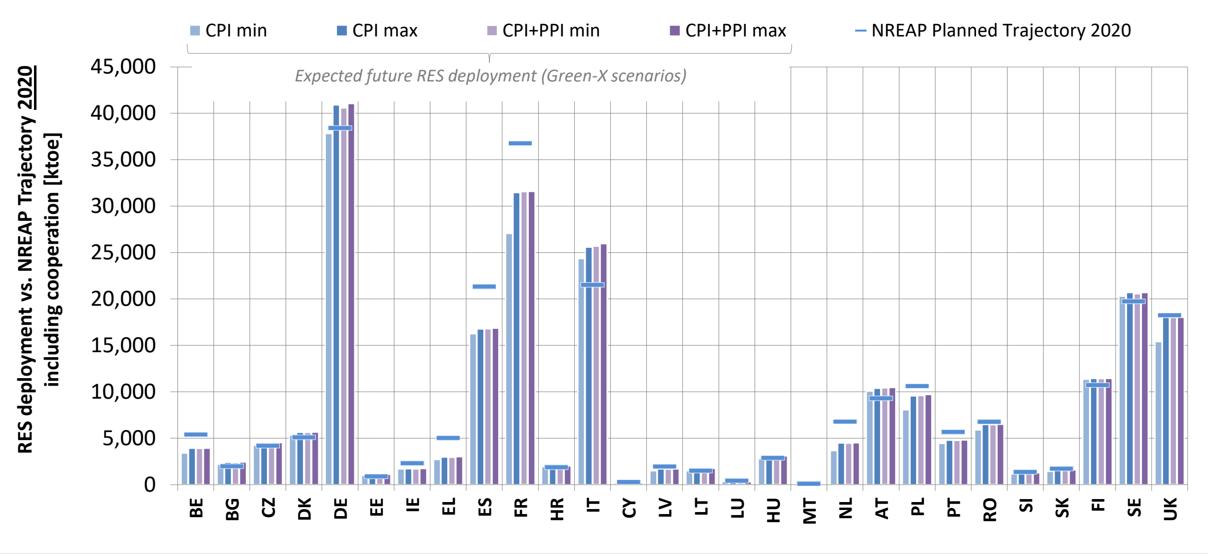


Figure 21. Expected RES deployment (in absolute terms) in 2020 vs. 2020 indicative NREAP target including cooperation mechanisms

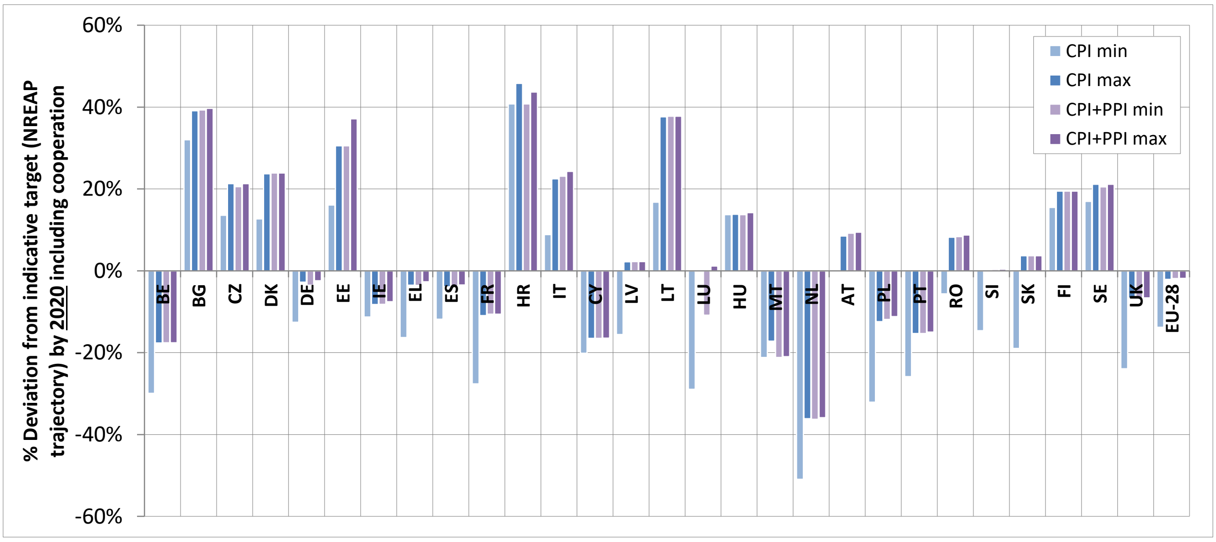


Figure 22. Deviation of expected RES shares (Green-X scenarios) from indicative NREAP target by 2020 including cooperation mechanisms

Table 9. Expected, planned and required RES shares in 2020 including cooperation mechanisms

RES share in gross final energy demand by 2020	**Expected RES share 2020 (CPI scenario)**		**Expected RES share 2020 (CPI+PPI scenario)**		**RED binding 2020 RES targets**	**2020 NREAP target**	**Deviation of expected from RED 2020 binding RES target (CPI and CPI+PPI scenario)**		**Deviation of expected from 2020 NREAP target (CPI and CPI+PPI scenario)**	
	Min.	**Max.**	**Min.**	**Max.**			**Min.**	**Max.**	**Min.**	**Max.**
Member State	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Belgium	9.1%	10.7%	10.7%	10.7%	13.0%	13.0%	-29.9%	-17.5%	-29.9%	-17.5%
Bulgaria	21.1%	22.3%	22.3%	22.4%	16.0%	16.0%	32.0%	39.7%	32.0%	39.7%
Czech Republic	15.9%	17.0%	16.9%	17.0%	13.0%	14.0%	22.3%	30.6%	13.6%	21.3%
Denmark	34.3%	37.6%	37.7%	37.7%	30.0%	30.4%	14.2%	25.5%	12.7%	23.9%
Germany	17.1%	19.1%	18.9%	19.1%	18.0%	19.6%	-4.8%	6.3%	-12.6%	-2.4%
Estonia	29.0%	32.6%	32.6%	34.3%	25.0%	25.0%	16.1%	37.1%	16.1%	37.1%
Ireland	14.2%	14.7%	14.7%	14.8%	16.0%	16.0%	-11.3%	-7.5%	-11.3%	-7.5%
Greece	15.1%	17.4%	17.4%	17.5%	18.0%	18.0%	-16.3%	-2.6%	-16.3%	-2.6%
Spain	18.3%	20.0%	20.0%	20.1%	20.0%	20.8%	-8.3%	0.4%	-11.8%	-3.5%
France	16.6%	20.5%	20.6%	20.6%	23.0%	23.0%	-27.6%	-10.6%	-27.6%	-10.6%
Croatia	28.3%	29.3%	28.3%	28.9%	20.0%	20.1%	41.5%	46.6%	40.8%	45.8%
Italy	18.5%	20.8%	20.9%	21.1%	17.0%	17.0%	8.9%	24.3%	8.9%	24.3%
Cyprus	10.4%	10.9%	10.9%	10.9%	13.0%	13.0%	-20.1%	-16.4%	-20.1%	-16.4%
Latvia	33.8%	40.9%	40.9%	40.9%	40.0%	40.0%	-15.5%	2.2%	-15.5%	2.2%
Lithuania	28.0%	33.0%	33.1%	33.1%	23.0%	24.0%	21.8%	43.8%	16.8%	37.8%
Luxembourg	7.8%	11.0%	9.8%	11.1%	11.0%	11.0%	-28.9%	1.2%	-28.9%	1.2%
Hungary	16.7%	16.7%	16.7%	16.7%	13.0%	14.7%	28.2%	28.7%	13.7%	14.2%
Malta	8.0%	8.4%	8.0%	8.1%	10.0%	10.0%	-18.9%	-14.7%	-19.2%	-15.1%
Netherlands	7.1%	9.3%	9.2%	9.3%	14.0%	14.5%	-49.2%	-33.6%	-50.9%	-35.9%
Austria	34.2%	37.1%	37.3%	37.4%	34.0%	34.2%	0.5%	10.1%	-0.1%	9.4%
Poland	10.8%	13.9%	14.0%	14.1%	15.0%	15.9%	-28.3%	-6.1%	-32.1%	-11.2%
Portugal	25.6%	29.2%	29.2%	29.3%	31.0%	34.5%	-17.5%	-5.4%	-25.9%	-15.0%
Romania	22.6%	26.0%	26.0%	26.1%	24.0%	24.0%	-5.6%	8.7%	-5.6%	8.7%
Slovenia	21.6%	25.4%	25.4%	25.4%	25.0%	25.3%	-13.6%	1.6%	-14.6%	0.4%
Slovakia	11.3%	14.5%	14.5%	14.5%	14.0%	14.0%	-19.0%	3.7%	-19.0%	3.7%
Finland	43.9%	45.4%	45.4%	45.4%	38.0%	38.0%	15.5%	19.5%	15.5%	19.5%
Sweden	58.7%	60.8%	60.5%	60.8%	49.0%	50.2%	19.8%	24.1%	17.0%	21.1%
United Kingdom	11.4%	14.0%	14.0%	14.0%	15.0%	15.0%	-23.9%	-6.6%	-23.9%	-6.6%
European Union	**18.3%**	**20.8%**	**20.9%**	**20.9%**	**20.0%**	**21.3%**	**-8.3%**	**4.4%**	**-13.8%**	**-1.8%**

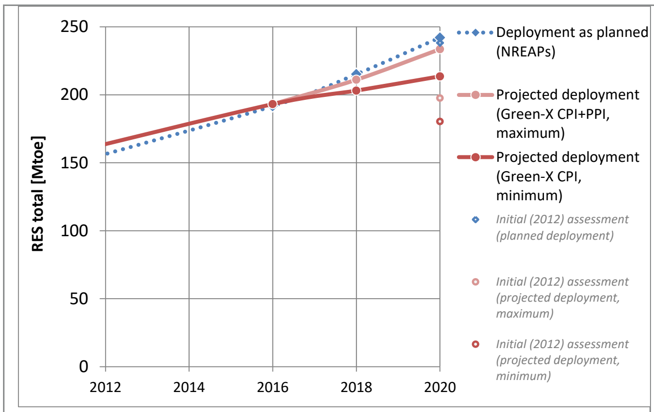
3.2.1.3 Technology overview

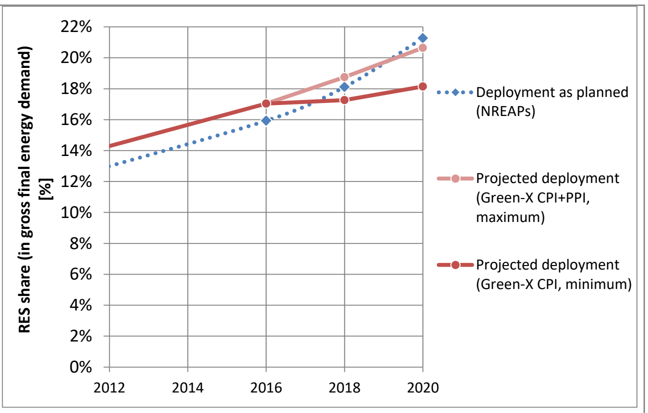
Complementary to above, in the following section the technology insights are presented. More precisely, Table 10 gives for each RES technology an overview of the status quo (2016) as well as the expected and planned (according to NREAP sectoral trajectories) deployment at EU-level by 2018 and by 2020. Additionally, also aggregates (by sector and for RES in total) as well as deviations (i.e. comparing expected and planned deployment) are indicated. Complementary to this, Figure 23 and Figure 24 provide a graphical illustration of the data, indicating the planned as well as the actual (2016) and expected future (2018, 2020) deployment by sector (Figure 23) and at technology level (Figure 24), using however aggregated technology clusters compared to the detailed technology breakdown shown in Table 10. Moreover, these graphs also allow for a comparison of this year's assessment of future progress with a previous one (six years ago, (Ecofys, 2013)).

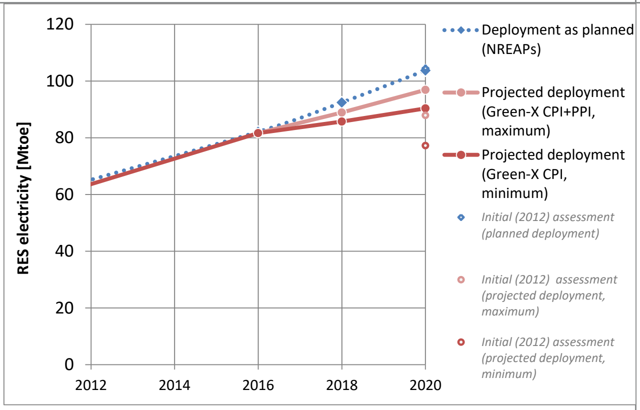
For 2018 a negative trend can be observed with respect to aggregated RES deployment at EU-level, where expected progress is below the planned one (as stated in the NREAP trajectories). The need for improvements in order to achieve or come close to the planned 2020 NREAP trajectories is becoming apparent. Of interest, the situation differs by sector and also by technology.

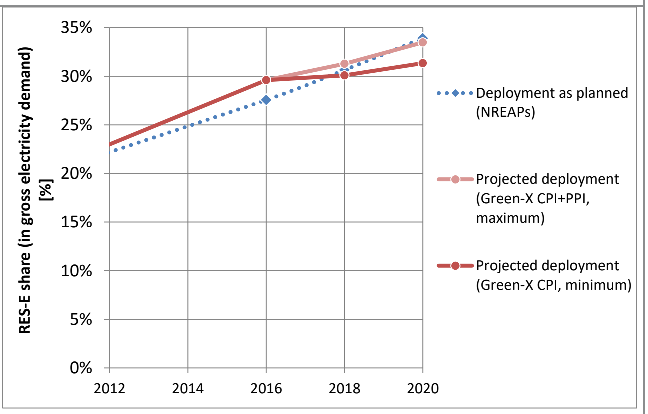
Generally, the heat sector appears most advanced among all energy sectors. With 99 Mtoe current (2016) deployment of RES-H&C, this is about 12% higher than the planned one (88.5 Mtoe as reported by MS in their NREAP sectoral trajectories). This trend is expected to continue in the short-term (2018) with an at least 6% higher expected deployment than the planned one as in the NREAP sectoral trajectories. Scenarios of future deployment indicate a decline of the surplus, but a positive trend can still be expected for 2020, with expected deployment (ranging from 108.4 to 116.9 Mtoe) being 0.4% lower to 7.4% higher than the planned one from the NREAP sectoral trajectories (108.9 Mtoe). Compared to an initial assessment as conducted throughout 2012, this represents the most significant change in perceptions: Previous scenarios have shown a 17% lower deployment for 2020. One key reason for changing expectations is that past progress in RES-H&C was far better than MS own expectations (as expressed in NREAPs or previous Progress Reports). In particular the developments in biomass heat and heat pumps have been remarkably strong in several MS. A higher than planned contribution from these technologies is also expected in 2020. In contrast to the above, one can identify need for improvements in the sector of heating & cooling for technologies like biogas, solar thermal collectors and mid- to large-scale geothermal heating systems. These technology options may most urgently require additional initiatives in order to let them play their role in meeting the 2020 NREAP sectoral trajectories.

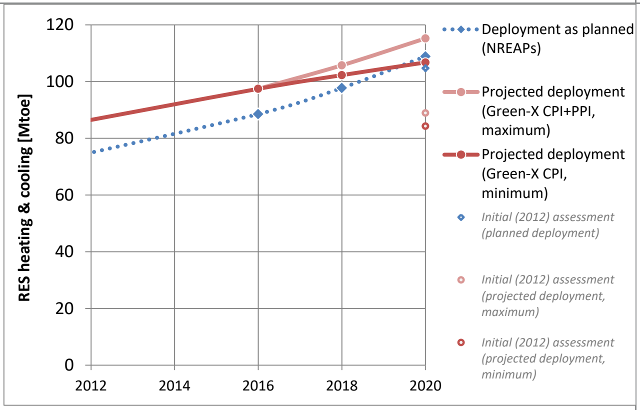
In contrast to RES-H&C, RES-E shows a comparatively large gap by 2020, ranging from 6.2% to 12.4% (corresponding to 6.5 to 12.9 Mtoe). Thanks to the strong deployment of photovoltaics in several MS, electricity from RES is currently (2016) fully in line with NREAP plans. Due to a slowdown of past progress in several MS a small deficit (i.e. 3.4% (3.2 Mtoe) to 6.7% (6.2 Mtoe)) can be expected by 2018, and this trend is assumed to continue in forthcoming years up until 2020. At technology level the need for improvements is highest for CSP and marine technologies (incl. tidal stream and wave power). But most important for achieving the NREAP sectoral trajectories appears to improve support and framework conditions for wind energy, in particular for offshore wind. At the aggregated level this year's assessment of 2020 RES-E progress can be classified as more optimistic than the initial one (conducted throughout 2012), leading to an 11% higher RES-E generation by 2020. In accordance with a decline of turbine prices, perceptions have changed in particular for onshore wind, and also for PV a positive trend occurs. For offshore wind, biomass electricity, marine technologies and CSP the opposite change in perceptions has occurred.

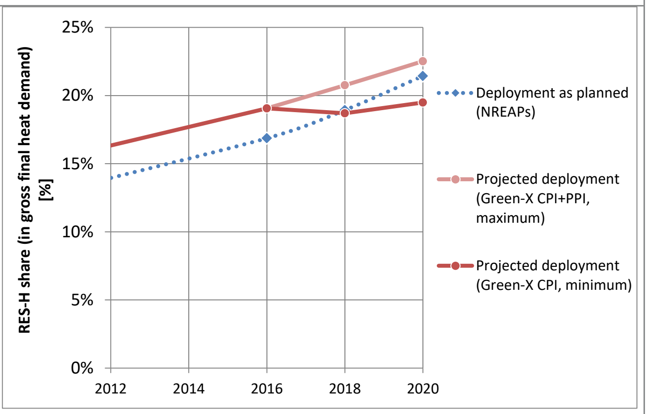

RES total [Mtoe]
250
200
150
100
50
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)

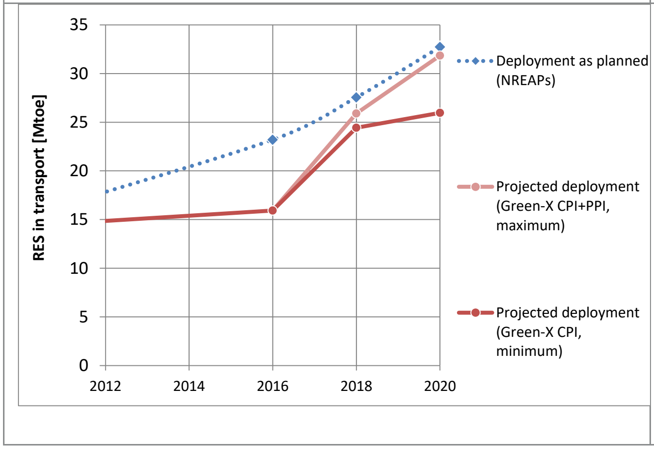

RES share (in gross final energy demand) [%]
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


RES electricity [Mtoe]
120
100
80
60
40
20
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


RES-E share (in gross electricity demand) [%]
35%
30%
25%
20%
15%
10%
5%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


RES heating & cooling [Mtoe]
120
100
80
60
40
20
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


RES-H share (in gross final heat demand) [%]
25%
20%
15%
10%
5%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


RES in transport [Mtoe]
35
30
25
20
15
10
5
0
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)

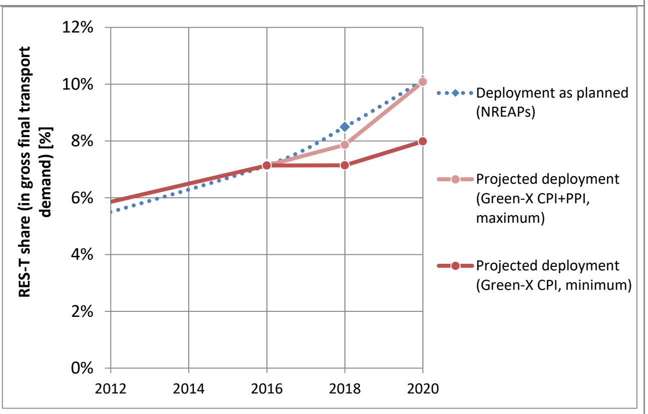

RES-T share (in gross final transport demand) [%]
12%
10%
8%
6%
4%
2%
0%
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)

Figure 23. Historic, expected and planned sector-specific RES deployment at EU-level by 2016, 2018 and 2020 in absolute terms (Mtoe, left) and in relative terms (as RES share in corresponding demand, right)

Regarding RES-T, additional initiatives are required for biofuels in transport where deviations between planned (based on the NREAP sectoral trajectories) and expected progress appear largest compared to the other technologies. More precisely, in accordance with the previous assessment expected deployment of biofuels is 27% to 44% (or about 8 to 13 Mtoe) lower than the planned deployment from the 2020 NREAP sectoral trajectories. This is a consequence of policy changes related to first generation biofuels where sustainability concerns are decisive in lowering their required contribution to overall RES-T target achievement (the ‘ILUC Directive’).

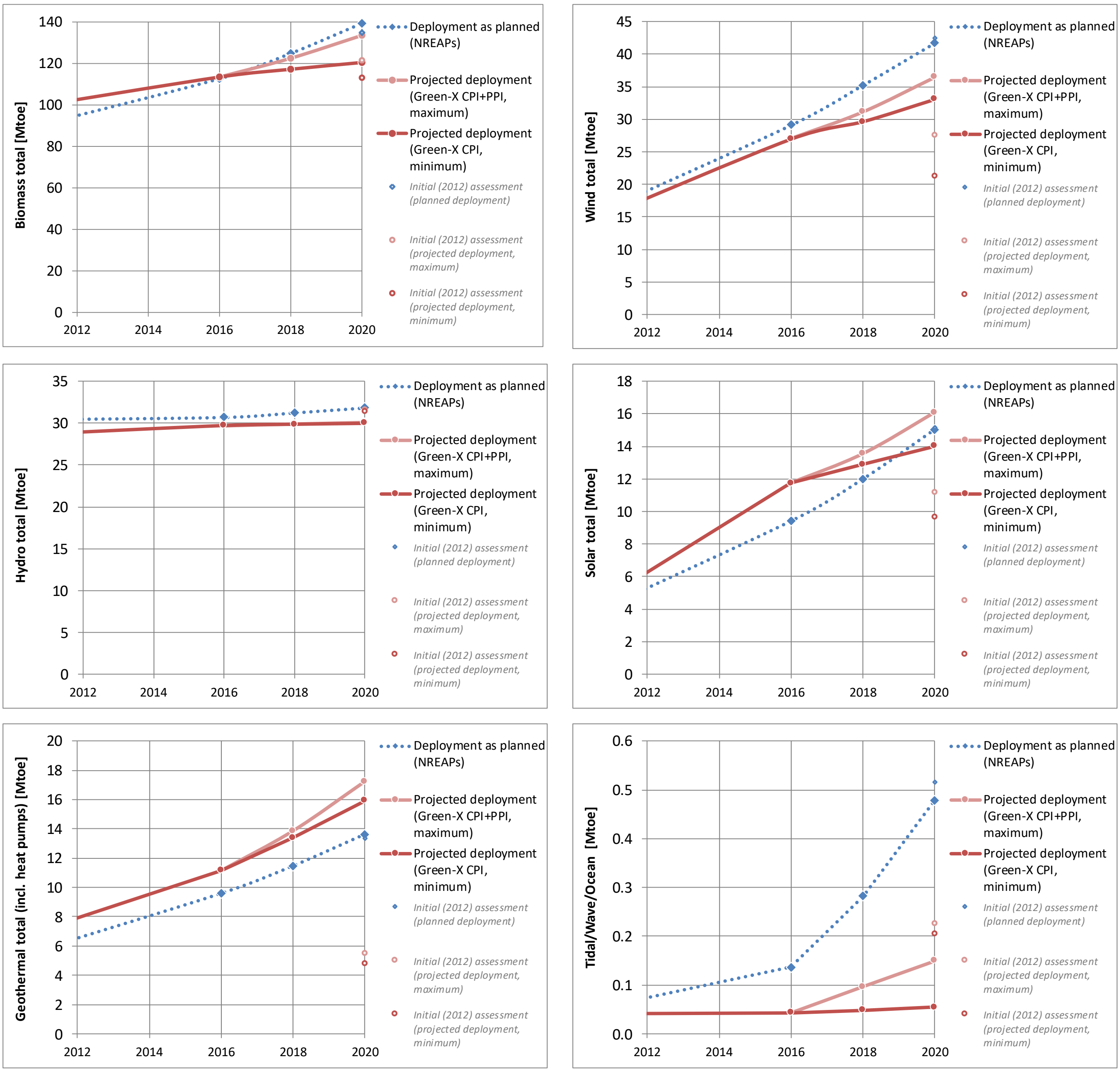


Figure 24. Historic, expected and planned technology-specific RES deployment at EU-level by 2016, 2018 and 2020

Table 10. Historic, expected and planned technology-specific RES deployment at EU-level by 2016, 2018 and 2020

Technology-specific RES deployment at EU-level	**Status Quo 2016**	**NREAP indicative trajectory 2016**	**Expected deployment 2018** (CPI scenario)		**NREAP indicative trajectory 2018**	**Expected deployment 2020** (CPI scenario)		**Expected deployment 2020** (CPI+PPI scenario)		**NREAP indicative trajectory 2020**	**Deviation of expected from planned deployment (and of actual deployment vs planned (2016))**				
												2018		**2020**	
			Min.	Max.		Min.	Max.	Min.	Max.		**2016**	Min.	Max.	Min.	Max.
Technology category	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]		[%]	[%]	[%]	[%]	[%]
RES electricity	**81.6**	**82.1**	**85.7**	**88.9**	**92.5**	**90.3**	**96.4**	**96.2**	**96.9**	**103.7**	**-0.6%**	**-7.3%**	**-3.8%**	**-12.9%**	**-7.1%**
Biomass (solid and liquid)	9.31	11.51	9.48	10.63	13.05	9.35	10.84	10.90	10.93	14.67	-19.1%	-27.4%	-18.5%	-36.2%	-26.1%
Biogas	5.43	4.13	5.65	5.73	4.70	5.92	6.04	6.04	6.07	5.45	31.5%	20.1%	21.7%	8.7%	10.9%
Geothermal	0.58	0.67	0.59	0.68	0.79	0.60	0.69	0.77	0.78	0.96	-13.5%	-24.8%	-14.2%	-37.9%	-28.2%
Hydro large-scale	25.51	26.40	25.52	25.53	27.00	25.56	25.56	25.55	25.59	27.39	-3.4%	-5.5%	-5.5%	-6.7%	-6.7%
Hydro small-scale	4.22	4.32	4.35	4.41	4.26	4.44	4.51	4.48	4.52	4.46	-2.4%	2.2%	3.4%	-0.4%	1.0%
Photovoltaics	9.09	4.91	9.98	10.26	5.93	10.85	11.74	11.74	11.90	7.03	85.3%	68.2%	73.1%	54.4%	67.1%
Concentrated solar power	0.48	0.91	0.48	0.48	1.17	0.49	0.51	0.51	0.51	1.56	-47.2%	-59.1%	-59.1%	-68.3%	-67.4%
Wind onshore	23.63	23.60	25.58	26.88	26.94	28.35	30.35	30.02	30.48	30.26	0.1%	-5.0%	-0.2%	-6.3%	0.3%
Wind offshore	3.35	5.52	4.06	4.22	8.32	4.71	5.97	5.99	5.99	11.48	-39.4%	-51.2%	-49.3%	-58.9%	-48.0%
Tidal/Wave/Ocean	0.04	0.14	0.05	0.10	0.28	0.05	0.15	0.15	0.15	0.48	-68.4%	-82.8%	-65.8%	-88.7%	-68.8%
RES heating & cooling	**97.4**	**88.5**	**102.3**	**105.7**	**97.8**	**106.8**	**114.7**	**114.8**	**115.2**	**108.9**	**10.1%**	**4.6%**	**8.2%**	**-2.0%**	**5.3%**
Biomass (solid and liquid)	81.07	72.95	83.35	86.02	78.47	84.97	90.93	90.85	91.25	85.27	11.1%	6.2%	9.6%	-0.4%	6.6%
Biogas	3.60	3.07	3.68	3.72	3.72	3.77	3.84	3.84	3.86	4.50	17.3%	-1.0%	0.1%	-16.1%	-14.5%
Geothermal	0.77	1.60	0.83	0.90	2.11	0.93	1.12	1.15	1.15	2.63	-52.1%	-60.7%	-57.2%	-64.7%	-57.3%
Heat pumps	9.82	7.33	11.97	12.29	8.58	14.40	15.19	15.27	15.29	10.03	33.9%	39.5%	43.2%	43.6%	51.5%
Solar Thermal	2.18	3.59	2.44	2.80	4.88	2.69	3.57	3.66	3.68	6.45	-39.2%	-50.1%	-42.6%	-58.4%	-44.7%
RES transport (biofuels only)	**14.1**	**21.0**	**15.1**	**16.5**	**24.9**	**16.5**	**21.4**	**21.4**	**21.4**	**29.5**	**-33.1%**	**-39.6%**	**-33.6%**	**-44.1%**	**-27.2%**
First generation biofuels	14.1	19.8	14.5	15.9	23.1	14.7	19.3	19.3	19.3	27.1	-29.0%	-37.1%	-31.3%	-45.6%	-28.6%
Second generation biofuels	0.00	1.22	0.52	0.66	1.79	1.75	2.10	2.08	2.09	2.38	-99.8%	-70.8%	-63.2%	-26.7%	-11.7%
RES total	**193.1**	**191.7**	**203.1**	**211.2**	**215.1**	**213.6**	**232.4**	**232.4**	**233.6**	**242.1**	**0.8%**	**-5.6%**	**-1.8%**	**-11.8%**	**-4.0%**

3.2.2 Projected future progress in RES-E

In this section, we provide more details on the projected future progress for the electricity sector.

3.2.2.1 RES-E sector overview

(1) Overview of expected deployment vs. indicative NREAP trajectories for 2018 and by 2020

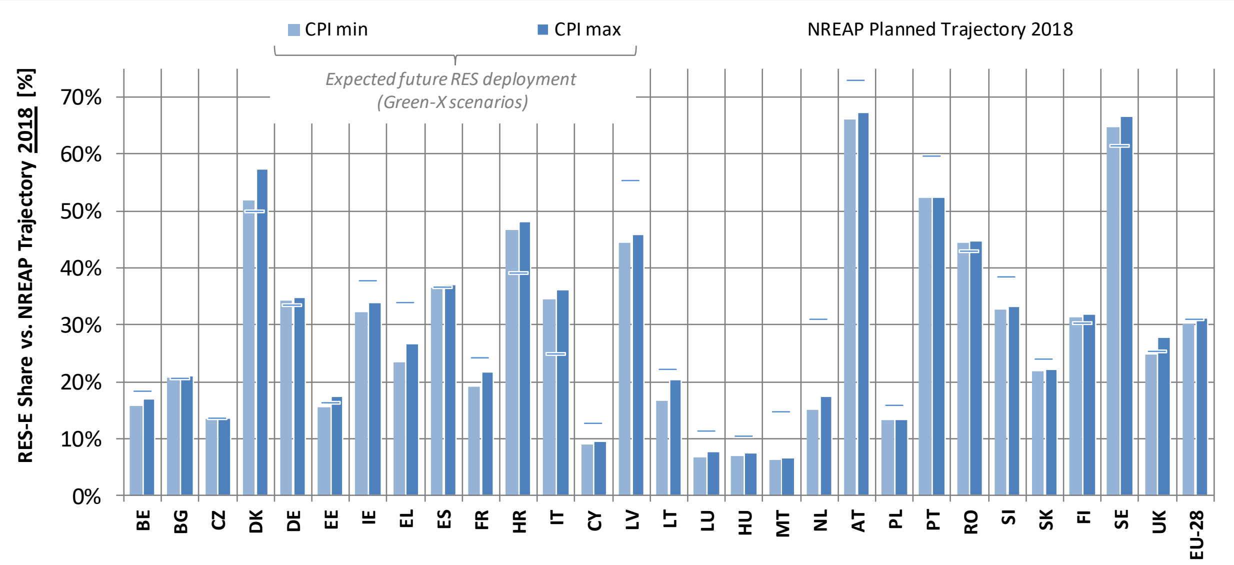


Figure 25. Expected RES-E share in 2018 vs. 2018 indicative NREAP trajectories (%)

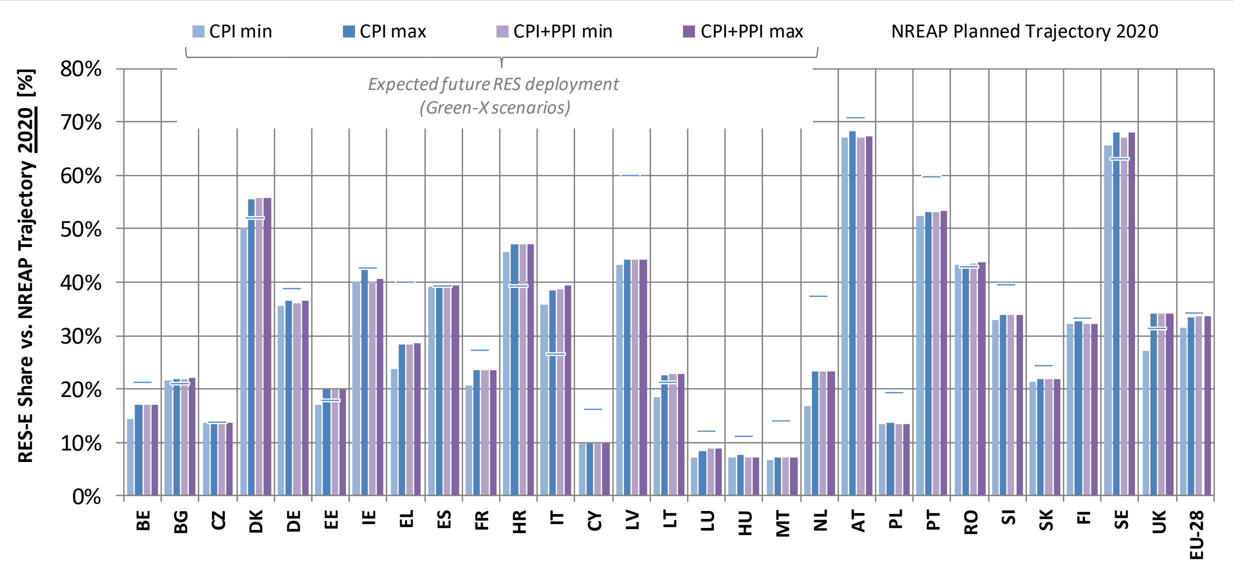


Figure 26. Expected RES-E share in 2020 vs. 2020 indicative NREAP target (%)

The expected (according to Green-X scenarios) and the planned (i.e. the indicative NREAP trajectories) short-term (2018) progress of RES in the electricity sector is compared in Figure 25, showing RES-E deployment in relative terms, that is the RES-E share in gross electricity demand. The corresponding depiction for 2020 is given in Figure 27.

(2) Deviation from 2018 and 2020 NREAP sectoral trajectories

Complementary to these graphs the following figures illustrate the deviation of expected RES-E deployment from the indicative sectoral trajectory (i.e. the planned progress as prescribed in the MS NREAPs). More precisely, for 2018 Figure 27 indicates the deviation under business-as-usual conditions, taking into account only currently implemented policy initiatives. The complementary depiction for 2020 is provided in Figure 28, whereby also planned improvements are taken into consideration. In both figures uncertainty related to the development of future energy demand is reflected, illustrating lower (i.e. CPI min, CPI+PPI min) and upper levels (CPI max, CPI+PPI max) of expected RES-E shares in gross electricity consumption.

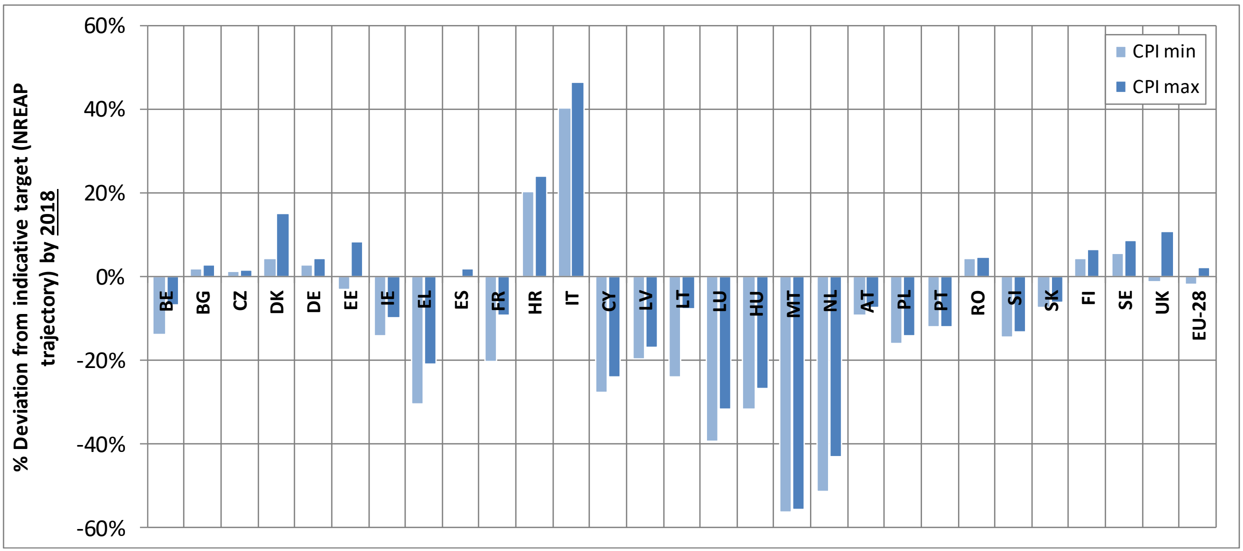


Figure 27. Deviation of expected RES-E Shares (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

In the short-term, i.e. by 2018, 10 out of 28 MS will be able to meet (and over-succeed) their RES-E deployment as planned in the NREAP sectoral trajectory under all assessed circumstances. Top of that list is Italy, followed by Croatia, Denmark, Sweden, Finland, Germany, the Czech Republic, Spain and Bulgaria. At EU-level either an insignificant deficit of 1.8% or a surplus of about 2.1% can be expected. For the UK and Estonia, the situation remains ambiguous – for both MS either a gap or a surplus appears feasible by 2018. Two MS (i.e., Austria and Slovakia) show a comparatively small to moderate gap compared to their planned sectoral trajectory (below a 10% threshold) and the remaining 16 MS can be classified as not successful in planning their short-term progress with respect to renewable electricity. Top of that list (of negative ranking) is Malta, the Netherlands, Luxembourg, Hungary, Greece and Cyprus with deficits larger than 20%.

The situation is expected to turn for the worse towards 2020. The gap to the indicative sectoral trajectories for RES-E deployment will at EU-level increase to 1.0% to 7.6% with currently implemented and planned policy initiatives.

Two MS are expected to exceed their 2020 NREAP sectoral trajectory by more than 10% under all assessed cases. Thereby the strongest surplus will arise in Italy, followed by Croatia. Sweden, and to a lesser extent Bulgaria, the Czech Republic, Spain and Romania still show a small surplus in expected deployment compared to their 2020 RES-E sectoral trajectory under all analysed variants. Estonia, Lithuania, the UK and Denmark reach their sectoral trajectory only under specific circumstances, e.g. if moderate to optimistic assumptions related to demand growth are used and if the policy implementations show no discontinuity. Austria, Germany, Ireland, Finland, and Slovakia are MS facing a small deficit that is with a deviation below a 10% threshold.

Top of the list of MS that are expected to fail in delivering their planned 2020 RES-E deployment are Malta, followed by Cyprus, the Netherlands, Hungary, Greece, Poland, Luxembourg, Latvia, Belgium, Slovenia, Portugal, and France, all referring to a continuation of current trends (CPI scenario). The situation will improve slightly in some MS if planned RES policy initiatives are also taken into consideration.

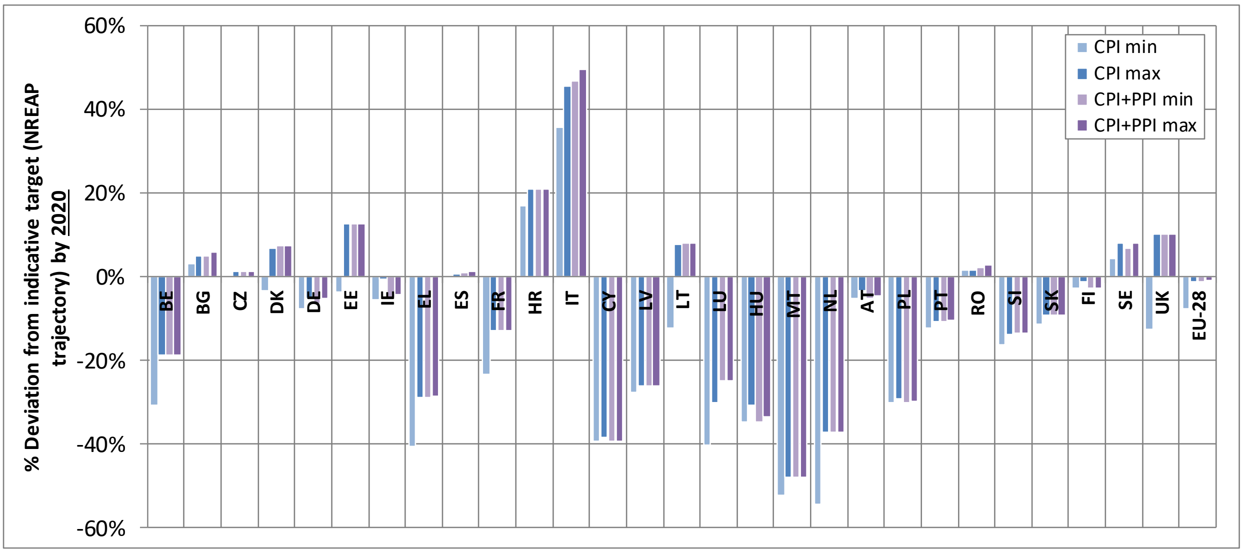


Figure 28. Deviation of expected RES-E Shares (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.2.2 Biomass electricity

With respect to electricity production from solid and liquid biomass, Figure 29 highlights the deviations from the actually planned progress as in the NREAPs to the expected development according to the CPI scenario for the year 2018 on MS level. Across the majority of MS a broad deviation of around plus/minus 50% occurs, whereas at EU-level an underachievement of 19% to 27% is observed. With a surplus above 50% compared to plans, Estonia, the UK and Slovakia are outperforming far better than planned in their NREAP for this technology. Additionally, the Czech Republic and Latvia are on the list of well performing MS. The large remainder of MS is expected to fail in meeting their planned deployment for the year 2018, whereby strongest deviations (with deficits above 50% compared to their plans) can be observed in Greece, Malta, Romania and the Netherlands.

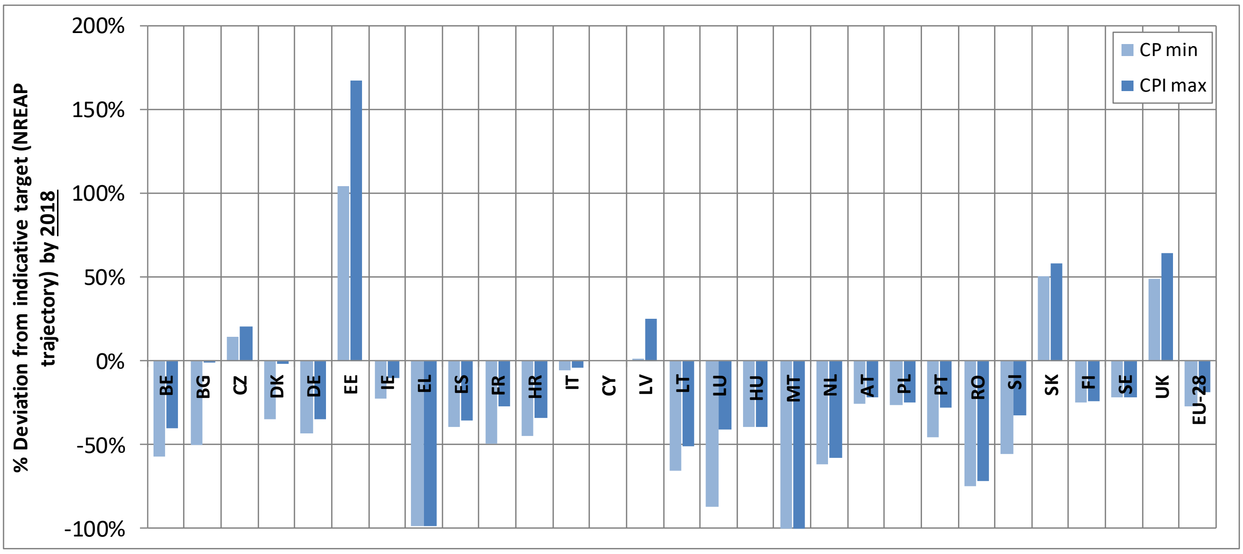


Figure 29. Deviation of expected deployment of biomass electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

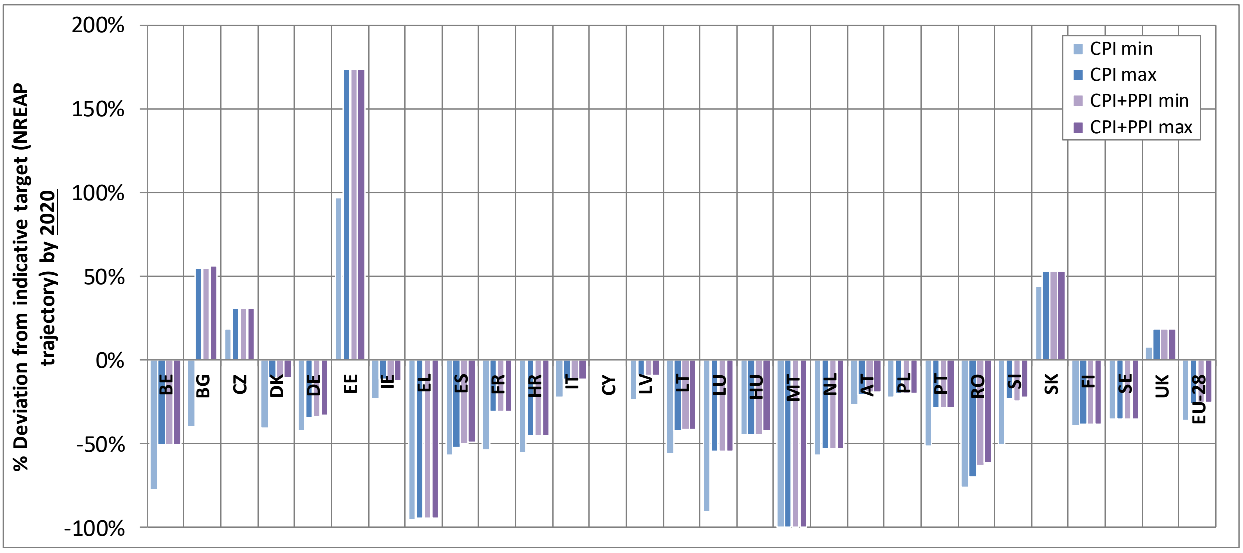


Figure 30. Deviation of expected deployment of biomass electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

A comparatively similar situation is expected for the year 2020. An overview of the impact of currently implemented and additionally planned policy initiatives on biomass deployment in the electricity sector by MS is given in Figure 30. With currently implemented and planned support policies (CPI as well as CPI+PPI scenarios) the EU would fail to meet the planned target by 26% to 36%. Compared to 2018 the situation hardly differs by MS – but exceptions from this general trend occur for Bulgaria and Latvia. For example, Latvia which is likely to over-perform in 2018 is expected to fail in meeting its trajectory in 2020 under all circumstances. An opposite trend is observable for Bulgaria where expected 2020 deployment is well above given plans whereas in 2018 the expected one is perceived to stay below the planned one.

3.2.2.3 Biogas electricity

In contrast to electricity production from solid and liquid biomass, biogas electricity production is expected to slightly overachieve the NREAP deployment trajectories for the year 2018, i.e. at EU-level by about 20% to 22%. A detailed overview of the deviations of the expected biogas electricity generation to the planned contribution at MS level is given in Figure 31. Among the largest three MS with respect to biogas electricity production in absolute terms, Germany and Italy are expected to overachieve their NREAP sectoral trajectory to a large extent. Other well performing MS are the UK, Croatia, Austria, Finland, and the Czech Republic. In contrast to above, the large remainder of MS are expected to fail in meeting their planned NREAP sectoral trajectory in 2018 – i.e. eight of them (including Denmark, Greece, Cyprus, Lithuania, Malta, the Netherlands, Romania and Slovenia) by more than 50%. As such, a wide geographical spread appears with respect to the positive or negative deviation from the domestic NREAP trajectories of electricity generation from biogas.

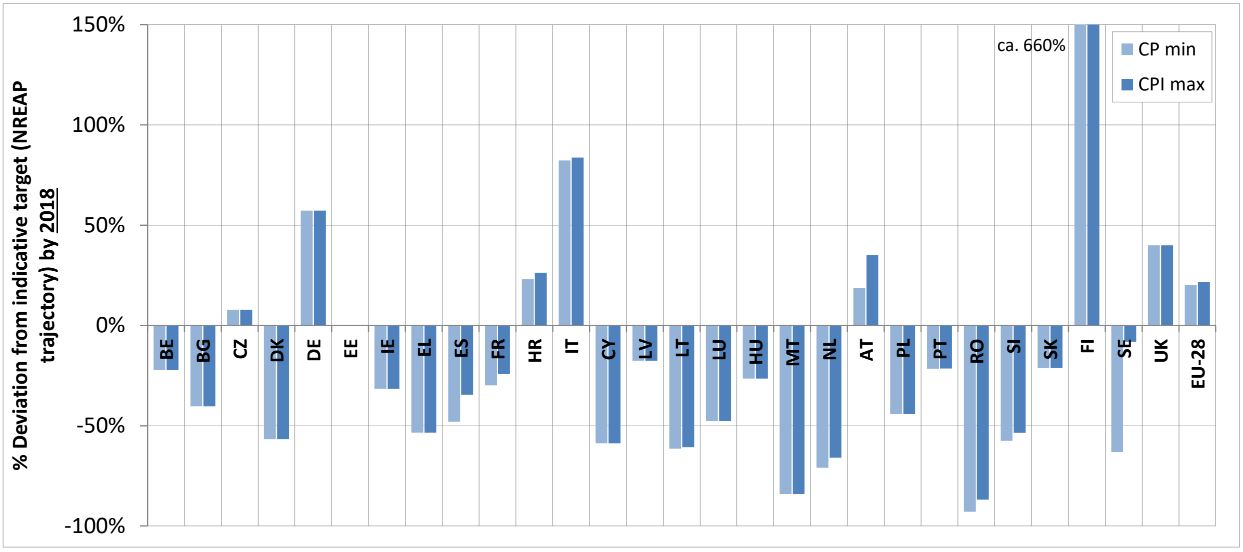


Figure 31. Deviation of expected deployment of biogas electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

Prolonging the time frame to the year 2020 results in a comparatively similar situation, see Figure 32 below. Apart from Finland, Italy, Sweden, Austria, Germany and the United Kingdom, all other MS will fail to meet their domestic 2020 projections of electricity production from biogas. Nevertheless, the former are those MS contributing most to the aggregated electricity generation from biogas at EU-level which compensates large parts of the gap arising from other MS. Apparently, at EU-level a surplus of 9% to 11% can be observed in 2020. Remarkably, hardly any difference is expected between the modelled sensitivities, and planned policy initiatives do not appear decisive for biogas deployment.

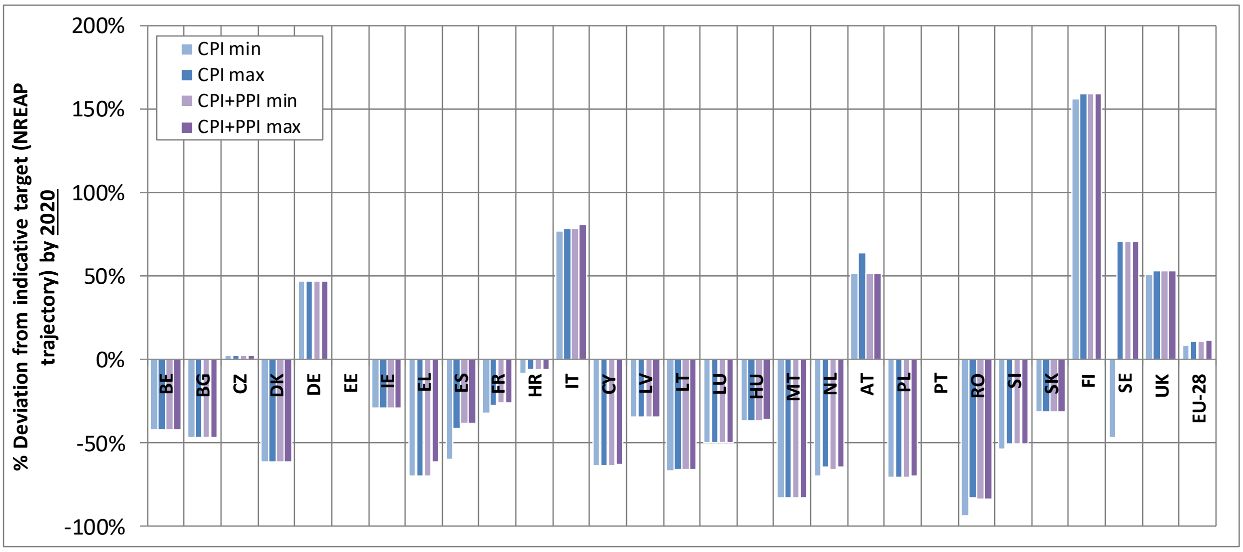


Figure 32. Deviation of expected deployment of biogas electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.2.4 Concentrated solar power electricity

The CSP technology is from the current perspective only realistically applicable in Southern Europe. Thus, Figure 33 shows that only six MS planned to implement this technology in the electricity market already by 2018. All these MS miss their sectoral trajectory by 2018, in the case of Greece, Portugal, France, Italy and Cyprus by 100%, while Spain is facing a gap of about 50% compared to plans. This sums up to a 59% deviation for the EU as a whole.

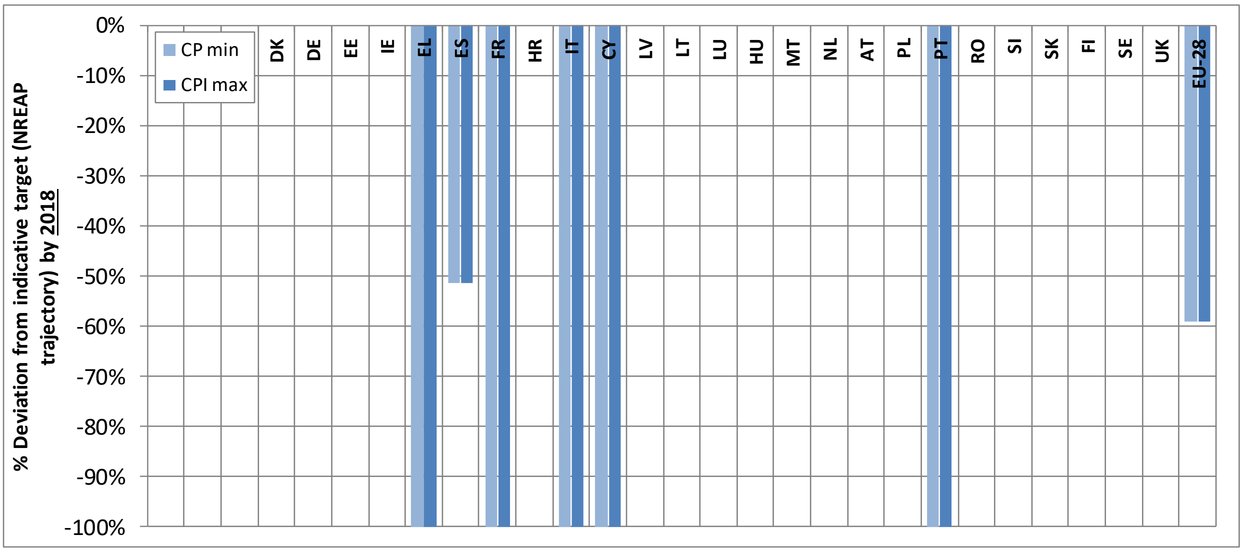


Figure 33. Deviation of expected deployment of solar power electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

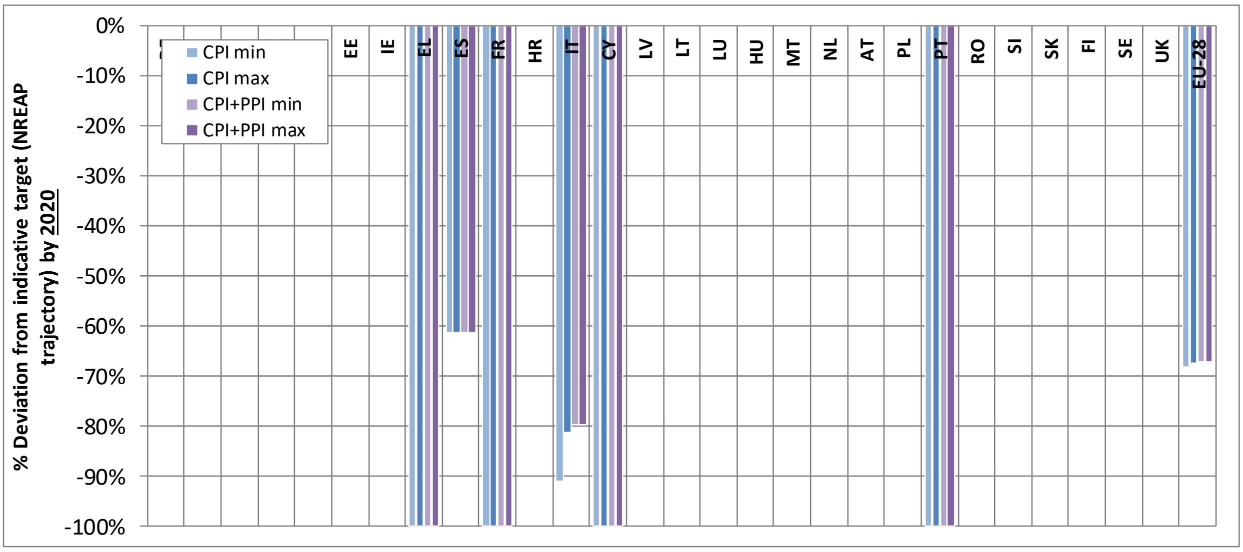


Figure 34. Deviation of expected deployment of solar power electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

By 2020 the situation gets even worse, with a gap to fulfilment of the sectoral trajectories of about 67-68% at EU-level. Thereby planned policy initiatives show only minor improvements for the market penetration of CSP, limited to one of these MS, namely Italy.

3.2.2.5 Geothermal electricity

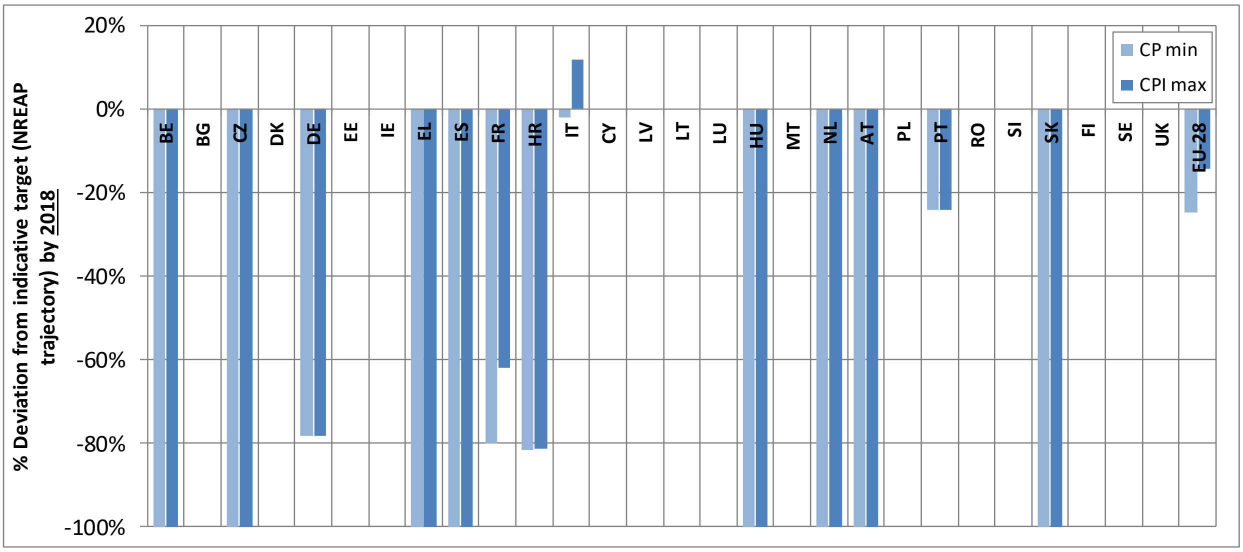


Figure 35. Deviation of expected deployment of geothermal electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

At present geothermal electricity is used only in Italy, Germany and Portugal. A few MS have however indicated their aims to use that technology in the short-term (2018) as well as by 2020.

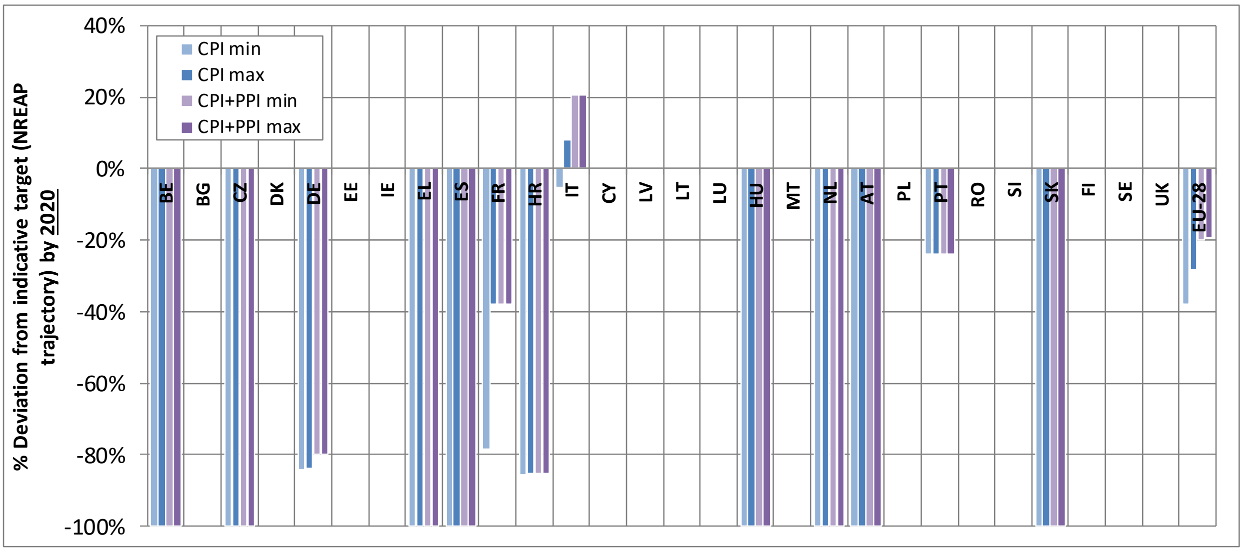


Figure 36. Deviation of expected deployment of geothermal electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.2.6 Large hydro

The category large hydro refers to installations of more than 10 MW. Large hydro is the most mature RES-E technology, with the major share of the realisable potential already being exploited in most MS. Thus, the scale of deviations between expected and planned electricity generation from large-scale hydropower is relatively small compared to previously discussed RES-E technologies, see Figure 37. However, several MS, like Germany, Croatia, Hungary, Italy, Spain, Lithuania and Finland are expected to over-succeed their indicative NREAP trajectories for 2018. In contrast to above, Belgium, Portugal and the United Kingdom will not meet their indicative deployment trajectories in the year 2018, showing a deviation of expected to planned deployment larger than 20%. At EU-level a comparatively low underachievement of ca. 5% is expected for 2018.

In the time frame up to 2020 no significant change is expected at EU and at MS level, with a rise of the gap to planned deployment of 6.7% at EU-level. By 2020 Belgium, Portugal and the United Kingdom are expected to end up with more than 20% underachievement according to the scenarios. All other MS will show only moderate deviations to their domestic projections of hydropower generation in 2020, being within the 20% interval. Generally, Figure 38 depicts only marginal differences among sensitivities and policy options analysed for electricity generation from large hydropower plants across the majority of MS.

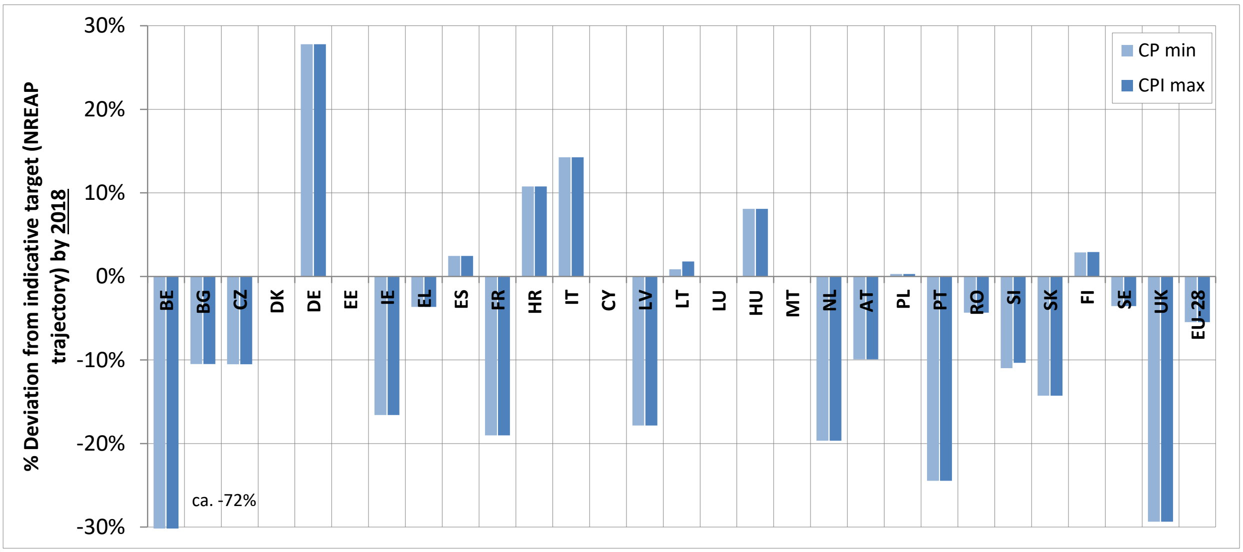


Figure 37. Deviation of expected deployment of large hydro (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

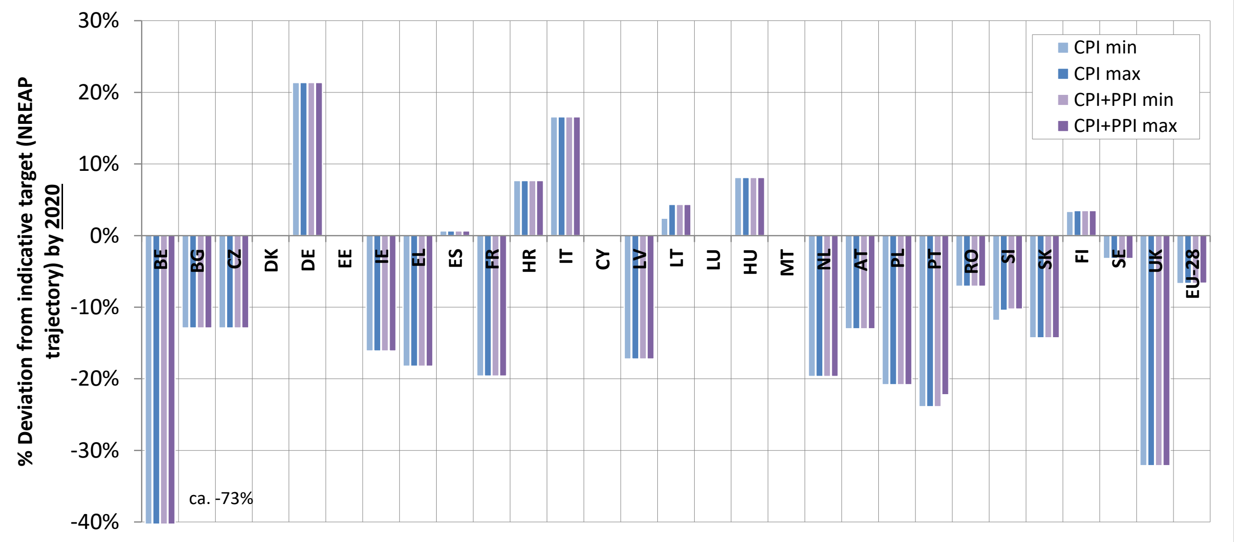


Figure 38. Deviation of expected deployment of large hydro (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.2.7 Small hydro

Observing the electricity production of the technology sector of small hydropower in Figure 39, it can be seen that in the short-term (2018) only a relatively small number of six MS achieve their indicative sectoral trajectories. At top of the positive ranking is Portugal, followed by Sweden, Romania, Austria and Italy. With a deficit above 40% the largest gaps are hereby expected for the Netherlands, Slovakia and Croatia. At EU-level this would lead to a slight overachievement in the range between 2.3% and 3.4% by 2018.

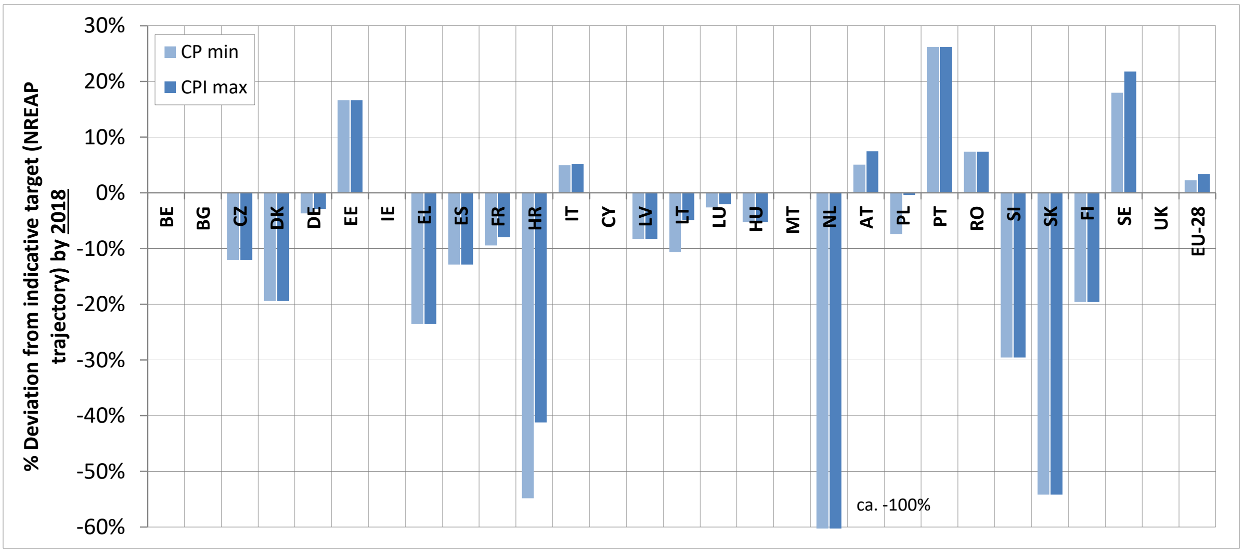


Figure 39. Deviation of expected deployment of small hydro (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

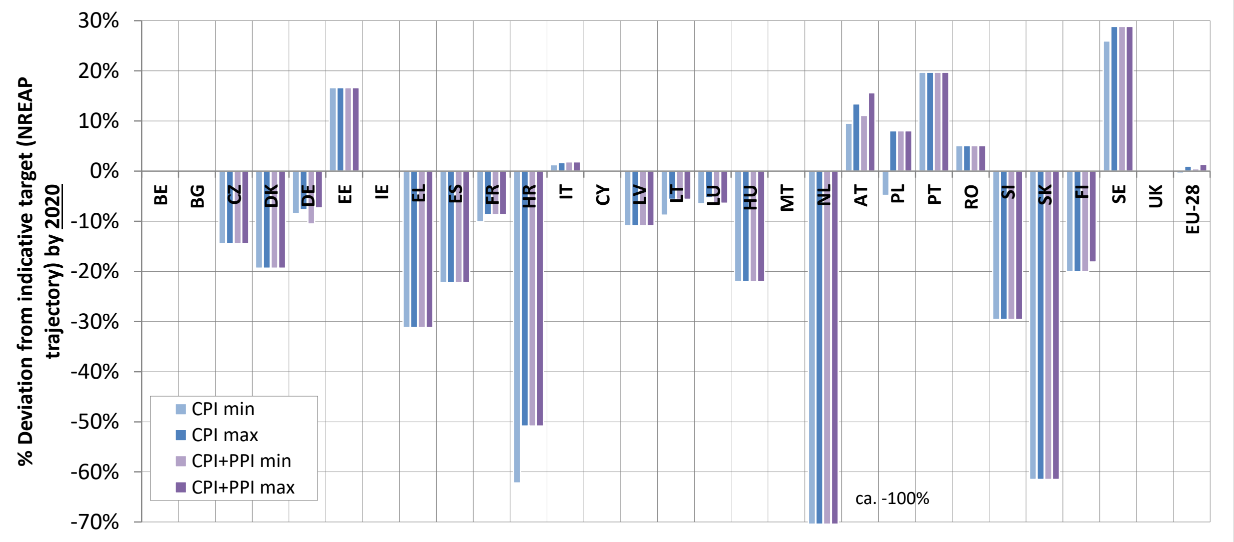


Figure 40. Deviation of expected deployment of small hydro (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

Looking at 2020 the EU sum of NREAP sectoral trajectories within the small hydro power sector, a range between a 0.4% gap to an overachievement of 1.3% is expected depending on the selected scenario (Figure 40). This is an indicator for the technology to be quite well integrated in the actual electricity market as a proven technology. Differences between the CPI and the CPI+PPI scenarios are hardly applicable and in general terms the country-specific circumstances remain identical to the 2018 timeframe expect for Poland which is expected to turn its negative trend towards an overachievement in 2020.

3.2.2.8 Onshore wind

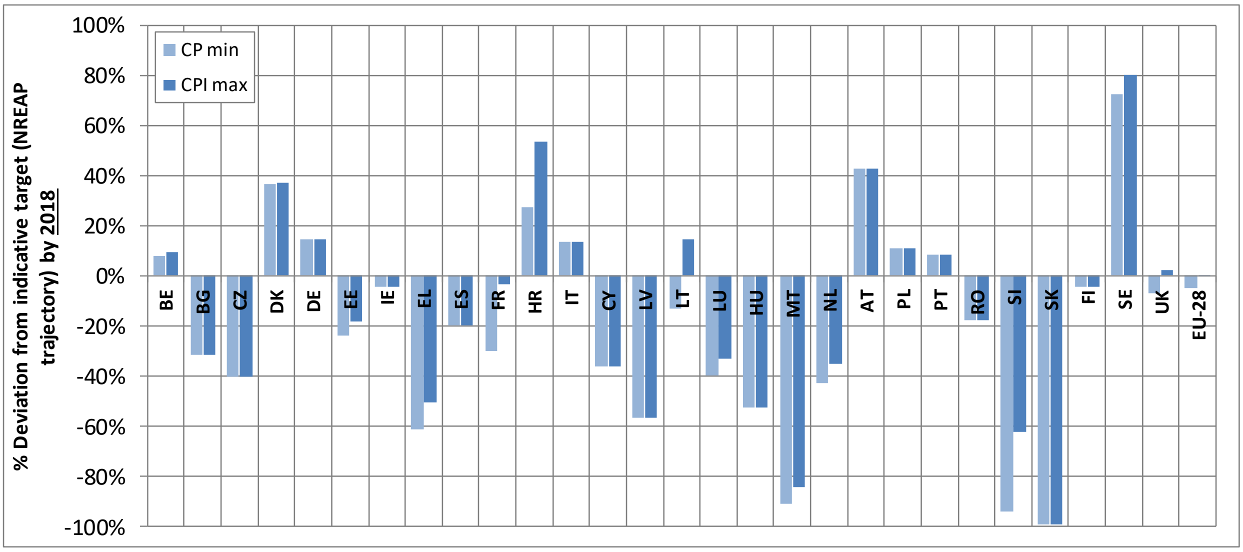


Figure 41. Deviation of expected deployment of onshore wind (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

In the technology sector of wind onshore electricity generation 9 MS are expected to achieve their indicative short-term trajectories for 2018 (see Figure 41), and for two others, namely Lithuania and the United Kingdom, the situation remains unclear – i.e. either a gap or a surplus may arise when comparing expected and planned deployment. The biggest overachievers are Sweden, Austria, Denmark and Croatia, reaching a surplus of more than 20% when comparing expected with planned deployment from their NREAPs. At EU-level expected wind onshore deployment indicates a small gap in the range between 0.3% and 5.0%.

The situation hardly changes towards 2020, as shown in Figure 42. The gap at EU-level may increase to about 6.3% - but also an exact fulfilment of the NREAP trajectories appears similarly likely. Thereby planned policy initiatives and optimistic framework conditions positively influence deployment and improve progress in achievement of the sectoral trajectory, specifically in Denmark, Ireland, Luxembourg and Austria. Large surpluses (i.e. positive deviations to the planned deployment of more than 40%) can be expected in Sweden, Croatia (under certain circumstances) and in Austria. Contrarily, top of the list of not well performing MS are Slovakia, Malta[34], Greece, Cyprus, Hungary and Latvia, achieving a more than 50% lower deployment by 2020 than planned in their trajectories. Several other MS are also expected to fail in achieving their trajectory but to a less significant extent. Generally, this indicates among others that onshore wind requires improvements related to support as well as to market integration.

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[34] Please note that for Malta the submitted NREAP version as of 24 May 2011 was used. The resubmitted version of June 2017 does not include necessary details concerning technology specific contributions (i.e. on installed capacity, gross electricity generation) expected from each renewable energy technology in Malta for meeting the binding 2020 targets and for the interim trajectory. Specifically the according to the EC template prescribed Table 10.a, Table 10.b, Table 11 and Table 12 of the NREAP Template (see Decision 2009/548/EC) were not included in the resubmitted version.

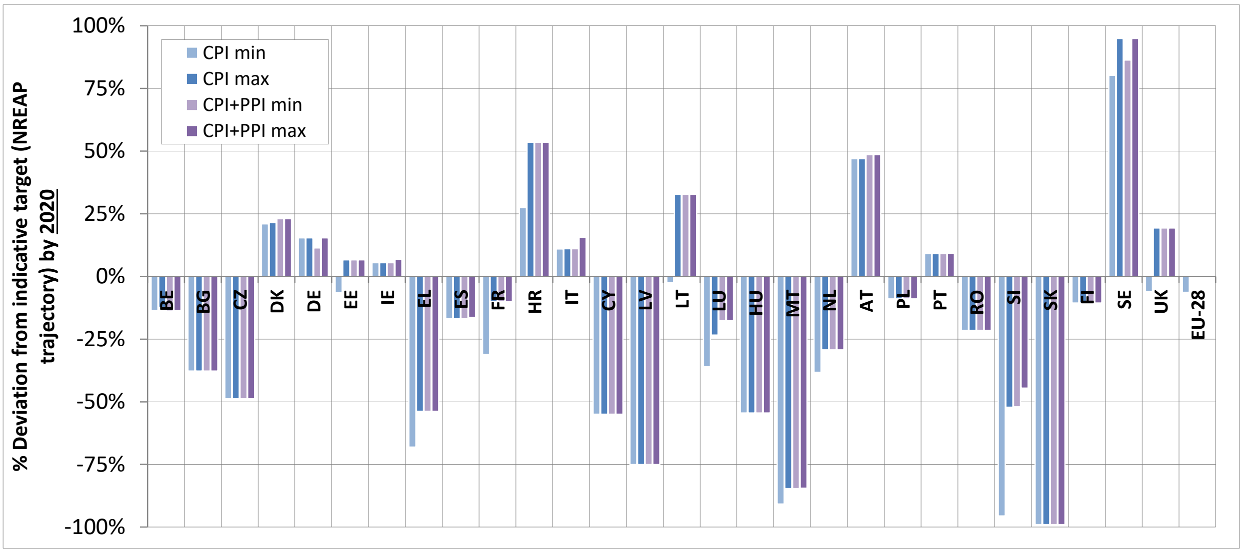

Figure 42. Deviation of expected deployment of onshore wind (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.2.9 Offshore wind

The offshore wind sector may still be classified as a new technology sector in this assessment. 15 out of 28 EU MS planned to implement this technology by 2018, see Figure 43. For 2018 a significant gap of about 50% to the planned trajectory is becoming apparent at EU-level since only Sweden is expected to perform better than planned, overachieving its indicative sectoral trajectory by more than 55%. All other MS are expected to miss their indicated sectoral trajectories.

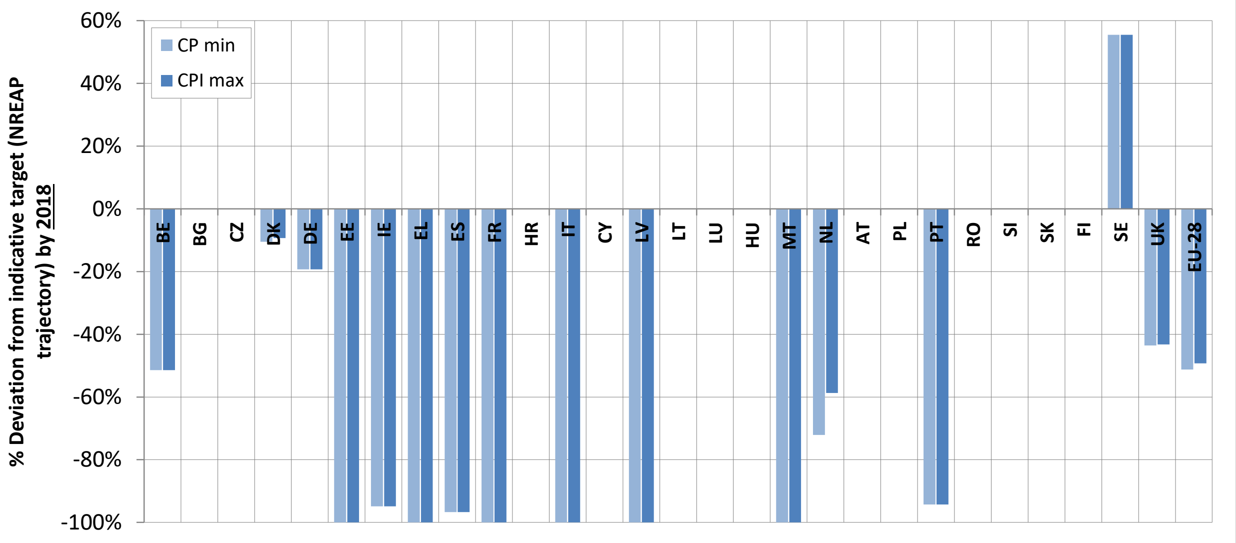

Figure 43. Deviation of expected deployment of offshore wind (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

Also, for 2020 Figure 44 shows deficiencies in the CPI and CPI+PPI scenarios regarding the possible market penetration at EU-level, i.e. offshore wind farms operating in 2020. And there is not much hope that planned policy initiatives, assessed with the CPI+PPI scenarios, may contribute to mitigate deficits in legislation and planning. Since ambitious deployment trajectories have been set for offshore wind by several MS according to their NREAPs, the overall EU sum of these trajectories for 2020 is missed by around 48% in the assessed scenarios, except for the high demand case where a higher gap (i.e. with about 59% compared to planned) appears likely.

As indicated in Figure 44, when comparing expected and planned wind offshore generation a surplus by 2020 can only be expected for Sweden (38%) and Denmark (0.6% to 2%)[35].

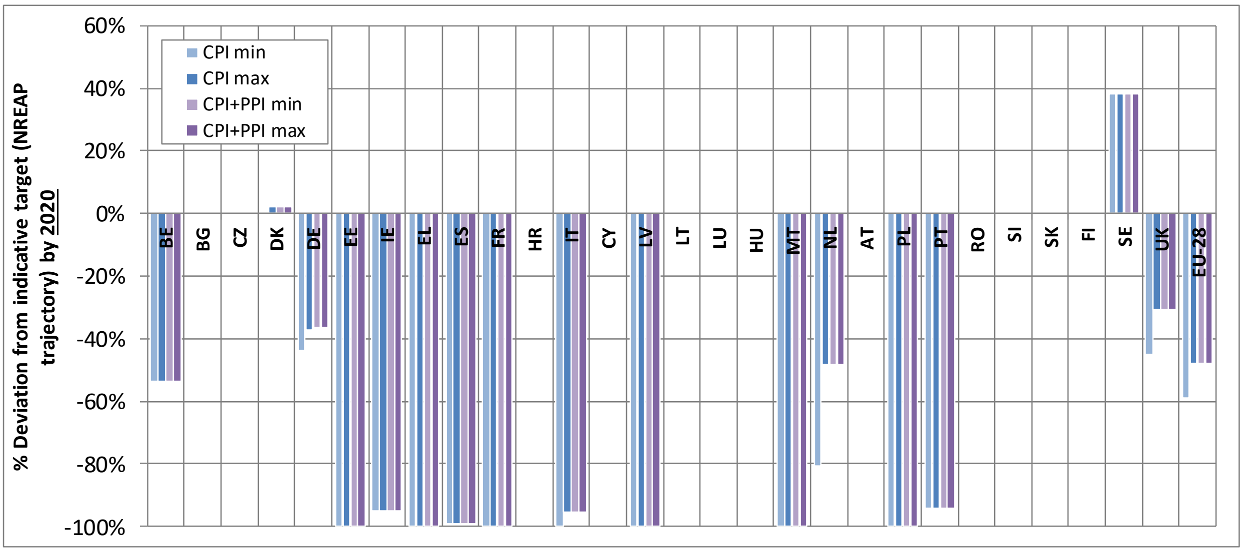

Figure 44. Deviation of expected deployment of offshore wind (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

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[35] Please note however that the Danish planned offshore generation by 2020 is more than 10 times larger than the Swedish one (i.e. 5.322 GWh (Denmark) vs. 500 GWh (Sweden)).

3.2.2.10 Photovoltaics

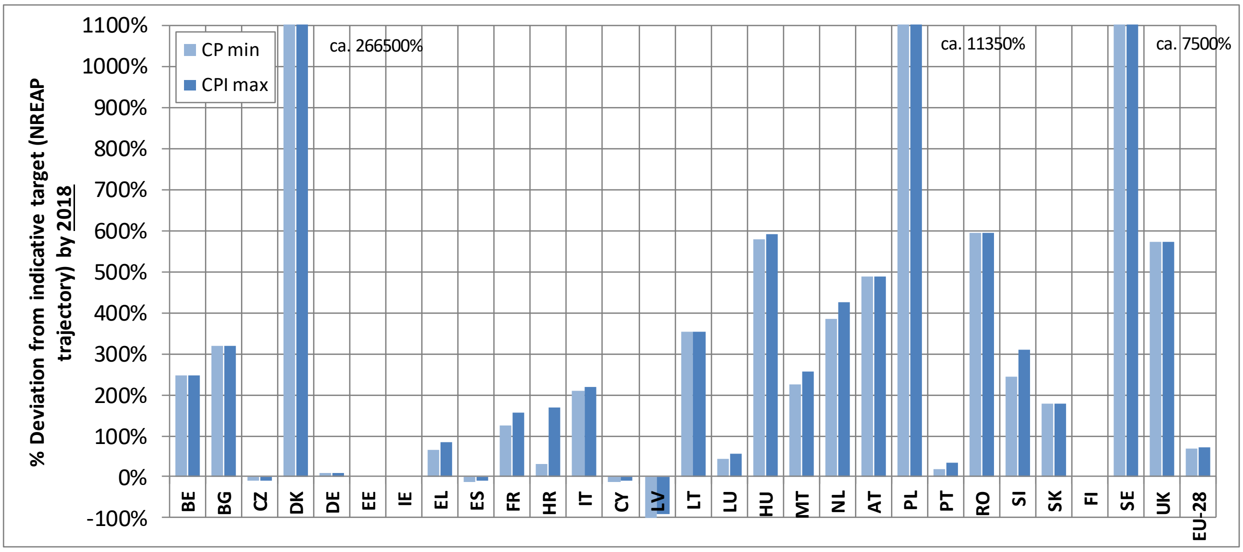

Figure 45. Deviation of expected deployment of photovoltaics (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

In the PV sector the EU trajectory (based on the sum of the NREAP sectoral trajectories) is overachieved in the short-term (2018) (Figure 45) as well as by 2020 in all scenarios (Figure 46). The surplus appears significant in magnitude, amounting to 68% to 73% by 2018 and ranging from 54% to 69% by 2020. Noteworthy is the positive impact of planned policy initiatives on PV performance in MS like Bulgaria, Italy and Luxembourg.

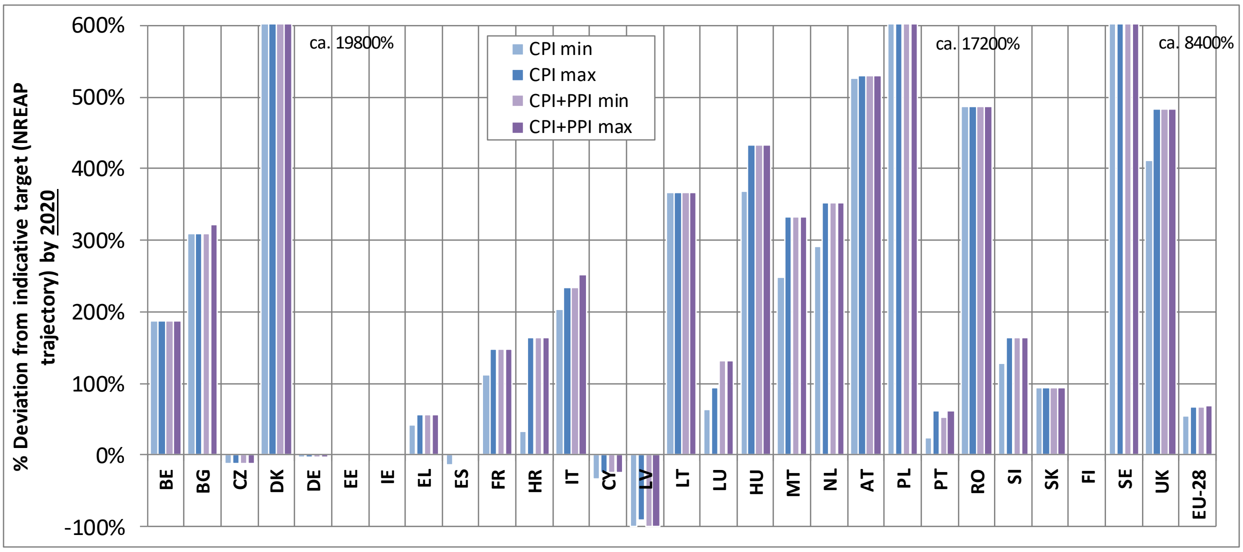

Figure 46. Deviation of expected deployment of photovoltaics (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.2.11 Tidal and wave electricity

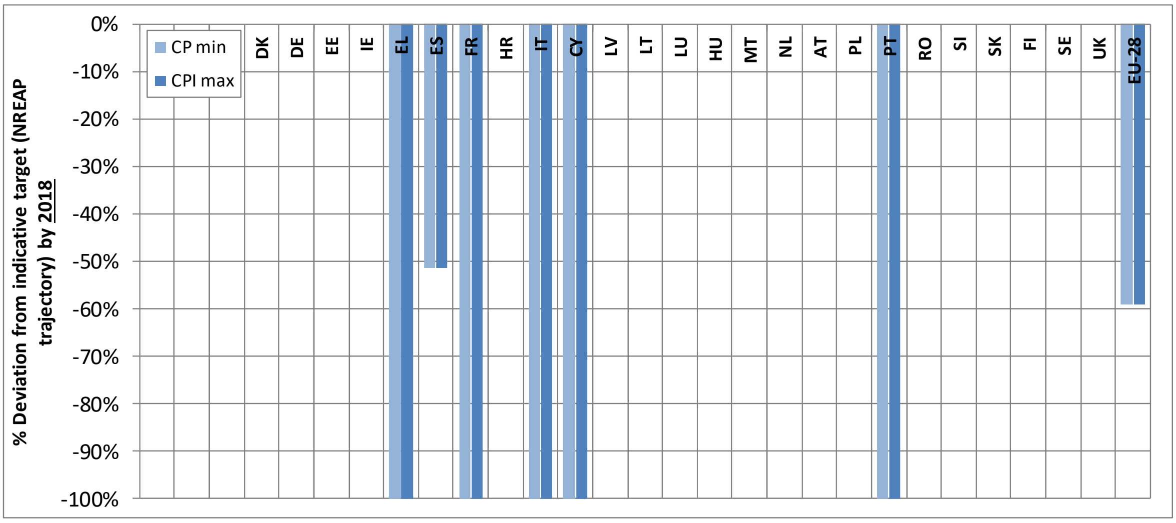

Figure 47. Deviation of expected deployment of tidal and wave electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

Ocean technologies like wave power or tidal stream may still be classified as novel technology options in a market state which has not reached full maturity yet. Thus, only six MS, namely Ireland, France, Spain, Italy, Portugal and the UK planned to use that option already in the short-term (2018), see Figure 47. From the current perspective it can however be expected that plans are not met, i.e. at EU-level a deficit of about 69 to 89% will arise by 2020 compared to the NREAP sectoral trajectories. This indicates that implemented and planned measures appear insufficient and further initiatives are of need – as demonstrated for Italy where planned policy initiatives may lead to a significantly higher deployment of marine technologies.

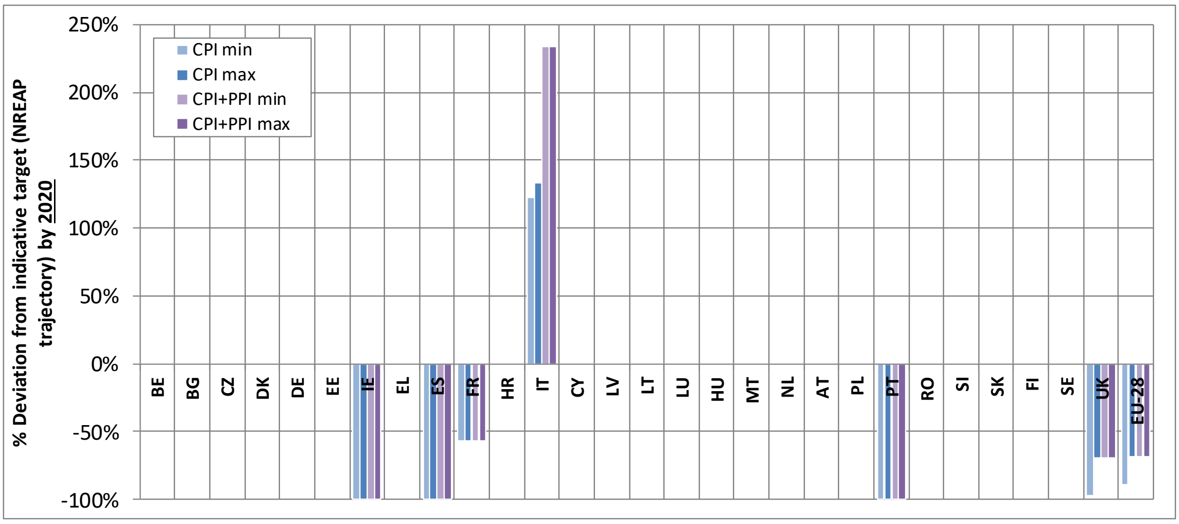

Figure 48. Deviation of expected deployment of tidal and wave electricity (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.3 Projected future progress in RES-H&C

In this section we provide more details on the projected future progress for the heating & cooling sector.

3.2.3.1 RES-H&C sector overview

(1) Overview of expected deployment vs. indicative NREAP sectoral trajectories for 2018 and by 2020

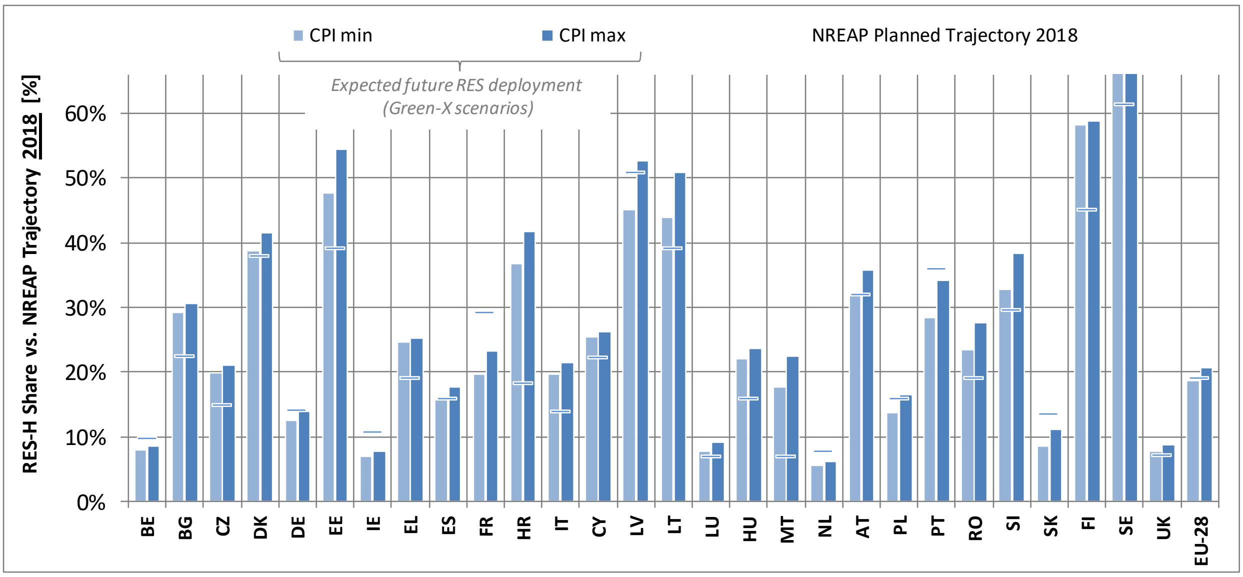

Figure 49. Expected RES-H share in 2018 vs. 2018 indicative NREAP sectoral trajectories (%)

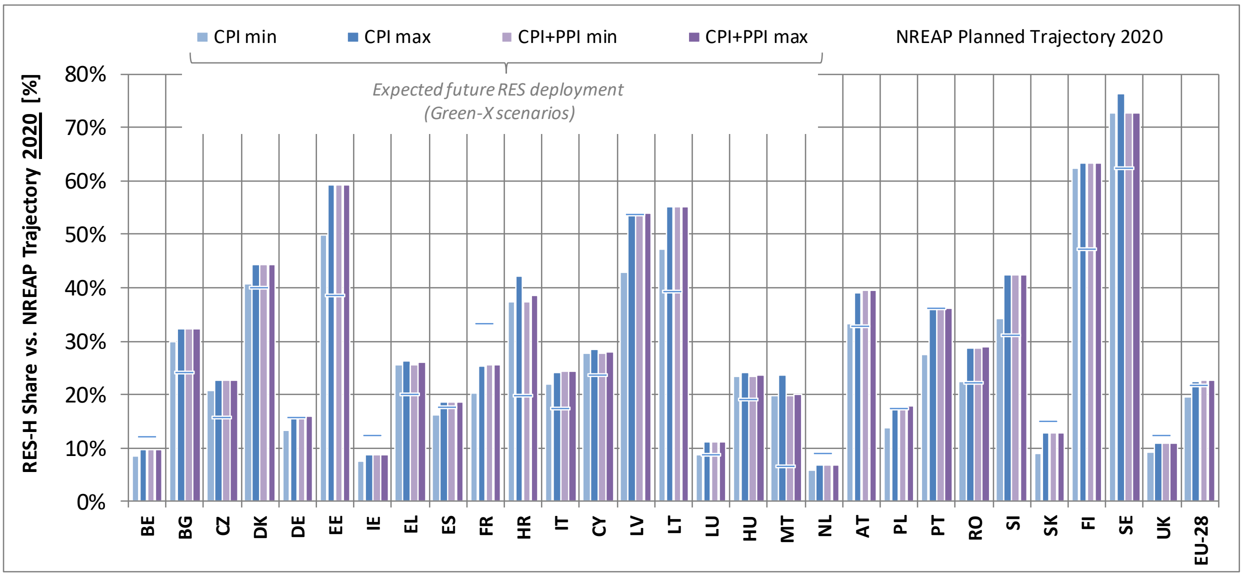

Figure 50. Expected RES-H share in 2020 vs. 2020 indicative NREAP sectoral trajectories (%)

Figure 49 shows a comparison of the expected (according to Green-X scenarios) and the planned (i.e. the indicative NREAP sectoral trajectories) short-term (2018) progress with respect to RES in the sector of heating and cooling. This depiction is done in relative terms, expressing the RES-H&C share in gross final heat demand. Overall this figure shows a mixed picture of past success in stipulating RES-H&C deployment. Several MS are on track or have even over-accomplished their indicative trajectories for 2018, while others are lagging behind their indicative trajectories by some percentage points, in particular Ireland, France, the Netherlands, Portugal and Slovakia.

Complementary to above, Figure 50 shows the corresponding depiction for 2020, allowing for a comparison of the expected (Green-X scenarios) and the planned (i.e. the indicative NREAP sectoral trajectories) progress by 2020. It can be observed that the majority of MS appears well on track to achieve their indicative 2020 trajectories for RES-H&C. Of highlight are the large surpluses applicable for Denmark, Finland and Sweden as well as Austria, Bulgaria, Italy, the Czech Republic and Hungary. On the contrary, six MS are expected to fail in delivering the planned deployment. Top of that list are Ireland and France. Framework conditions like (the mitigation of) country-specific financing risks or the future development of the demand for heating & cooling have a partly strong effect on the future deployment of RES-H&C, compare MS like Belgium, Estonia or France.

(2) Deviation from 2018 and 2020 NREAP sectoral trajectories

Complementary to above, Figure 51 and Figure 52 indicate the deviation of expected RES-H&C deployment from the planned one (i.e. the indicative sectoral trajectories as described in the MSs NREAPs) in descending order. Figure 51 shows the deviation under business-as-usual conditions, taking into account only currently implemented policy initiatives (CPI case). Figure 52 provides the complementary depiction for 2020, whereby also planned improvements are taken into consideration. In both figures uncertainty related to the development of future energy demand and other key framework conditions is reflected, illustrating lower (i.e. CPI min, CPI+PPI min) and upper levels (CPI max, CPI+PPI max) of expected RES-H&C shares in gross heat consumption.

By 2018 the majority of MS will be able to meet (and significantly over-succeed) their planned deployment trajectory for RES-H&C. The strongest progress ahead of the trajectory is expected for Malta where originally planned RES deployment can be classified as low to moderate.

A similar observation is valid for Croatia, being second in the ranking of over-succeeding, where an alignment of statistical accounting of bioenergy use to Eurostat practices led to a strong increase in corresponding deployment in recent years. Other MS that clearly over-fulfil their plans (i.e. with a deviation higher than 20%) are Bulgaria, the Czech Republic, Denmark, Estonia, Greece, Italy, Lithuania, Luxembourg, Hungary, Romania and Slovenia, Finland and Sweden – among this long list of MS partly however only according to the optimistic scenario (characterised by low demand growth etc.). Several other MS (e.g. Cyprus or the United Kingdom) have defined realistic short-term targets for RES-H&C, where deviations between expected and planned deployment are (significantly) smaller than 20%, but not below the given trajectory. Few MS are at risk of staying slightly below their trajectory or are significantly lagging behind. These include Belgium, Ireland, Germany (under pessimistic circumstances), France, Latvia, the Netherlands, Poland, Portugal and Slovakia.

This positive view cannot be fully extended to the 2020 timeframe, as some MS may not maintain their progress achieved in 2018. A small risk occurs that the EU as a whole would fail in meeting the combined indicative trajectory:

While for 2018 the comparison of expected with planned deployment indicates a range between a small gap of 1.2% and a surplus of 9.6%, a small deficit in size of 9.1% may occur as postulated by the pessimistic CPI scenario. Even more likely appears however that a surplus of about 5% compared to the planned deployment may occur by 2020. Besides dedicated policy initiatives to support RES-H&C framework conditions like energy demand developments appear decisive in this respect.

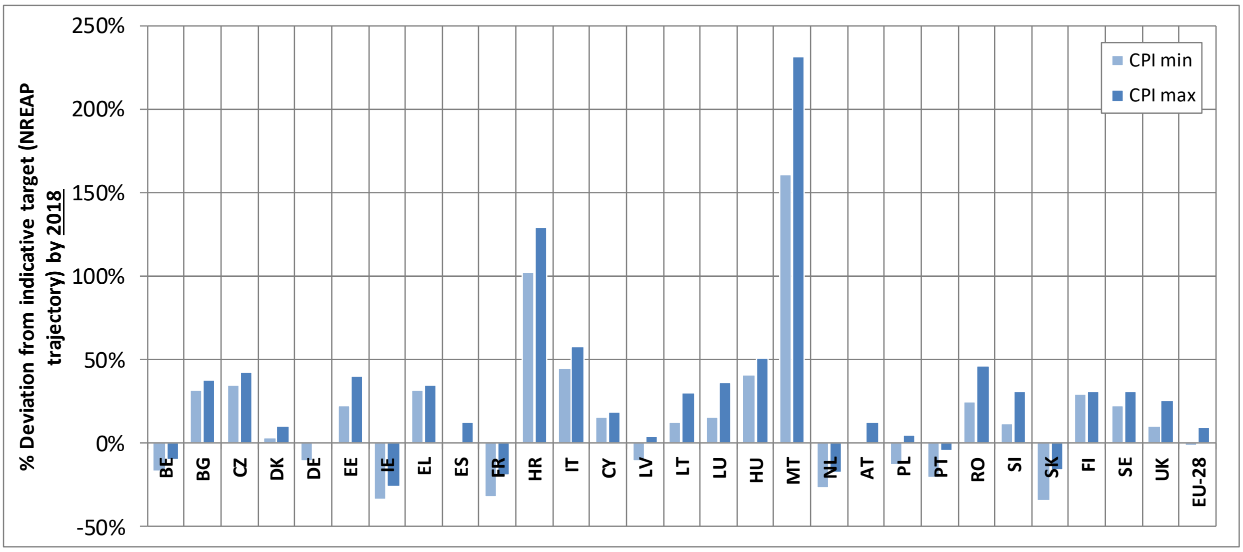

Figure 51. Deviation of expected RES-H shares (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

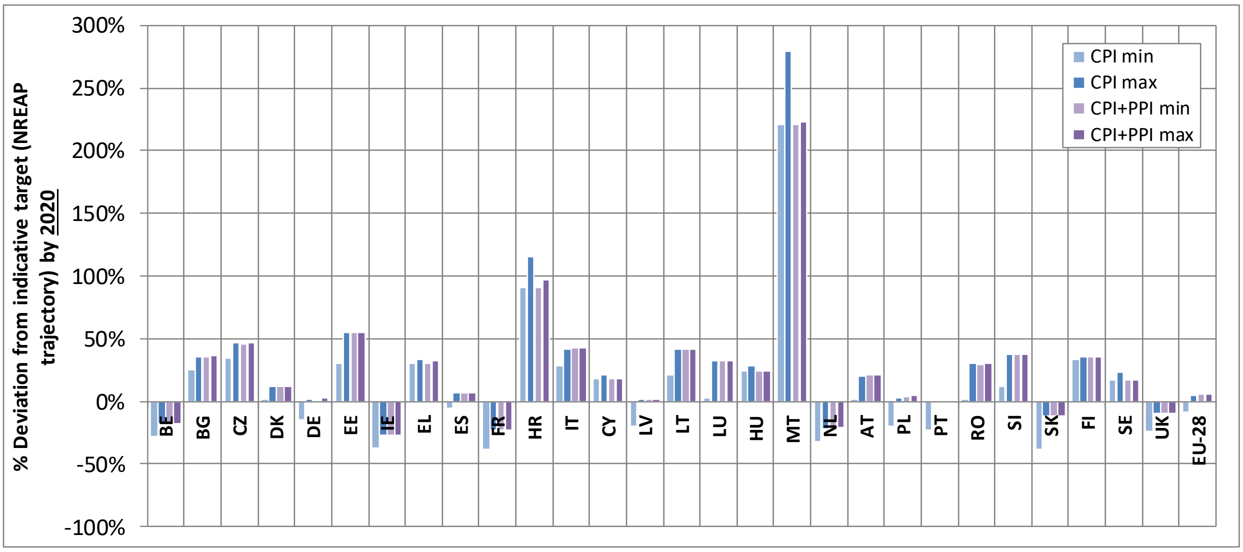

Figure 52. Deviation of expected RES-H shares (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.3.2 Biogas Heat

Figure 53 illustrates the expected deviation from the indicative NREAP trajectory for biogas heat production in 2018 by MS. This figure shows a very uneven picture for 2018. Ten MS, in descending order Sweden, Austria, Belgium, the United Kingdom, Italy, Croatia, Finland, Bulgaria, Denmark and Germany outperform their indicative trajectories, the ones named first by far (with a surplus larger than 150% when comparing expected with planned deployment) while others are right on track. A small group of MS including Estonia, Greece, Cyprus and Slovenia have not established any indicative trajectories on biogas heat use. A large group of MS is however in severe risk of missing their indicative NREAP sectoral trajectory. The latter regards in particular Czech Republic, Ireland, France, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Poland, Portugal and Romania since these are MS facing a significant gap in biogas heat use, above or around 50% compared to the planned one. At EU-level a range between a small gap of 1% and an overachievement of 0.1% is applicable by 2018.

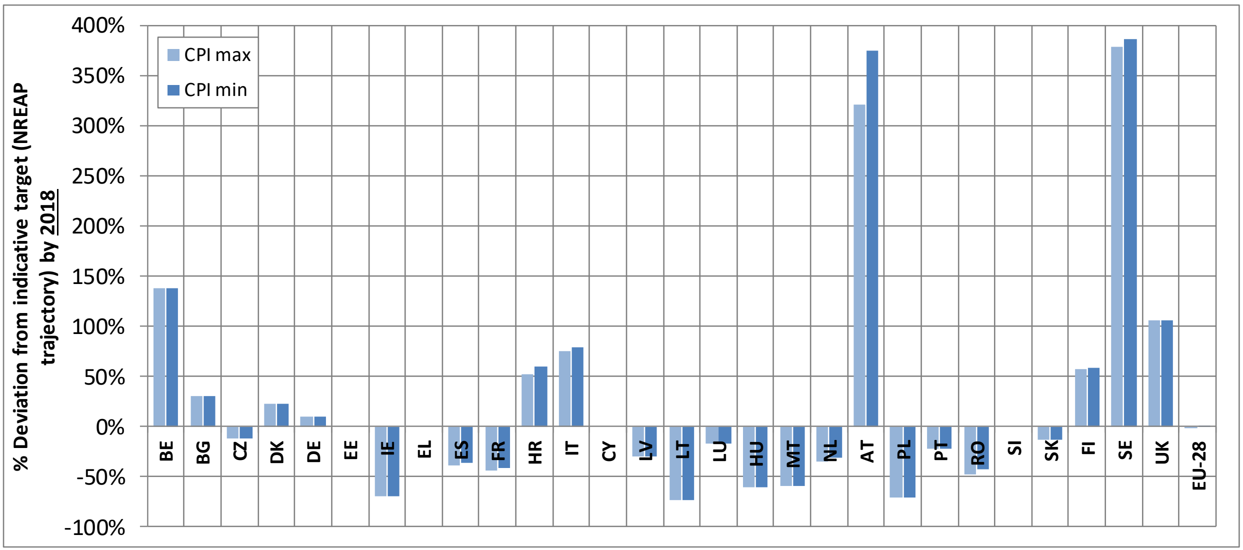

Figure 53. Deviation of expected deployment of biogas heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

Figure 54 provides the corresponding depiction for 2020 of the expected deviation from the indicative trajectories for biogas heat production at MS level. For 2020 it is expected that the imbalance remains or partly slightly further increases. The list of MS that are expected to over-succeed their indicative trajectories includes Austria, Sweden, Belgium, Bulgaria, Italy, Croatia, Denmark, the United Kingdom and Germany. Again, Austria and Sweden top the upward deviation reached by all other MS by far. A growing number of MS – i.e. 15 by 2020 – are likely to miss their indicative 2020 trajectory by far. This list comprises of Lithuania, Ireland, Poland, Hungary, France, Malta, Spain, the Netherlands, Romania and Slovakia – i.e. it can be expected that they all face a deficit by 2020.

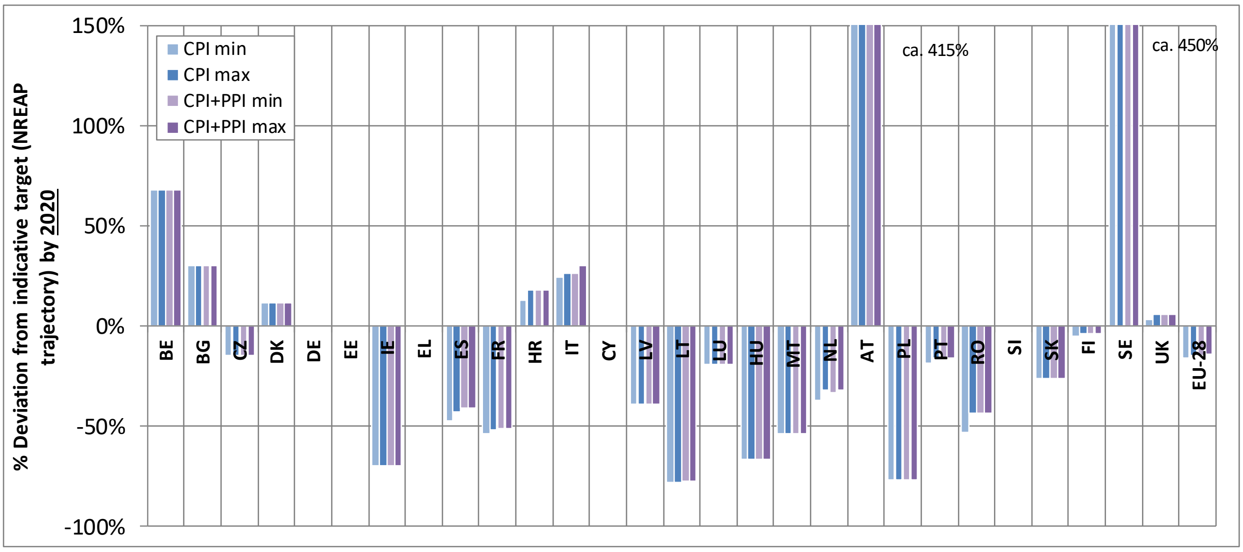

Figure 54. Deviation of expected deployment of biogas heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.3.3 Biomass heat

The expected deviation from the indicative trajectory of biomass heat production in 2018 is presented in Figure 55. The majority of MS outperform or fulfil their indicative trajectory, whereby Croatia, Hungary, the Netherlands, Italy and the United Kingdom overachieve its levels even by more than 50%. Some MS are expected to be at risk of not achieving their indicative short-term trajectory; these include Belgium, Spain, Portugal, Slovakia and Sweden, and in particular Greece, France, Portugal and Ireland.

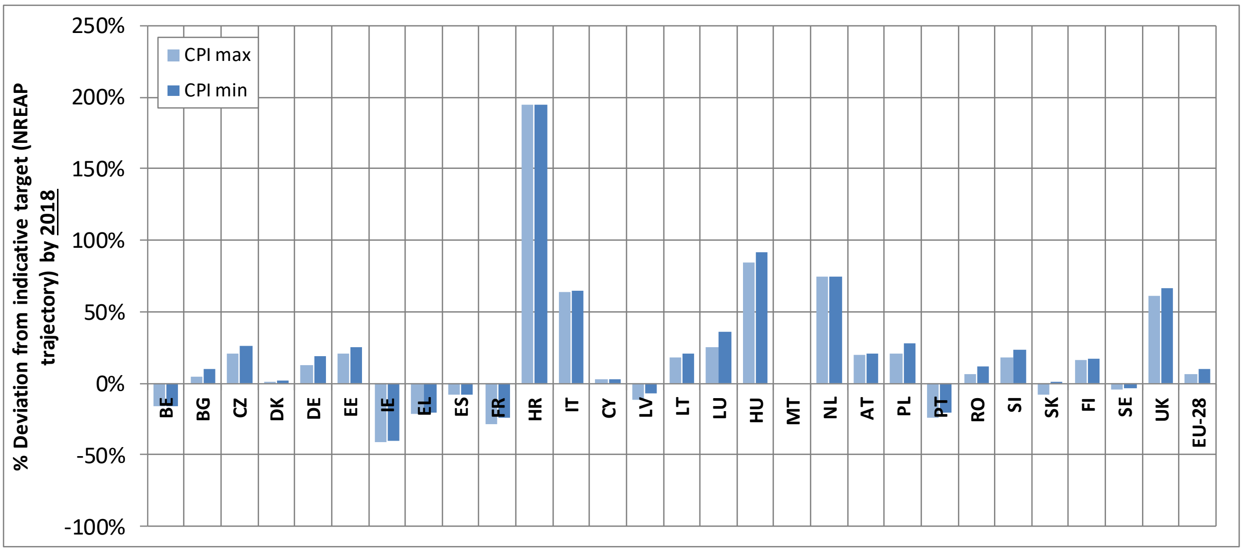

Figure 55. Deviation of expected deployment of biomass heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

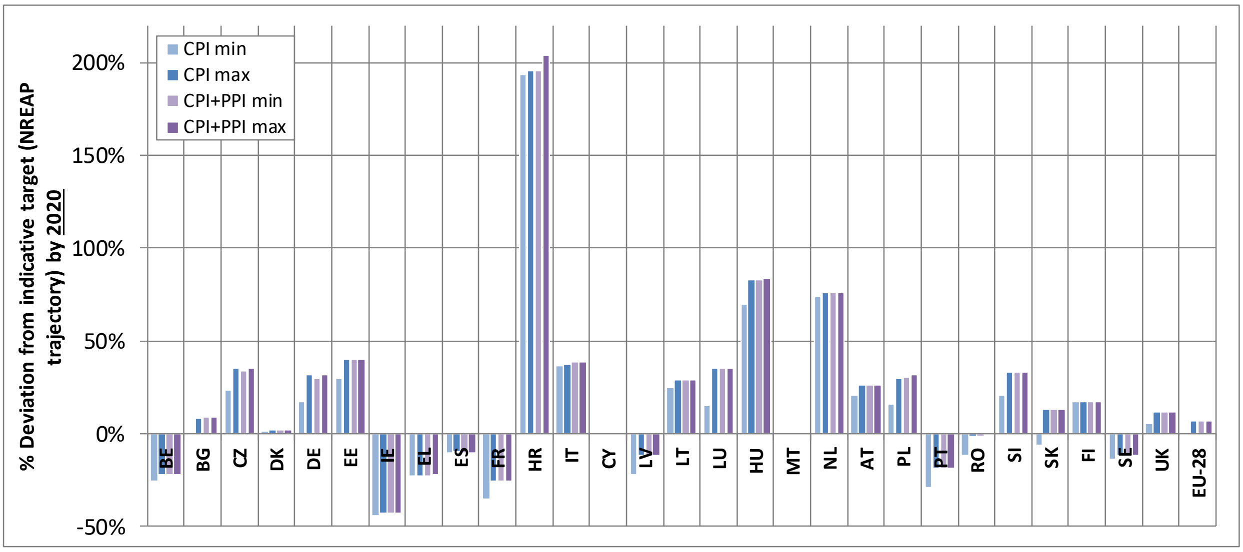

Figure 56. Deviation of expected deployment of biomass heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

Complementary to above, Figure 56 shows the expected deviation from the indicative trajectory of biomass heat production in 2020. Again, it can be observed that fewer MS can maintain their progress achieved by 2018 and several MS are at risk of not achieving their indicative 2020 trajectories for biomass heat production, also with new policy initiatives being implemented in forthcoming years. Noteworthy Romania bears the risk of losing its regional frontrunner position and of meeting its indicated trajectory. MS that bear significant risk (with a deviation larger than 20%) of missing their 2020 indicative trajectory include Belgium, Ireland, Greece, France and Cyprus. At EU-level the positive overall trend is however expected to remain: here a range between a gap of 0.3% and a surplus of 6.8% is expected for 2020.

3.2.3.4 Geothermal heat

Bulgaria, Spain and Slovenia are expected to strongly overshoot their indicative trajectories in geothermal heat production by 2018. This accounts however only for a small production compared to the strong markets in Italy and Hungary. The majority of MS fail to meet their indicative trajectory by 2018 and on EU-scale the sum of the 2018 trajectories is expected to be missed by 57% to 61%.

In 2020, Bulgaria is even expected to exceed its indicative trajectory by more than 250%. Besides Slovenia, Spain, Italy and Romania, all other MS that have expressed plans for geothermal heat are expected to fail in meeting their 2020 NREAP trajectories. In all considered scenarios the EU-wide sum of the NREAP trajectories is missed by about 56% to 64%.

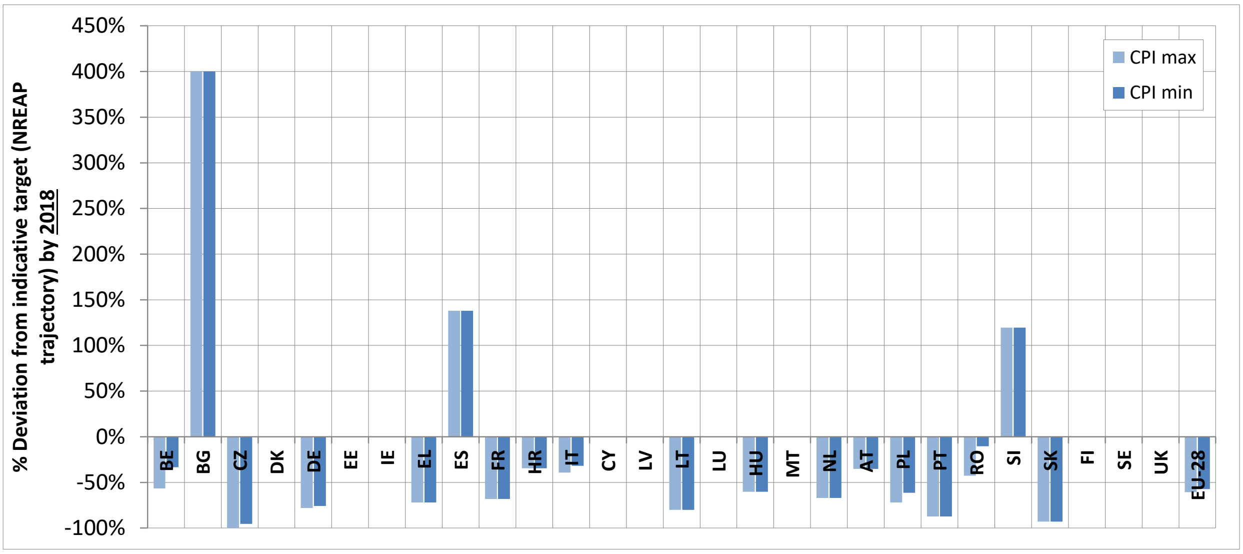

Figure 57. Deviation of expected deployment of geothermal heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

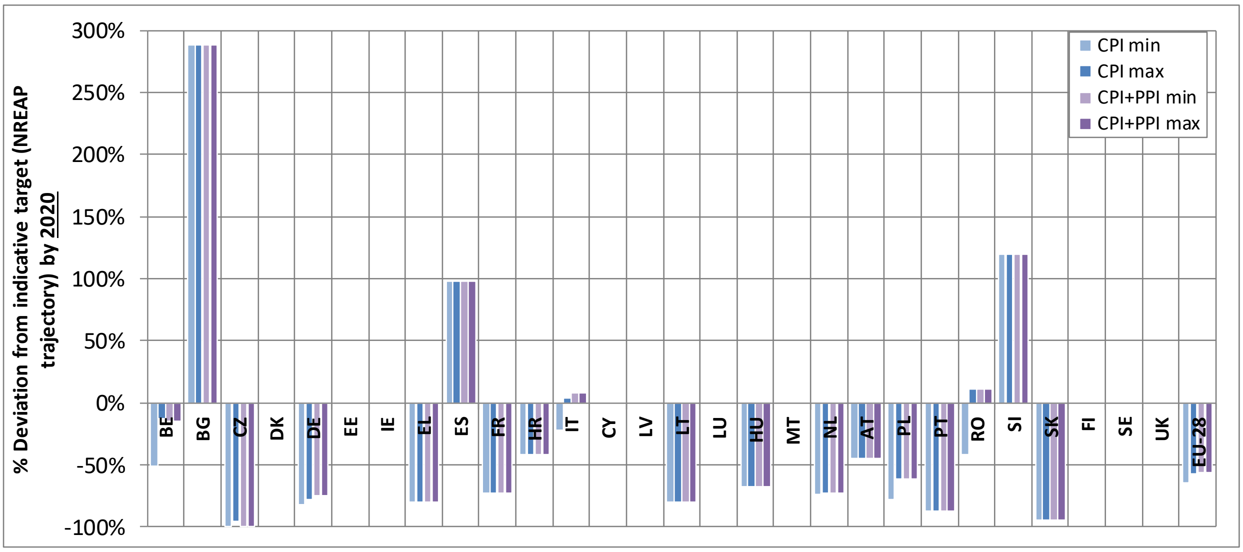

Figure 58. Deviation of expected deployment of geothermal heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.3.5 Heat pumps

Figure 59 shows the expected deviation from the indicative trajectories for heat pump H&C production in 2018. Also, in the case of heat pumps an unbalanced, mixed situation in 2018 can be observed. About an equal amount of MS will either over- or underachieve their indicative trajectories significantly, as MS are on track to meet the trajectory or are in risk of failing to meet them. The exceptionally good past performance with respect to heat pumps in MS like Sweden, Italy, France or recently Spain created also at EU-level a significant surplus in the range of 40% to 43% compared to the planned deployment.

Next a closer look on the 2020 expectations with respect to heat pump deployment is taken. Similar to above, Figure 60 allows for a comparison of expected and planned progress regarding heat pump H&C production in 2020. Overall a similar situation as for 2018 is observed, where Spain is again expected to overshoot its indicative trajectory by far. More important for EU trajectory achievement appears however the surplus arising in Italy, France, Sweden and recently also Germany – i.e. in these MS significant amounts of heat pumps have already been installed today and, consequently, a further increase in related deployment will have a strong effect on the achievement of corresponding EU sum of the trajectories. Thus, even though for a large number of MS a deficit is projected, the EU as a whole is still expected to surpass the combined indicative 2020 trajectory – and that by even larger amounts compared to 2018, as the MS with deficits had only assumed comparatively low absolute values for their indicative trajectories.

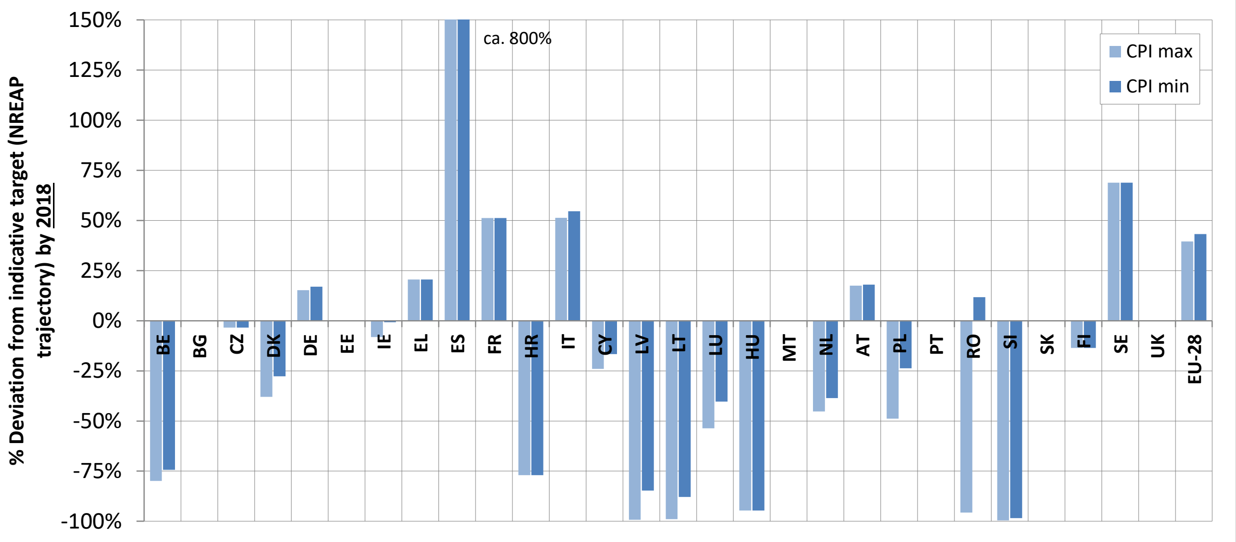

Figure 59. Deviation of expected deployment of heat pumps (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

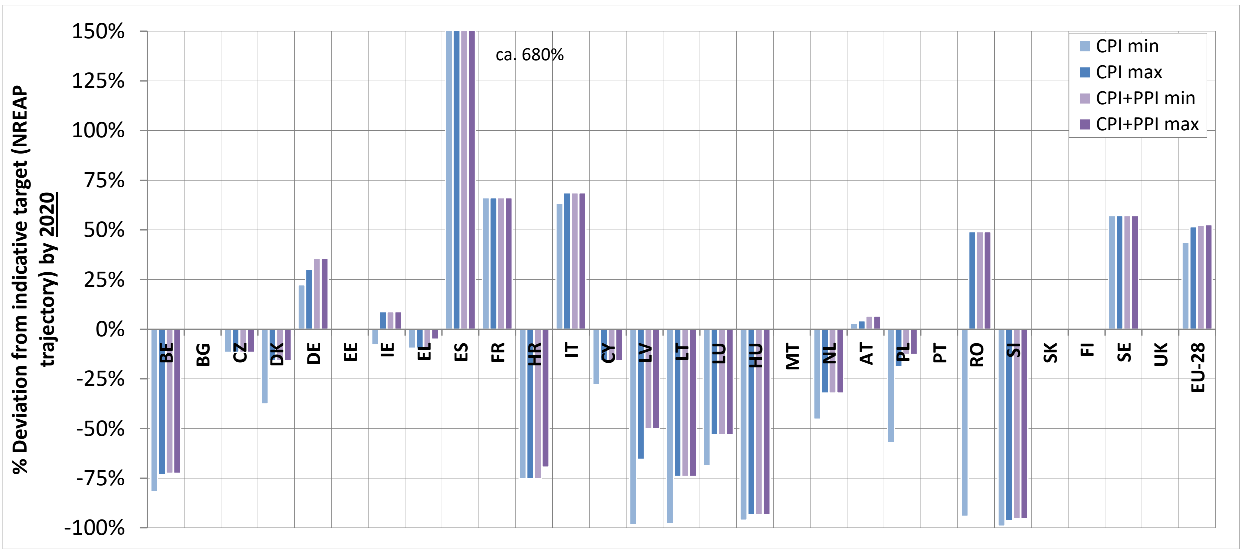

Figure 60. Deviation of expected deployment of heat pumps (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.3.6 Solar thermal heat

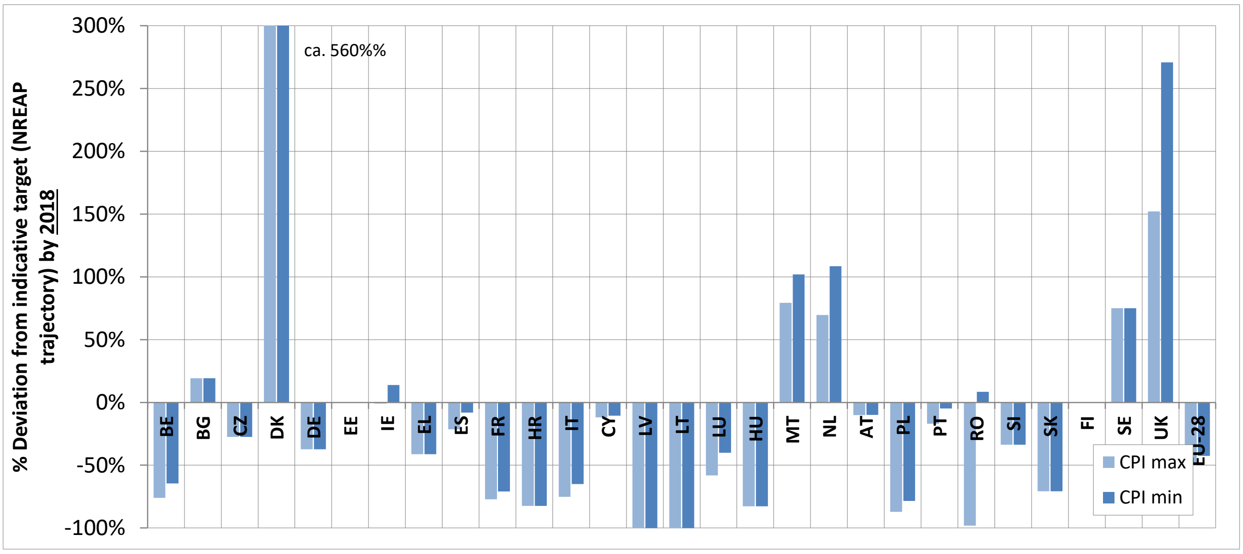

Figure 61. Deviation of expected deployment of solar thermal heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

Figure 61 shows the expected deviation from the indicative trajectory of solar thermal heat production in 2018 across EU MS. In this segment of the heating sector Denmark, the United Kingdom, Malta, the Netherlands and Sweden clearly surpass their indicative trajectory by more than 70%. In contrast to above, strong deficits in the deployment of solar thermal collectors can be observed in Belgium, France, Croatia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Poland, Romania and Slovakia – i.e. where expected 2018 deployment is more than 50% lower than the planned one.

Complementary to the above, the expected deviation from the indicative trajectory for solar thermal heat production in 2020 is illustrated in Figure 62. Again, the picture is very uneven and generally shows similar trends as discussed for 2018. A few MS including Denmark, the UK, Sweden, the Netherlands and Malta will exceed their indicative trajectory by far, whereas a larger group is not likely to align with their deployment plans. It is noteworthy that in Bulgaria and Malta their planned policy initiatives play a decisive role – i.e. it can be expected that these initiatives trigger significant amounts of investments in solar thermal collectors in the period up to 2020. The EU as a whole is expected to miss the roughly 6.5 Mtoe that have been indicated in MS' Progress Reports by about 43-58%.

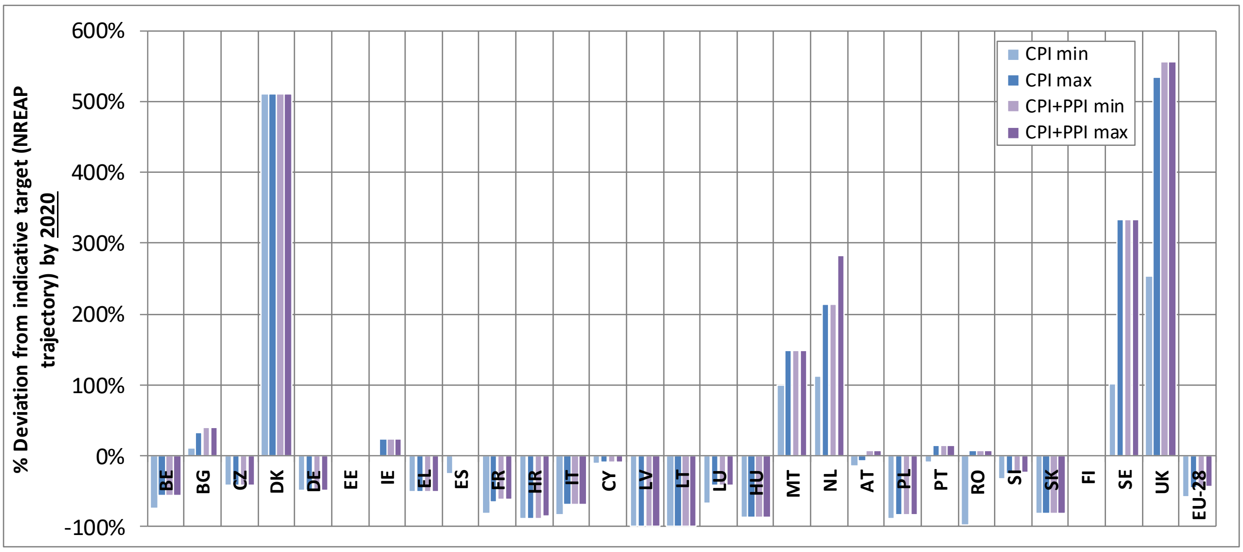

Figure 62. Deviation of expected deployment of solar thermal heat (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.4 Projected future progress in RES-T

In this section we provide more details on the projected future progress for the transport sector. Calculations of the RES-T share (in 2018 and 2020) take into account caps for first generation biofuels as well as multipliers as defined for second generation biofuels and for the contribution of electricity used in transport as originally specified in the RES Directive (e.g. Annex IX) and, later on, partly revised in the Directive to reduce indirect land use change for biofuels and bioliquids (ILUC Directive).

3.2.4.1 RES-T sector overview

(1) Overview of expected deployment vs. indicative NREAP sectoral trajectories for 2018 and by 2020

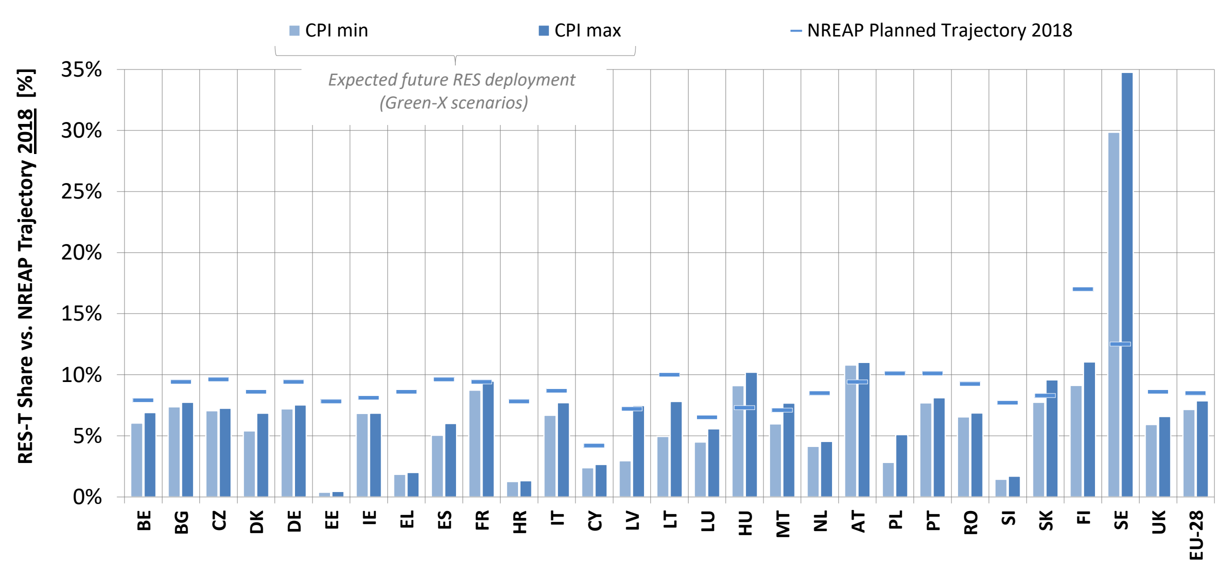

Figure 63. Expected RES-T share in 2018 vs. 2018 indicative NREAP sectoral trajectories (%)

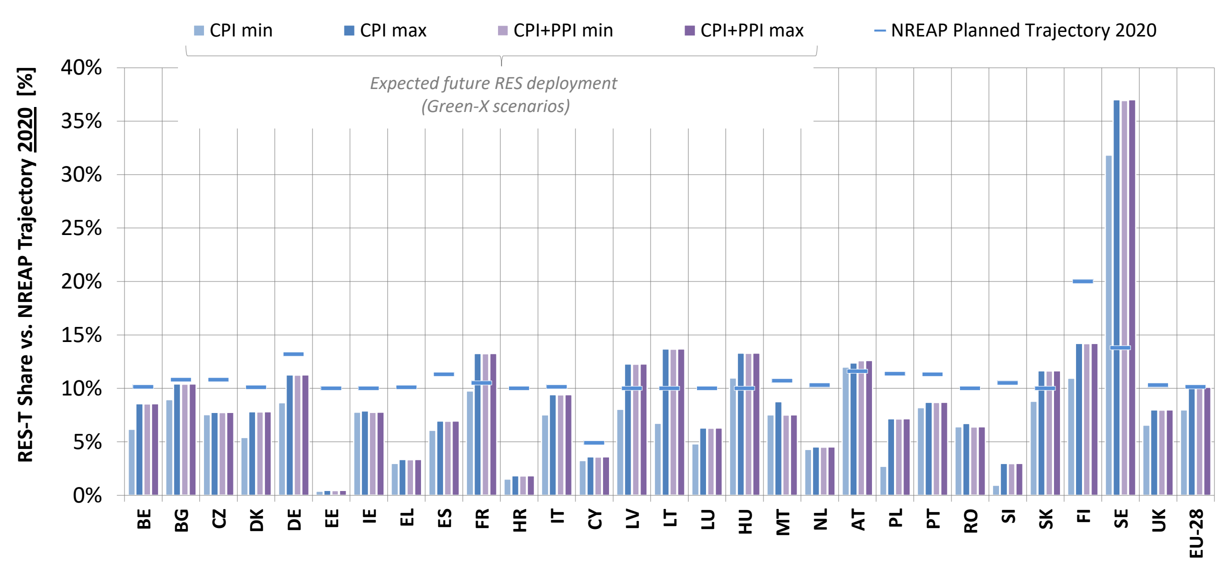

Figure 64. Expected RES-T share in 2020 vs. 2020 indicative NREAP sectoral trajectories (%)

The expected[36] and the planned (i.e. the indicative NREAP trajectories) short-term (2018) progress of RES in the transport sector is compared in Figure 63, showing RES-T deployment in relative terms. That is the RES-T share or, more precisely, the RES share in the final consumption of energy in transport. Please see Article 3 (4) in the RES Directive for the detailed description of the calculation of the RES-T share. The corresponding depiction for the RES-T share expected for 2020 is given in Figure 64.

(2) Deviation from 2018 and 2020 NREAP trajectories

Complementary to these graphs the following figures illustrate the deviation of expected RES-T deployment from the indicative trajectories (i.e. the planned progress as prescribed in the MS NREAPs). More precisely, for 2018 Figure 65 indicates the deviation under business-as-usual conditions, taking into account only currently implemented policy initiatives. The complementary depiction for 2020 is provided in Figure 66, whereby also planned improvements are taken into consideration. In both figures uncertainty related to the development of future energy demand is reflected, illustrating lower (i.e. CPI min, CPI+PPI min) and upper levels (CPI max, CPI+PPI max) of expected RES-T shares in gross electricity consumption.

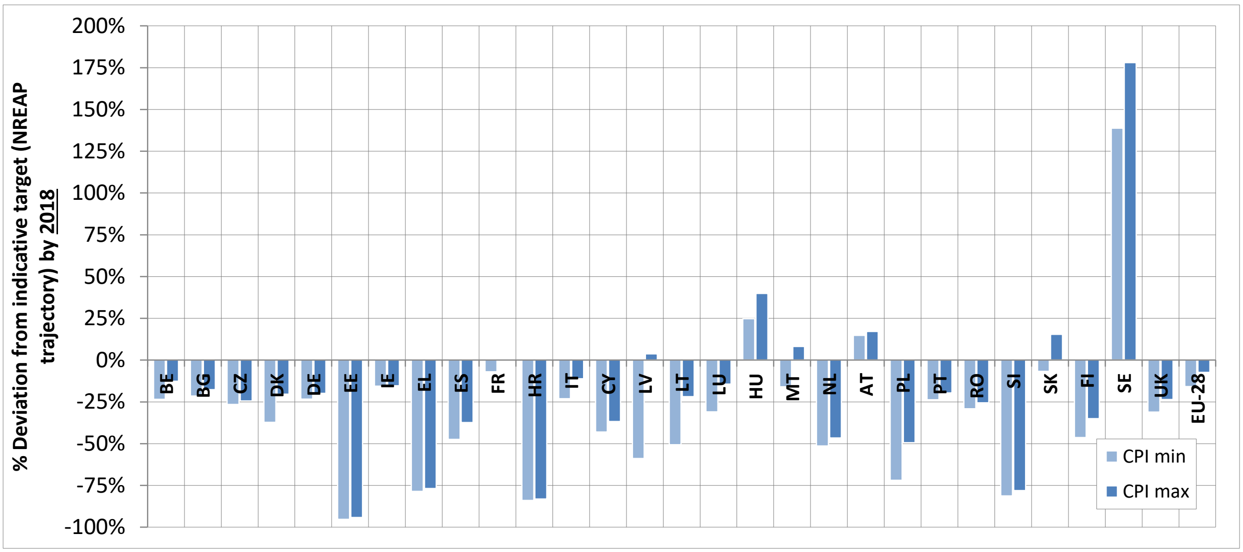

Figure 65. Deviation of expected RES-T shares (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

In the short-term, i.e. by 2018, 3 out of 28 MS will be able to meet (and over-succeed) their RES-T deployment trajectories under all assessed circumstances. On the top of that list is Sweden, followed by Hungary and Austria. At EU-level a deficit of 7% to 16% (compared to given NREAP trajectories) can be expected. For Slovakia, Malta and Latvia, the situation remains ambiguous – either a gap, or a surplus appear feasible by 2018. Seven MS (including for example France and Italy) show a comparatively small to moderate gap compared to their planned trajectory (below a 20% threshold) and the remaining 15 MS can be classified as not successful in planning their short-term progress with respect to RES in transport. Top of that list (of negative ranking) is Estonia, Croatia, Slovenia and

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[36] Modelled RES-T deployment represents a combination of modelled biofuel deployment, done by use of the Green-X model, and an extrapolation of historic trends concerning electricity use in transport that builds on the historic record.

Greece with deficits larger than 75%. By 2020 this situation is not expected to change by a large margin except for the fact that at EU-level within all scenarios with the exception of the CPI min case the EU RES-T target of 10% by 2020 will be met. In contrast to above, within the CPI min case a deficit of 21% in 2020 can be seen at EU-level by 2030.

The three MS that are expected to reach their indicative 2020 NREAP trajectory under all assessed circumstances stay the same: Sweden, Hungary and Austria. With France and Lithuania there are two more MS which will probably achieve their 2020 trajectories (under optimistic circumstances) complementary to Latvia and Slovakia. In contrast to these, Malta is expected to join the large group of now 21 MS that are expected to underachieve their indicated RES-T trajectory by 2020. Please be aware that at EU-level the situation looks more promising than at MS level since at EU-level the 10% RES-T target is taken into consideration instead of generally more ambitious plans reported by MS with the indicative sectoral trajectories.

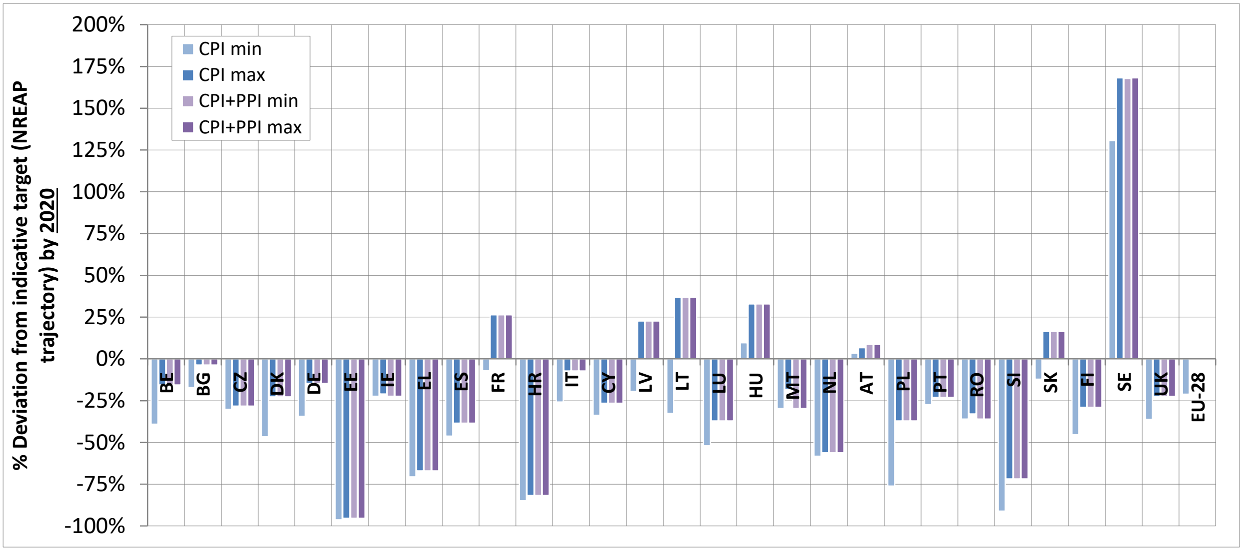

Figure 66. Deviation of expected RES-T shares (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.4.2 Biofuels sector overview

(1) Overview of expected deployment for 2018 and by 2020

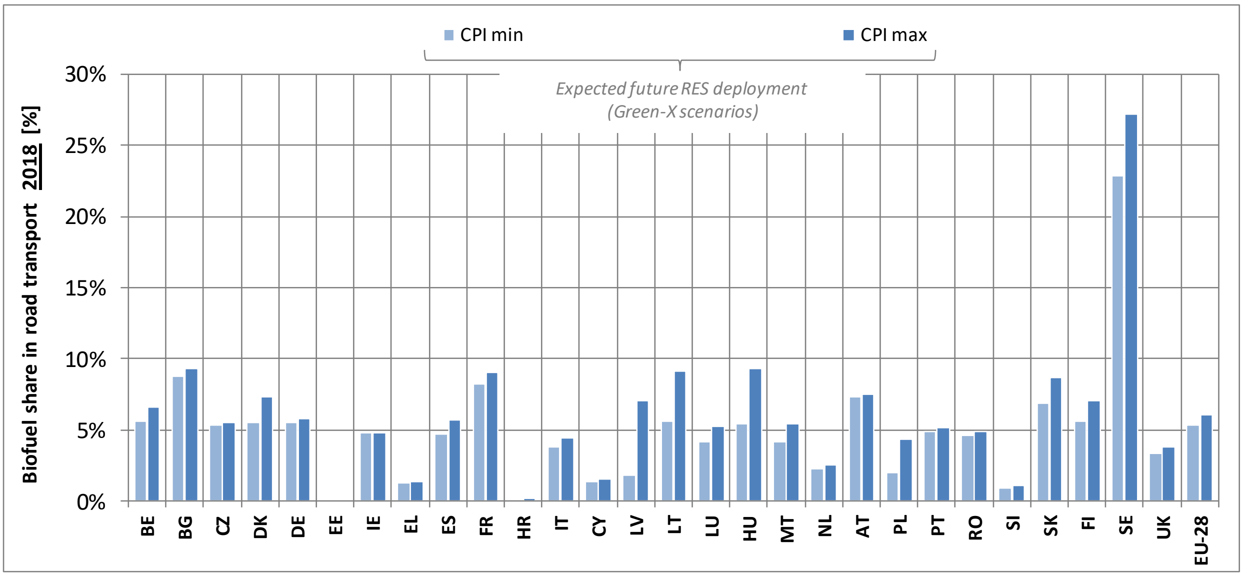

Figure 67. Expected Biofuel share in 2018 (%)

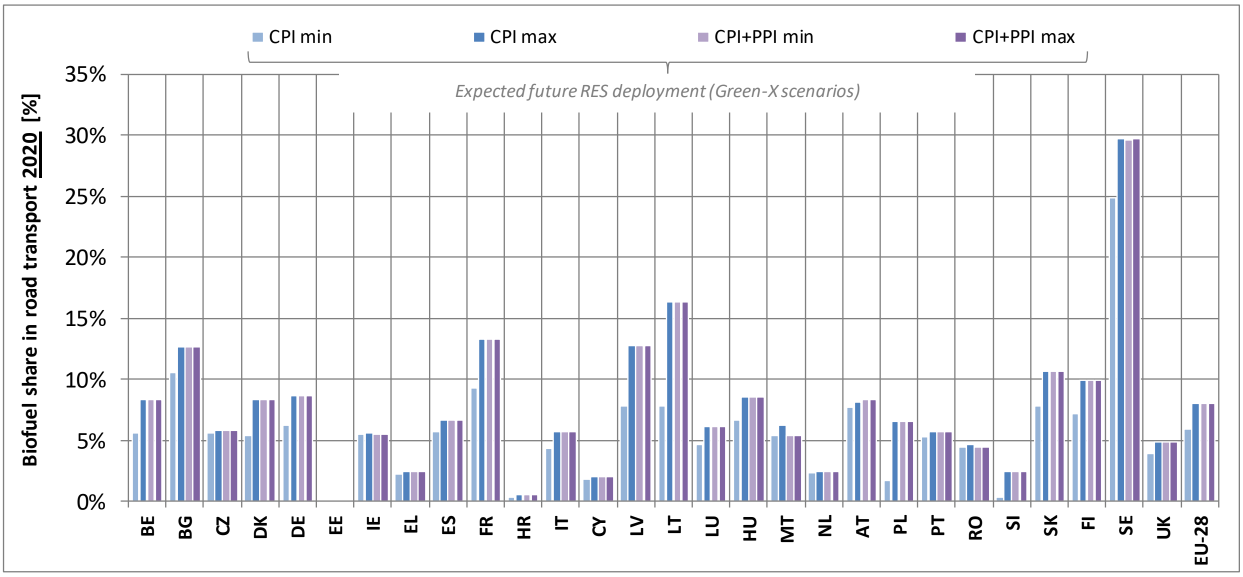

Figure 68. Expected Biofuel share in 2020 (%)

The expected (according to Green-X scenarios) short-term (2018) progress with respect to biofuels in the transport sector is shown in Figure 67. This depiction is done in relative terms, expressing the biofuel share in road transport related energy demand. Figure 68 offers the corresponding depiction for 2020. Note that a comparison to MS plans as set out in the NREAPs with respect to the biofuel share is not feasible since MS were not asked to specify demand trends in that detail in their NREAPs. In contrast to the above, a comparison of biofuel deployment in absolute terms, that is produced diesel or gasoline of biomass origin, is feasible with data provided in NREAPs.

Complementary to the above Figure 69 and Figure 70 indicate the deviation of expected biofuel deployment from the planned one (i.e. the indicative trajectories for biofuels as described in the MS NREAPs). More precisely, Figure 69 shows the deviation under business-as-usual conditions for 2018, taking into account only currently implemented policy initiatives (CPI case). Figure 70 shows the corresponding depiction for 2020, whereby also planned initiatives are taken into consideration (insights until spring 2018 have been taken into account). In this context, uncertainty related to the development of future energy demand and other key framework conditions is reflected, illustrating lower (i.e. CPI min, CPI+PPI min) and upper levels (CPI max, CPI+PPI max) of expected biofuel deployment that result from the corresponding sensitivity assessment.

(2) Deviation from 2018 and 2020 NREAP trajectories

By 2018 seven MS will be able to meet (and over-succeed) their planned deployment trajectory for biofuels in the transport sector, for some of those however only under specific circumstances. Sweden, Bulgaria, Austria, France, Malta, Denmark and Hungary are MS with a strong likeliness to succeed in their plans. In this context, Sweden and Bulgaria are however outperforming compared to the others – here a significant surplus can be expected. On the contrary, MS like Belgium, Luxembourg and Slovakia are expected to face a comparatively small to moderate deficit. A strong deficit is expected for the Czech Republic, Germany, Greece, Estonia, Ireland, Spain, Croatia, Italy, Cyprus, Latvia, Lithuania, the Netherlands, Portugal, Slovenia, Finland and the UK - MS which all miss their trajectories by more than 40%. At EU-level a deficit in the magnitude of 34% to 40% may consequently arise, see Figure 69.

In contrast to other sectors and technologies, it can however be expected that the situation will improve towards 2020. At EU-level the gap to the planned biofuel deployment is expected to range from 27% to 44% by 2020, see Figure 70. Accordingly, in the most optimistic scenario the deficit of 34% in 2018 will decrease to 27% by 2020.There are only few planned measures described in the Progress Reports that may positively impact the deployment of biofuels in the transport sector. According to the scenarios assessed only seven MS are expected to end up with a higher deployment of biofuels in 2020 than their planned one. The strongest surplus is expected to arise in Sweden, followed by Latvia, Bulgaria, France, Lithuania, Denmark and Slovakia. The largest deficits can be expected for Estonia, Croatia, Greece, the Netherlands, Cyprus and Slovenia – all facing projected deficits larger than or of about 60%.

As general remark on the indicated deviations of expected from planned biofuel deployment at EU and at MS level, one needs to consider that the recent changes in form of the ILUC Directive have also paused/disturbed recent achievements. The debate on sustainability concerns related to biofuel use that finally triggered the changes in the ILUC Directive has caused that several MS lowered their blending targets for some years (e.g. the UK).

Moreover, please note that the biofuel deployment trajectory is difficult to predict since it depends little on previous years’ progress and does not require long lead times for implementation (e.g. construction of installations). For example, an obligation with high penalty in 2019/2020 could result in many MS reaching their trajectory since unlike

RES in other energy sectors there is no need to facilitate a large build-up of generation infrastructure to make fulfilment of plans happen.

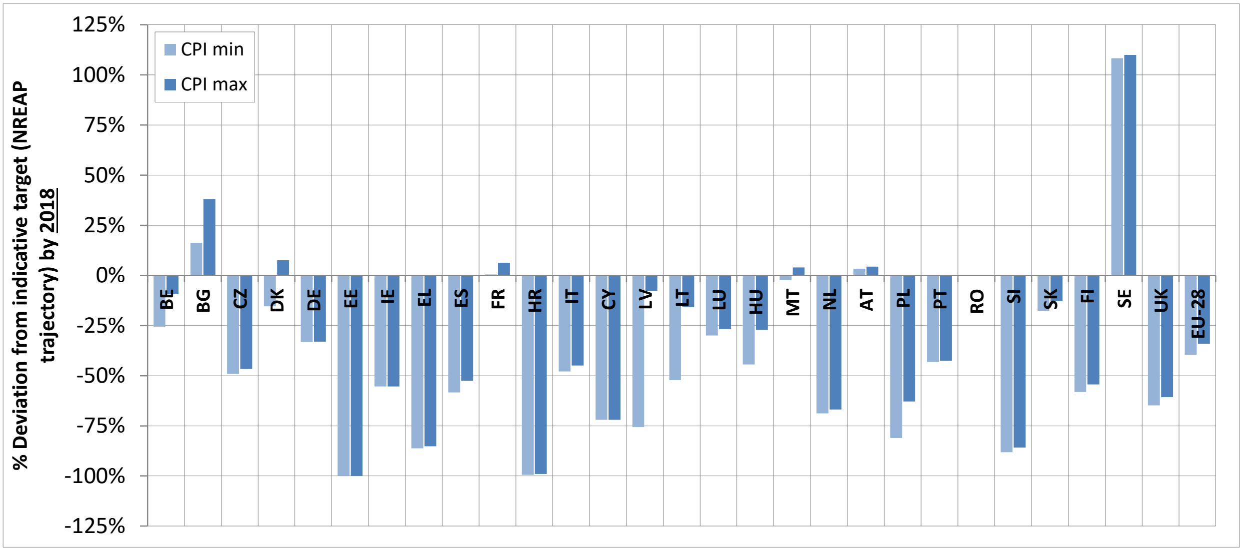

Figure 69. Deviation of expected biofuel deployment (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

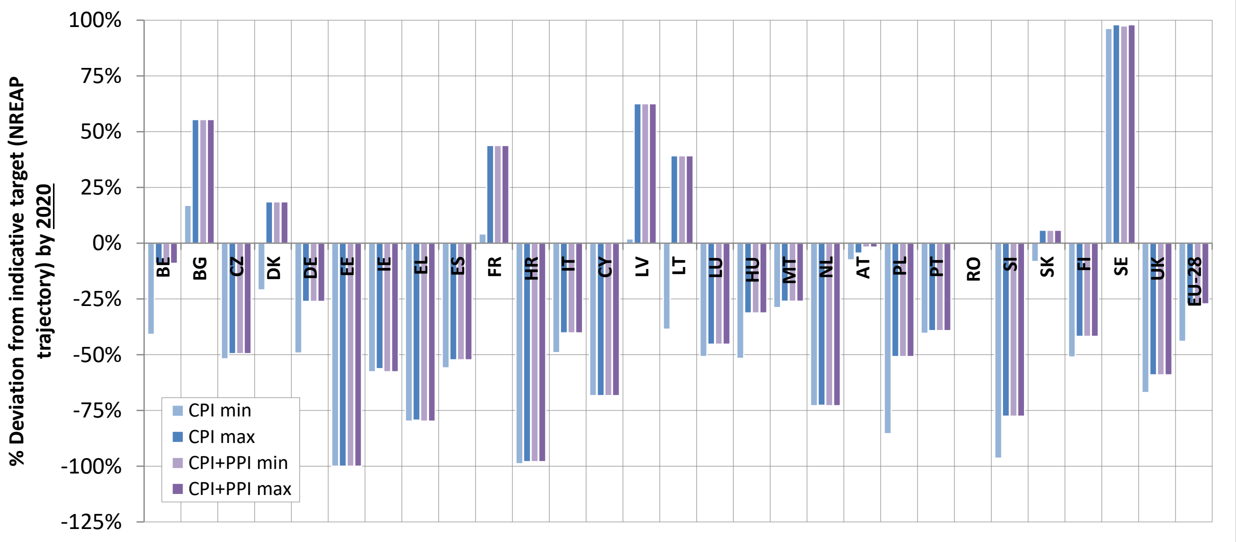

Figure 70. Deviation of expected biofuel deployment (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.4.3 Biofuel, first generation

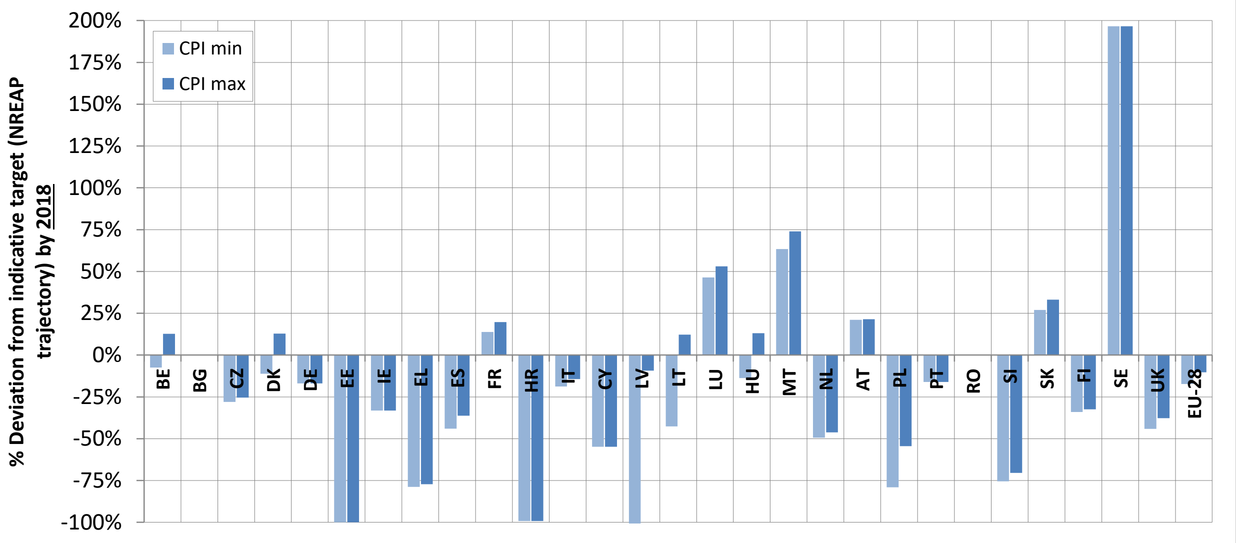

Figure 71. Deviation of expected deployment of first generation biofuels (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

As indicated in Figure 71, first generation biofuels are expected to progress as planned in the short-term (up to 2018) but until 2020 significant improvements are needed to achieve the planned deployment. Similar to biofuel deployment at the aggregated level, Sweden and by 2020 also Bulgaria act as frontrunner whereas a broad variety of MS lag behind their early expressed NREAP plans. There are quite some changes in meeting NREAP plans when comparing 2020 and 2018 expectations on first generation biofuel deployment. For example, Cyprus outperforms by 2020 whereas in 2018 a quite significant gap is applicable. Reason for this strange pattern is the underlying NREAP plan where in final years rapidly declining deployment of first generation biofuels was planned. This leads to, given the moderate increase of biofuel use in absolute terms, to a substantial over-fulfilment of given NREAP trajectories.

At EU-level the gap to the planned biofuel deployment will rise to about 10% to 17% by 2018 to 28% to 45% by 2020, compare Figure 72. Seven MS are expected to end up with a significantly higher deployment of first generation biofuels in 2020 than the planned one. The strongest surplus is expected to arise in Cyprus and Bulgaria, followed by Denmark, Sweden, Latvia, France and Slovakia. In contrast to above, the strongest deficits can be expected for Estonia, Croatia, Greece, Slovenia, the Netherlands, Ireland, the United Kingdom and Poland where improvements would be required for achieving deployment levels as set in their NREAP trajectories by 2020.

Please note that recent changes in the ILUC Directive – i.e. the exclusion of waste-based (conventional) biofuel feedstock from the classification “conventional biofuels” on which a cap has been introduced – will cause large deviations in the split over conventional/advanced biofuels since the definitions changed compared to before, and, moreover, since a cap on conventional biofuels has been established. That, in turn, creates difficulties in conducting predictions on future progress per biofuel sub-category.

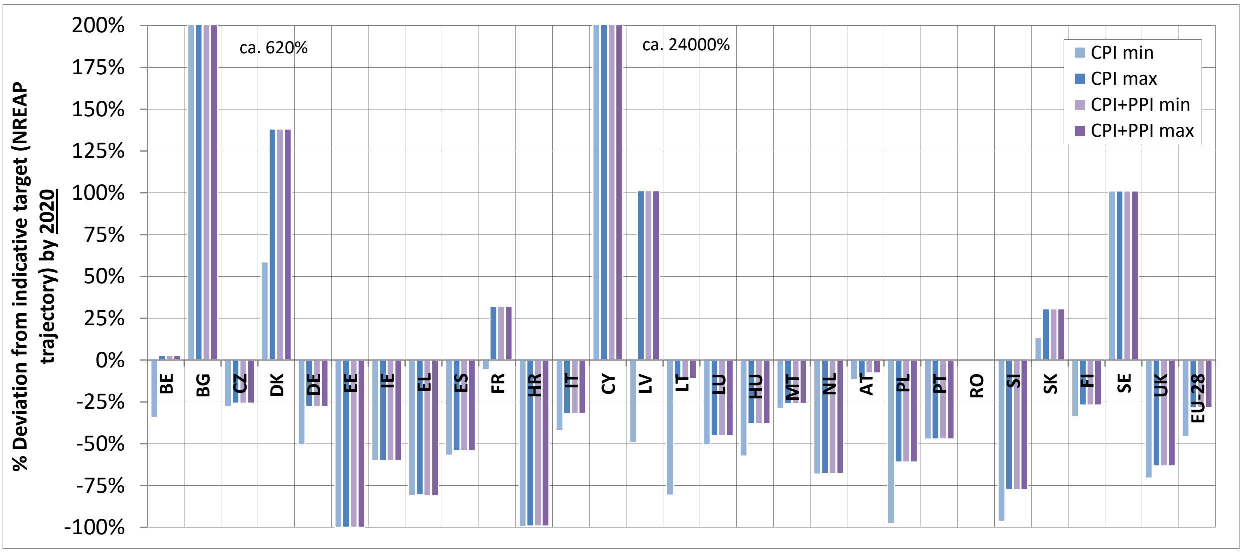

Figure 72. Deviation of expected deployment of first generation biofuels (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.4.4 Biofuel, second generation

It appears likely that plans related to second generation biofuels are not met in the short-term. Green-X scenarios indicate that for 2018 with the exception of Portugal all MS that have expressed tan aim will fail in delivering their projected deployment of second generation biofuels. Up to 2020 the situation is expected to improve and several MS are projected to progress well (e.g. Portugal, Ireland, France, Hungary, Germany, Latvia, Poland and Sweden). For others related initiatives need to be planned and implemented.

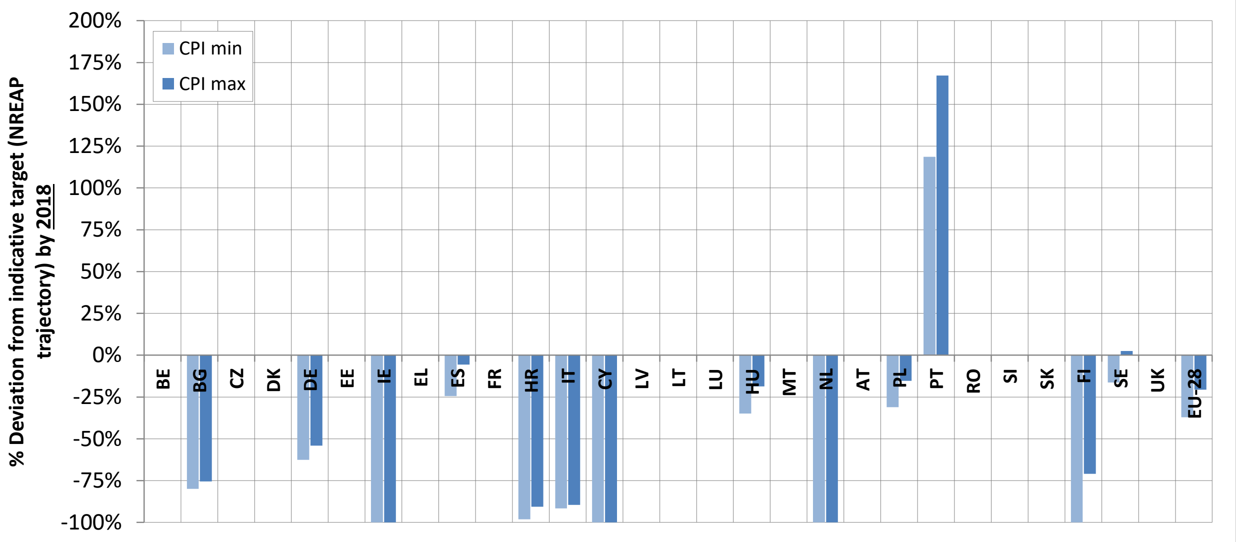

Figure 73. Deviation of expected deployment of second generation biofuels (Green-X scenarios) from indicative NREAP sectoral trajectories by 2018

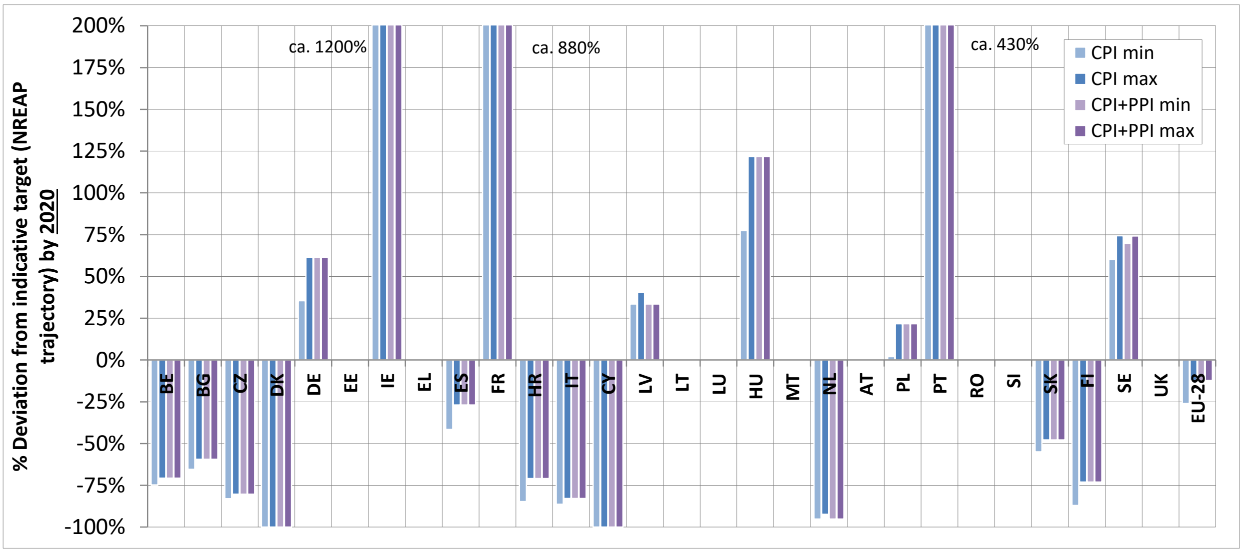

Figure 74. Deviation of expected deployment of second generation biofuels (Green-X scenarios) from indicative NREAP sectoral trajectories by 2020

3.2.4.5 Electricity in transport

As the mass deployment of electric vehicles in road transport just started, relatively large deviations from planned NREAP trajectories for electricity in the transport sector are obvious in the short term (until 2018), see Figure 75. Besides the renewable share of electricity used in the road transport sector, also the use of renewable electricity in the rail- and other transport sectors is counted towards the electricity in transport trajectory and targets. The EU overfulfils its trajectory by 11.5% in 2018. Six MS overreach their electricity in transport trajectories by more than 95% with Estonia, Poland and the Czech Republic taking the lead. Cyprus and Malta pose the negative examples with zero use of electricity reported for the transport sector and as such failing their trajectory by 100% in 2018.

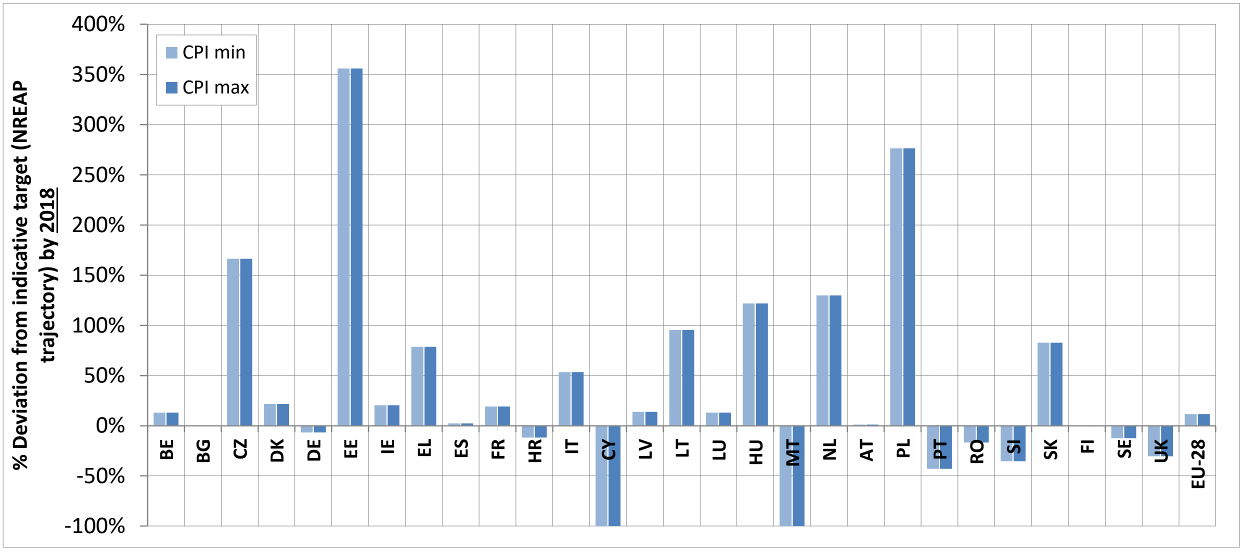

Figure 75. Deviation of expected deployment of electricity in transport (extrapolated historic data) from indicative NREAP sectoral trajectories by 2018

As the use of electricity in the different transport sectors (road, rail and others) was extrapolated from historic data, the deviation from indicative NREAP trajectories by 2020 is associated with great uncertainty, see Figure 76. Only seven MS are expected to fulfil their planned trajectories, with Poland, the Czech Republic and Bulgaria showing positive deviations of more than 100%. The EU combined trajectory will be missed by around 30% if no additional policies are adopted in the near future to promote the use of electricity in the different sectors of transportation.

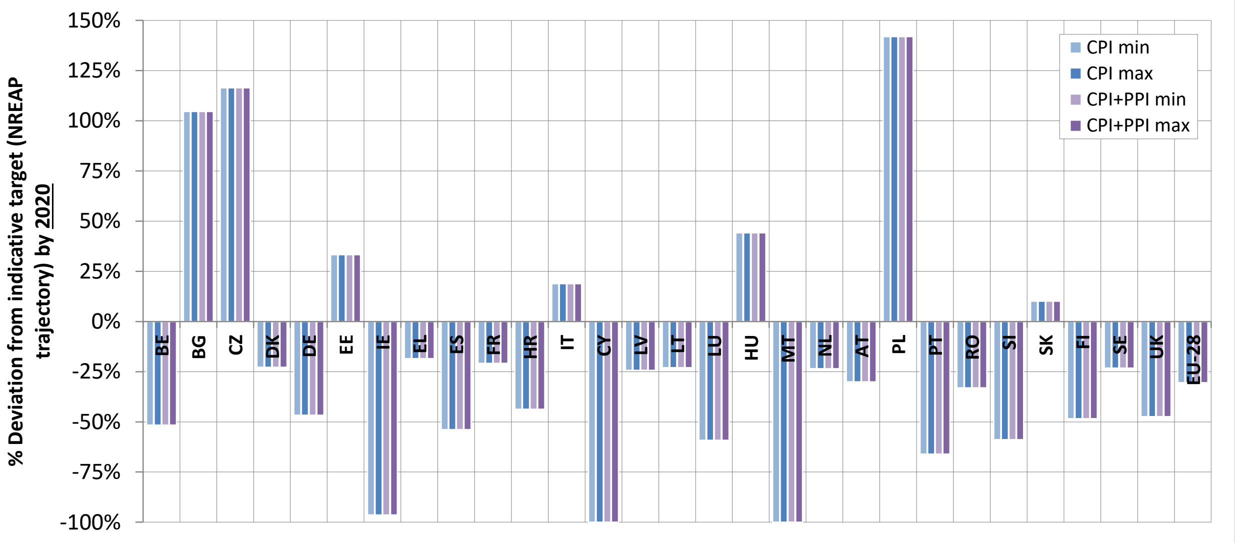

Figure 76. Deviation of expected deployment of electricity in transport (extrapolated historic data) from indicative NREAP sectoral trajectories by 2020

4 Member States' specific recommendations

4.1 General recommendations

Some general recommendations and conclusions can be drawn based on the assessment of the individual MS. These recommendations should be considered by all MS that are in risk of falling short of their target. For all MS that are on track to reach their target, these recommendations give an indication on how their RES framework may become more effective.

Short-term solutions and actions:

- **Assess current project pipeline:** Knowing the number and volume of projects that are currently being developed and that could be finalized within a short period of time is an important starting point for evaluating the current situation and the deployment outlook. This allows to refine steering i.a. through policies or the broader administrative and regulatory framework.
- **Assess options to promote short-term deployment:** Since 2020 is approaching fast, little time is left to close a gap in deployment. MS are thus encouraged to promote solutions that effectively increase RES deployment in each sector in the short term.
- **Address barriers to deployment:** Barriers related to administrative issues, building and planning, grid, support schemes and the availability of information (see Annex C), can impede the effective deployment of renewables either by extending duration and costs of project realisation or even preventing deployment altogether. MS should assess options to reduce the most important barriers and thereby allow for shorter project realisation time, e.g. through simplified procedures for certain projects/technology sizes.
- **Focus on technologies that have short implementation periods:** Technologies with short implementation periods can still be effectively commissioned and deployed before the end of 2020. This is, for example, the case for solar PV and solar thermal. Technologies with longer implementation periods, such as wind onshore and offshore, may not be connected to the grid before 2021 if auctioned today.
- **Limit "deployment gap" when shifting to auctioning:** The transition towards an auction-based scheme and its effective implementation may result in delays in the RES-E deployment. MS should aim to avoid long interim periods with no support for new installations and should aim to quickly open a call for tenders.
- **Monitor if realisation is happening in time:** MS should monitor if projects can be expected to be implemented in time.
- **Make use of cooperation mechanisms:** MS should consider the use of cooperation mechanisms and in particular statistical transfers (i.e. buying renewable energy from MS that exceed their targets).

Medium- to long-term solutions and actions:

- **Increase volume or implement additional support schemes:** MS should assess the option to increase the volume of the existing support schemes or to implement additional support schemes. Compared to the other actions proposed, this would have an evident financial impact on the MS budgets (or consumer surcharges).
- **Provide clear outlook for future deployment:** MS should aim to promote the planning and investment certainty needed for the investments that are required to reach medium- to long-term policy goals. MS can

foster certainty by providing a clear outlook on deployment goals and support instruments. With regard to RES-E, MS should ideally publish a multi-annual auction schedule, for those technologies supported through auctions. With regards to RES-T, MS should ideally publish blending obligations for several years in advance to provide stability and outlook to fuel suppliers.

- **Provide policy stability:** Policy stability and predictability is an important ingredient for market stability. Frequent – and even worse retroactive – changes deteriorate market stability and investor security. MS should aim for stability, i.e. by avoiding abrupt or frequent changes of policies, budgets and regulatory conditions.
- **Assess options to ensure high realisation rates in auctions:** The effectiveness of renewables auctions ultimately depends on the reliable deployment of new RES installations. MS should therefore be careful in setting the right pre-qualification requirements and defining and enforcing penalties for non-realisation.
- **Address administrative barriers to deployment:** MS should assess options to reduce the most important barriers and thereby allow for shorter project realisation time and costs, e.g. through streamlining administrative and appeals procedures.
- **Make use of cooperation mechanisms:** MS should consider the use of cooperation mechanisms. In the medium- to long-term implementing joint support schemes or joint projects is an additional option to statistical transfers.

Specifically for RES-T, it is more difficult to predict future progress based on current achievements. Since biofuels can be purchased on the European and (much larger) global market, increasing blending obligations can likely be met fast and without high investments in production capacity or infrastructure. So, even though MS might be behind their 2016 NREAP trajectory, they could still meet the 2020 10% RES-T target. Stability of policy, especially in the surrounding system of options to demonstrate compliance, and in types of biofuel allowed to reach the quota, is important to ensure long-term fulfilment of blending obligations. Furthermore, it is advised to MS to implement the ILUC Directive as soon as possible as not to hamper continuation of the system in the few years remaining until 2020.

4.2 Member States' specific recommendations

This section presents specific recommendations on the way forward for MS whose currently implemented and planned RES policies appear insufficient to trigger the required RES volumes to reach their binding national 2020 RES targets as defined in the RES Directive, according to the modelling performed for this report (note that this modelling only considers policy measures up to May 2018; some Member States have announced or introduced additional policy measures in late 2018 which are not considered in the modelling). According to the projections, the following countries risk to fall short of their 2020 RES targets: Belgium, Ireland, Greece, Spain[37], France, Cyprus, Luxembourg, Malta, Netherlands, Poland, Portugal and United Kingdom. However, the projected deficit for Ireland, Greece, Cyprus, Malta and Portugal and Spain is comparatively small. A larger deficit is projected for Belgium, France, Luxembourg, the Netherlands, Poland and the United Kingdom (see chapter 3 for details). For each of those

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[37] Note that in some of the scenarios modelled, Spain does reach its binding national 2020 RES target, namely in those where additional planned policy measures were included.

MS (except Luxembourg), country-specific recommendations are provided in the following sections. Their indicative sectoral NREAP trajectories are shown in order to reveal sector-specific progress and gaps.

Projections are based on the figures outlined in Chapter 3.2. For the projections, optimistic framework conditions are assumed and current and planned RES policies are taken into consideration. In the scenarios with more pessimistic key assumptions (incl. demand growth and financing conditions), the number of well performing MS is decreasing further. In the less optimistic scenarios, Austria, Germany, Latvia, Slovenia, Slovakia and Romania additionally do not comply with their binding national 2020 RES target.

Luxembourg had the lowest renewables share in 2016 (5.4%) and is the MS with the largest projected gap by 2020. However, Luxembourg is likely to achieve its 2020 RED target by making use of statistical transfers. In 2017 Luxembourg signed agreements with Lithuania and Estonia, which have already reached their 2020 targets. Those two MS will sign over surplus statistics to Luxembourg for an agreed fee. Therefore, no additional recommendations are made for Luxembourg in this chapter.

Belgium

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Belgium is projected to miss its binding overall 2020 RES target of 13% by 2.4 – 4.2 pp.

Table 11. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Belgium and own modelling

BE	2015-share	Compliance 2016		Projections for 2020 share	2020 NREAP target	2020 binding RES target
	(according Progress Report)	2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	7.76	8.14	7.50	8.5 - 9.7	11.90	
RES-E (%)	15.54	15.75	14.80	14.4 – 17.0	20.90	
RES-T (%)	3.81	5.89	6.30	6.2 – 8.6	10.14	10.00
Overall RES share (%)	7.49	8.65	8.60	8.8 - 10.6	13.00	13.00

The table above shows that in 2016, Belgium was largely on track of its 2016 NREAP trajectory. Only the renewables share in the transport sector was slightly behind the trajectory. Current and planned policies appear not sufficient to meet the 2020 RES targets (neither the binding overall RES target nor the binding RES-T target). In its Progress Report, Belgium gives no indication as to whether it considers making use of statistical transfer in case it falls short of its binding 2020 RED target.

The development of renewables in Belgium, especially in the RES-E sector, has been complicated by the lack of political unity and the distribution of competencies between the federal level and the regions. Target achievement at the federal level will depend on the target achievement at the regional level. Stronger alignment between the federal level and the regions could help Belgium to reach its targets.

In order to reduce the projected gap as much as possible, Belgium could:

- Avoid rapid changes in technology-focus, in terms of which technologies shall be supported (for RES-E and RES-T) as this hampers investors' confidence.
- Consider further increasing the quota for RES-T, while taking into account biofuels which are line with the provisions of the ILUC Directive. The recently announced (Royal Decree 4 May 2018) increase to 8.5% in 2020 is a step in the right direction, but not sufficient to achieve the 10% RES-T target.
- Taking into account the sustainability and greenhouse gas emissions saving criteria for biomass fuels, consider to revive the abandoned biomass co-firing project in Flanders. Otherwise, re-focus on accelerating deployment of other technologies.

- Reduce regulatory and administrative barriers to the development of wind onshore. Lengthy appeal processes are currently slowing down the deployment of projects and site restrictions, strongly reduce the availability of sites.
- Improve the administrative frameworks for RES-H&C technologies. In the building sector, for example, the methodology for the calculation of RES contribution in the energy performance of buildings is not realistic.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

Ireland

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Ireland is projected to miss its binding overall 2020 RES target of 16% by 1.6 – 2.2 pp.

Table 12. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Ireland and own modelling

IR	2015-share	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
	(according Progress Report)	2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	6.60	6.80	9.70	7.6 - 8.7	12.00	
RES-E (%)	25.30	27.20	32.20	40.2 - 40.7	42.50	
RES-T (%)	5.70	5.00	6.60	7.1 – 7.1	10.00	10.00
Overall RES share (%)	9.20	9.50	12.20	13.8 - 14.4	16.00	16.00

The table above shows that in 2016, the renewables shares in all sectors and thereby also the overall renewables share were significantly behind the interim trajectory of the NREAP. Current and planned policies appear not sufficient to meet the 2020 RES targets (neither the binding overall RES target nor the binding RES-T target). Deployment in the RES-E sector is projected to be low up to 2019, as no RES-E support scheme has been in place since the discontinuation of the former feed-in tariff scheme in 2015. The introduction of RES auctions under a new support scheme is planned for 2019. In its Progress Report, Ireland gives no indication as to whether it considers making use of statistical transfers in case it falls short of its binding 2020 RED target.

In order to reduce the projected gap as much as possible, Ireland could:

- Enforce the RES-T quota that is in place; the targeted shares move in the right direction (with a quota of 8% in 2017 and 10% in 2019).
- Assess options to improve current grid connection regime. Issues related to the former grid connection (“gate model”) are a bottleneck for projects coming online.
- Consider options to accelerate grid development, in order to connect existing installations as quickly as possible.
- Implement the announced tender scheme for RES-E and provide an auction schedule to increase planning certainty.
- Ensure effective implementation of the Renewable Heat Incentive and assess options to accelerate and enhance measures of the programme.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

Greece

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Greece is projected to miss its binding overall 2020 RES target of 18% by 0.1 – 2.4 pp.

Table 13. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Greece and own modelling

GR	2015-share (according Progress Report)	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
		2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	25.61	24.24	18.30	25.6 - 26.0	19.70	
RES-E (%)	22.09	23.80	29.70	23.6 - 28.4	39.80	
RES-T (%)	1.08	1.68	7.10	3.0 – 3.3	10.10	10.00
Overall RES share (%)	15.33	15.23	12.40	15.6 - 17.9	18.00	18.00

The table above shows that in 2016, the renewables shares in the sectors of electricity and transport were significantly behind the interim trajectory of the NREAP, while the overall renewables share was still above the trajectory. Current and planned policies appear not sufficient to meet the 2020 RES targets, especially the binding RES-T target. The binding overall 2020 RES target is still in reach, at least under the more optimistic scenarios.

The overall financial situation and economic instability of Greece has led to low renewables' deployment levels in recent years and pessimistic projections for all sectors except RES-H&C for 2020. Greece has put in place a new framework for RES support in 2016 and is progressing well with its implementation. It has also made significant progress in reducing the deficit of the RES special account, thus improving investors' certainty on the viability of RES support. There is however a delay before this new framework translates into additional RES capacity. International funding, such as that provided by the EBRD and EIB, may help in lowering financial risks and revitalising renewables' investments. In its Progress Report, Greece gives no indication as to whether it considers making use of statistical transfer in case it falls short of its 2020 RED target.

In order to reduce the projected gap as much as possible, Greece could:

- Introduce and implement the currently developed long-term energy roadmap (presented and put in consultation in November 18).
- Ensure that the regulations on fines and infringements related to non-compliance with the blending obligations (implemented 2016) are enforced and operational to safeguard obtaining required RES-T levels.
- Assess solutions to improve the implementation of the quota, for example by setting blending obligations longer in advance instead of annually.

- Increase long-term certainty regarding available budgets for RES support by ensuring that the Special Account for RES is sufficiently funded and is sustainable in the long-term.
- Review and streamline administrative procedures (e.g. environmental and planning processes, permitting) and improve grid access regime.
- Assess options to accelerate the uptake of solar PV, e.g. through expanding the incentives for net metering, self-consumption and energy cooperatives.
- Assess further options to reduce the financial risk and improve financing conditions, in addition to the support provided by EIB, EBRD. Consider using structural funds to stabilise the support scheme, for instance through innovative guarantee schemes.
- Develop and maintain a comprehensive support scheme for RES-H (biomass, solar thermal and geothermal installations).

Spain

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Spain is projected to just fulfil its binding overall 2020 RES target of 20% or miss it by 1.7 pp. The indicative NREAP target of 20.8% would be missed by 0.8 – 2.5 pp.

Table 14. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Spain and own modelling

ES	2015-share	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
	(according Progress Report)	2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	16.84	16.84	14.30	16.3 - 18.5	17.30	
RES-E (%)	36.95	36.61	34.30	39.1 - 39.5	39.00	
RES-T (%)	1.23	5.28	8.70	6.1 – 6.9	11.30	10.00
Overall RES share (%)	16.17	17.26	17.30	18.3 - 20.0	20.8	20.00

The table above shows that in 2016, the renewables share in heating and electricity was above the interim trajectory of the NREAP, while the transport sector was significantly below. The overall renewables share was only slightly below the NREAP trajectory. Spain is projected to fall short of its overall indicative 2020 NREAP target and possibly also its binding 2020 RED target, in particular due to failing to meet the 2020 RES-T target share. In its Progress Report, Spain gives no indication as to whether it considers making use of statistical transfers in case it falls short of its binding 2020 RED target.

Despite these somewhat negative scenario projections, Spain has a good chance of meeting its binding 2020 RES target and its planned RES-E and RES-H&C shares, especially considering the additional policy measures planned and launched in the second half of 2018. These measures are not yet considered in the projections.

In order to further increase the likeliness of overall RES target achievement and reduce RES-T gap, Spain could:

- Increase the RES-T quota; this could be a short-term option to help the biofuel market to recover. Spain has displayed high increases in its share of transport fuel from renewables since 2015[38] (with the implementation of the updated quotas) and could build on that development, especially considering that Spain claims to already have quite some 3rd generation biofuel production capacity to quickly increase the

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[38] Spain has finalized the implementation of the sustainability criteria for biofuels in 2016, allowing for an increase of 'recognized sustainable biofuels'.

RES-T level. Currently, the quota is too low to meet the 2020 RES-T target of 10% (the objectives for biofuel penetration were significantly reduced in 2013, which destabilised the market).

- Assess further options to provide longer-term stability for the biofuel market, especially for advanced biofuels (and in particular based on domestic feedstock availability).
- Define a concrete strategy to execute the e-mobility objectives proposed by the national government[39]. Supportive measures such as grants for electric vehicles under Plan MOVEA and tax reductions for electric and fuel-efficient vehicles enacted in several municipalities are currently in place.
- Facilitate grid feed-in for RES-E. Disruption on central feeding but also on small scale is hampering renewables.
- Address administrative barriers that are hampering developments. Currently, administrative processes are relatively complex and not harmonised between regions. Reducing administrative barriers could facilitate a short-term realisation of projects.
- Continue to take steps to stabilise the market for RES-E investments, e.g. through the formulation of longer-term strategies and support instruments.
- Provide a longer-term auction schedule and aim for continuous auctioning to avoid boom and bust cycles. Avoid changes in the auction design (e.g. evaluation of bids) to increase continuity and stability of the support instruments. Review the penalty regime of the auctions to ensure high project realisation.
- Consider introducing a support scheme or other measures to promote H&C applications for households. This could lead to a faster uptake of RES-H&C technologies (e.g. focusing on solar thermal which is fast to implement).
- Assess for which RES-H&C technologies, that are not yet competitive to conventional solutions, limited financial support could boost uptake.
- Create a registry to collect quantitative data on the installed RES-H&C capacities in Spain. This would allow to assess how much potential can be still developed and monitor the development process for RES-H&C.

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[39] The planned objectives for e-mobility come from the Integrated National Plan for Energy and Climate 2021- 2030 (Plan Nacional Integrado de Energía y Clima – PNIEC), currently under preparation, and the Draft Energy Transition Law that the government has submitted to the parliament.

France

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, France is projected to miss its binding overall 2020 RES target of 23% by 2.5 – 6.4 percentage points (pp).

Table 15. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report France and own modelling

FR	2015-share (according Progress Report)	Compliance 2016		Projections for 2020 share	2020- NREAP target	2020 binding RES target
		2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	19.80	21.10	25.50	20.2 - 25.6	33.00	
RES-E (%)	18.80	19.30	21.50	20.7 - 23.5	27.00	
RES-T (%)	8.30	8.60	8.40	9.7 – 13.3	10.50	10.00
Overall RES share (%)	15.10	16.00	18.00	16.6 - 20.5	23.00	23.00

The table above shows that in 2016, the renewables shares in the sectors of heating & cooling and electricity, as well as the overall renewables share were significantly behind the interim trajectory of the NREAP. With current and planned policies, France is likely to miss the binding 2020 RED target, even in the positive scenarios (however, these scenarios do not reflect policy measures announced after May 2018).

The main reason for the projected target gap is a lack of investment in renewables in the past years and - as a result - very little progress in renewables deployment, especially in 2014 and 2015. Policy developments since 2015 result in a more positive outlook for the coming years, but the expected deployment of significant RES volumes will likely be too late to cover the gap in 2020. Since 2015, France has formulated more ambitious policies and strategies. With the Law on the Energy Transition for Green Growth in 2015, France has reshaped the existing support schemes for RES-E and set out a target of 40% renewable energies in the total electricity production for 2030. Technology-specific RES targets for the periods 2018-2023 and 2024-2028 will be set out in the Multiannual Energy Plan, which was planned for the end of 2018 but postponed until mid-2019. Despite these positive developments, planned RES-E capacities are not expected to be sufficient to reach the 2020 RES-E shares planned in the NREAP. France has also addressed the former lack of strategy for H&C. However, scenario calculations reveal that the measures of the new strategy become effective mostly in or after 2020. On the positive side, France is likely to meet its binding 2020 RES-T target (except in the most pessimistic scenario) and possibly also the RES-T share planned in the NREAP. In its Progress Report, France states that no statistical transfers or joint projects are planned at present, although France does not rule out their use in future.

In order to reduce the projected gap as much as possible, France could:

- Define technology-specific RES-E targets in the next Multiannual Energy Plan. An increase in the short-term deployment of solar PV, which has shorter realisation periods than Wind Onshore or Offshore, may still enable reaching the 2020 target.
- Improve administrative and procedural issues to speed up the deployment of renewables. This is for example the case for Wind Offshore capacities that have been successfully auctioned but are not as yet deployed.
- Appeal procedures are often time-consuming and hinder a prompt realisation of projects. Consider streamlining appeal procedures to enhance overall planning security.
- Reconsider auction penalties for late or non-realisation of awarded project bids to support a timely realisation of projects.
- Consider to significantly increase the support volume for the Heat Fund, especially before 2020.
- Increase investment security by clearly defining a reliable timeframe, volumes and support levels for RES-H&C technologies.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

Cyprus

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Cyprus is projected to miss its binding overall 2020 RES target of 13% by 1.5 – 2.0 pp.

Table 16. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Cyprus and own modelling

CY	2015-share	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
	(according Progress Report)	2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	23.60	23.72	20.70	27.8	23.50	
RES-E (%)	8.48	8.64	9.40	9.7	16.00	
RES-T (%)	2.45	2.63	3.50	3.2 – 3.6	4.90	10.00
Overall RES share (%)	9.34	9.27	9.70	11.0 – 11.5	13.00	13.00

The table above shows that in 2016, renewables shares in the sectors of electricity and transport, as well as the overall renewables share were slightly below the NREAP interim trajectory. The deployment of renewables in 2020 is projected to be clearly below target. In its Progress Report, Cyprus indicates that it aims to meet its binding RED target using only domestic production and is not expected to use the cooperation mechanisms. However, it does not exclude the prospect of participating in joint projects with other Member States and/or third countries.

In order to close the projected gap, Cyprus could:

- Increase the biofuel quota, which is currently set at 2.4%, to be in line with the 10% RES-T target defined in the RED for 2020. Ensure proper enforcement of the quota.
- Consider implementing additional measures to incentivise the uptake of renewables in the transport sector.
- Streamline administrative requirements for RES-E deployment and shorten permitting procedures for solar PV. Inconsistencies in the handling of planning procedures and lengthy permitting procedures inhibit a speedy deployment of solar PV.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

Malta

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Malta is projected to miss its binding overall 2020 RES target of 10% by 1.5 – 1.9 pp.

Table 17. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Malta and own modelling[40]

MT	**2015-share**	**Compliance 2016**		**Projections for 2020 share**	**2020-NREAP target**	**2020 binding RES target**
(figures according to new NREAP from June 2017)	**(according Progress Report)**	**2016-share (according Progress Report)**	**2016 NREAP-trajectory**			
RES-H&C (%)	14.10	15.30	15.74	19.9 - 20	18.33	
RES-E (%)	4.30	5.60	5.83	6.6 - 7.2	11.58	
RES-T (%)	5.00	5.80	6.47	7.5 – 7.5	10.07	10.00
Overall RES share (%)	5.00	6.10	6.14	8.1 - 8.1	10.04	10.00

The table above shows that in 2016, renewables shares in all sectors, as well as the overall renewables share were slightly below the NREAP interim trajectory. The deployment of renewables until 2020 is projected to be too low to reach the binding 2020 RED target. Malta has changed its renewables policy significantly: since 2016, technologies other than solar PV are no longer supported. Previous plans to develop wind offshore were abandoned. In its Progress Report, Malta indicates that it plans to meet its binding 2020 RED target through indigenous production, although it is well aware that the high growth in demand and the steep RES trajectory post 2018 will make this goal rather challenging. The revised NREAP identifies statistical transfers as a contingency measure should there be a minor shortfall from the planned production.

In order to reduce the projected gap as much as possible, Malta could:

- Assess options to accelerate the deployment of solar PV in the short term. The uptake of solar PV has been slow among others due to land use issues and conflicts of interest regarding the use of roofs for solar.
- Assess options to comprehensively develop solar PV on the roofs of public buildings. However, the effective capacity of public buildings is relatively small and would only have a limited impact on the achievement of the target.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

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[40] Overall NREAP targets for 2020 (and RES-E, RES-H&C, RES-T) are based on the new NREAP submitted in June 2017.

Netherlands

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, the Netherlands is projected to miss its binding overall 2020 RES target of 14% by 4.7 – 6.9 pp and the indicative NREAP target of 14.5% by 5.2 – 7.4 pp.

Table 18. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Netherlands and own modelling

NL	2015-share	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
	(according Progress Report)	2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	5.50	5.50	6.20	5.9 - 6.9	8.70	
RES-E (%)	11.10	12.50	24.40	16.9 - 23.3	37.00	
RES-T (%)	5.30	4.60	6.80	4.3 – 4.5	10.30	10.00
Overall RES share (%)	5.80	6.00	9.70	7.1 - 9.3	14.50	14.00

The table above shows that in 2016, the renewables shares in the sectors of electricity and transport, as well as the overall renewables share were significantly below the interim trajectory of the NREAP (as presented in section 2.2.3, the Netherlands are also below the 2015/16 indicative trajectory defined in the RED, with an actual average RES share of 5.9% for 2015/2016 versus 7.6% defined in the RED).

The Netherlands have taken measures to speed up the deployment of renewables in the coming years, including an upgrade of the SDE+ support scheme and an increase of the RES-T obligation for fuel suppliers increasing to 16.4% in 2020, compared to the 10.3% in the 2010 NREAP. Note that this (recent) policy change in transport has not been included in the 2020 projection. Nevertheless, overall, the Netherlands are projected to have a substantial gap in 2020. In its Progress Report, the Netherlands indicates that it does not see a necessity to use cooperation mechanisms. However, if it turns out at a later date that the Netherlands may be at risk of shortfall, then cooperation mechanisms may be considered to make up for this deficit. The Progress Report however indicates that there is minimal political support for the use of cooperation mechanisms in the Netherlands.

In order to reduce the projected gap as much as possible, the Netherlands could[41]:

- Assess why the RES-T trajectory is not achieved, despite the obligated parties fulfilling their blending quota.
- Reduce administrative barriers for onshore wind and PV, similar to the successful offshore wind approach, to accelerate implementation and lower uncertainties.
- Implement options to increase deployment of RES-H&C technologies that can be implemented in the short term. The recently developed Dutch National Climate Agreement includes actions related to the RES-H&C sector, such as a broadening of the SDE subsidy programme, making industrial technologies for H&C eligible. Municipalities shall indicate before 2022 which neighbourhoods will be heated without natural gas and transition towards RES.
- Reinforce incentives/regulations for the installation of heat pumps instead of gas boilers. There is a subsidy of €1000-2500 for newly installed heat-pumps, yet the standard gas boilers still reach almost 100% of all sales in heating technologies in the Netherlands.
- Increase targeted funding for renewables that have short development duration and therefore near term impact on RES share, e.g. green bonds issuing in 2019.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

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[41] Please note that when drafting these recommendations the recently developed Dutch National Climate Agreement has not been taken into account specifically. Most of the activities as mentioned in the National Climate Agreement will be effective after 2020, but the Agreement does show a momentum in the Netherlands towards closing the gap with the set ambitions.

Poland

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Poland is projected to miss its binding overall 2020 RES target of 15% by 1.1 – 4.4 pp and the indicative NREAP target of 15.85% by 1.95 – 5.25 pp.

Table 19. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Poland and own modelling

PL	2015-share (according Progress Report)	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
		2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	14.54	14.72	14.39	13.7 - 17.9	17.05	
RES-E (%)	13.43	13.36	13.85	13.4 – 13.4	19.13	
RES-T (%)	5.62	3.92	8.62	2.1 – 7.1	11.36	10.00
Overall RES share (%)	11.74	11.29	12.66	10.6 - 13.9	15.85	15.00

The table above shows that in 2016, the renewables share in the transport sector, as well as the overall renewables share were significantly below the interim trajectory of the NREAP. Current renewable policies in Poland are characterised by a lack of ambition and appear insufficient to reach the binding 2020 RED targets (both the overall RES target and the RES-T target). In its Progress Report, Poland gives no indication as to whether it considers making use of statistical transfer in case it falls short of its binding 2020 RED target.

In order to reduce the projected gap as much as possible, Poland could:

- Develop an ambitious medium to long-term energy policy, maximising the use of domestic renewable resources, that provides certainty for the market and improves investor confidence on the short term.
- Ensure that measures are in place to achieve the 10% RES-T target, in line with the provisions of the ILUC Directive, e.g. by an increased use of waste-based biofuels.
- Define a clear medium- and long-term strategy for the RES-T sector (including electric vehicles) and implement support instruments accordingly.
- Support development of flexible grid and system solutions to facilitate intake of electricity form variable sources.
- Increase legal stability of RES legislation to increase investment security. A series of amendments of the RES acts since 2015 have had a deteriorating effect on investment security, of which only some have been revoked in 2018.

- Provide a reliable auction schedule for the coming years to increase certainty regarding the availability of support in the mid- to long-term and improve investment planning. Currently, the government defines the size of the auctions on an annual basis, which does not provide sufficient investment horizon for development of renewable energy projects.
- Abolish building restrictions (minimum distance requirements) that currently strongly limit the development of onshore wind. This could help to revive the historically well-developed wind sector and, combined with a focus on wind onshore in auctions, would allow for fast renewable capacity and generation increase, based on commissioning of developed and permitting wind projects.
- Provide targeted support to small scale PV can help boost microgeneration in the housing sector.
- Strengthen support schemes for RES-H&C solutions also for solar thermal and heat pumps.
- Develop a clear vision for the green heating and cooling sector with ambitious targets.
- Consider the use of statistical transfer to reach the binding 2020 targets.

Portugal

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, Portugal is projected to miss its binding overall 2020 RES target of 31% by 1.4 – 5.3% pp and the indicative NREAP target of 34.5% by 4.9 – 8.8 pp[42].

Table 20. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report Portugal and own modelling

PT	2015-share	Compliance 2016		Projections for 2020 share	2020-NREAP target	2020 binding RES target
	(according Progress Report)	2016-share (according Progress Report)	2016 NREAP-trajectory			
RES-H&C (%)	33.36	35.12	36.00	27.6 - 36.2	35.90	
RES-E (%)	52.63	54.07	55.80	52.3 - 53.5	59.60	
RES-T (%)	7.38	7.51	8.50	8.2 – 8.7	11.30	10.00
Overall RES share (%)	27.98	28.50	32.20	25.7 - 29.6	34.50	31.00

The table above shows that in 2016, the renewables share in all sectors was behind the interim trajectory of the NREAP. The RES deployment based on current policies is projected to be insufficient to reach the binding 2020 RES target and the binding RES-T target.

Due to the economic situation in Portugal from 2011 to 2015, receiving foreign aid from the European financial institutions (IMF, ECB and EC), very limited support was provided to the RES-E sector from 2011 to 2018. In October 2018, the State Secretary of Energy was transferred from the Ministry of Economy to the new Ministry of Environment and Energy Transition to provide a new boost for RES development in Portugal. The Government has stated that in 2019, new frameworks for solar PV auctions and onshore wind repowering will be created. However, these measures will mainly affect RES deployment beyond 2020. In its Progress Report, Portugal gives no indication as to whether it considers making use of statistical transfer in case it falls short of its binding 2020 RED target.

In order to reduce the projected gap as much as possible, Portugal could:

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[42] NREAP targets presented for Portugal in this report are based on the redefined NREAP that Portugal adopted in 2013. The redefined NREAP is in accordance with a scenario based on reduced electricity demand, taking into consideration the effects of energy efficiency measures of the so-called Additional Energy Efficiency Scenario stipulated in the National Energy Efficiency Action Plan 2016.

- Ensure that measures are in place to achieve the 10% RES-T target which are line with the provisions of the ILUC Directive. The 2019 budget proposal sets the obligation for 2019/2020 at 7%[43], which would still leave a gap towards the 2020 RES T 10% target.
- Accelerate the Action Plan for Electric Mobility as to contribute to renewables in the transport sector already before 2020.
- Quickly implement the new RES-E auctions. This could help to ensure that the 1000 MW of solar PV that were licenced in the last two years are constructed as soon as possible.
- Provide a schedule for RES-E auctions for the coming years to improve the investment horizon for developers.
- Assess options to improve the burdensome administrative procedures that are currently a roadblock for RES-E projects in the pipeline.
- Implement a one-stop-shop for RES-E projects. Currently, the administrative procedures to obtain the production license are complex, time-consuming and involve several entities that are not coordinated with each other. The so-called SERUP service portal of the DGEG allows to submit an application for grid connection. However, the rest of the licencing process is not possible through SERUP.
- Streamline the environmental permitting procedures for RES-E projects. Currently these are too long and involve deadlines very hard to accomplish, which increases the project costs for developers.
- Consider the use of statistical transfers to reach the binding 2020 RES target.

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[43] Artigo 307.ºDerrogação do Decreto -Lei n.º 117/2010, de 25 de outubro

United Kingdom

Based on scenario calculations taking into account current as well as planned policies, as described in the Progress Report, the United Kingdom is projected to miss its binding overall 2020 RES target of 15% by 0.9 – 3.5 pp.

Table 21. Sectoral RES shares in 2015 and 2016 and projections for 2020. Source: Progress Report UK and own modelling

UK	**2015-share**	**Compliance 2016**		**Projections for 2020 share**	**2020-NREAP target**	**2020 binding RES target**
	(according Progress Report)	**2016-share (according Progress Report)**	**2016 NREAP-trajectory**			
RES-H&C (%)	6.34	7.02	4.00	9.1 - 10.9	12.00	
RES-E (%)	22.34	24.62	19.00	27.1 - 34.1	31.00	
RES-T (%)	4.45	4.94	7.00	6.6 – 8.0	10.30	10.00
Overall RES share (%)	8.52	9.28	8.00	11.5 - 14.1	15.00	15.00

The table above shows that in 2016, the renewables share in the transport sector was significantly behind the interim trajectory of the NREAP, while the other sectors and the overall RES share were above the 2016 NREAP trajectory. Regarding the renewables share in heating & cooling, limited progress is projected in this sector for the coming years. The UK is at risk of falling short of the overall binding RED target in 2020. The outlook for RES-T is more positive, as the RES-T quotas will increase in the coming years (the scenario projections above do not yet include the recently change RTFO). In its Progress Report, the UK gives no indication as to whether it considers making use of statistical transfers in case it falls short of its binding 2020 RED target. The BREXIT-decision is fuelling uncertainty regarding the implementation of EU climate and energy law post-BREXIT. It is still unknown whether the UK will stay committed to the EU 2020 targets after BREXIT.

In order to close the projected gap until 2020, the UK could:

- Increase the ambition level of the Renewable Heat Incentive (RHI).
- Assess options to accelerate RES-E projects that are currently in the pipeline, e.g. regarding offshore wind and tidal and wave energy - the latter is assessed to contribute up to 20% to consumed electricity. Overall, many projects are in the pipeline at the moment, but it is unsure if they will be realised in time to meet the 2020 target.
- Consider the use of statistical transfers to reach the 2020 RES target.

5 Summary and conclusions

At an EU-level, the shares of renewable energy sources (RES) in total, renewable electricity (RES-E), heating and cooling (RES-H&C), and to a lesser extent also transport (RES-T) have been continuously increasing over the past years. In 2016, the EU reached a share of 17% of RES in gross final energy consumption, the target for 2020 being 20%, as defined in the RES Directive 2009/28/EC (RED). The EU-28 has been comfortably above the indicative trajectory set in the RED, and the EU as a whole has also been above the slightly more ambitious trajectory defined by Member States (MS) themselves in their National Renewable Energy Action Plans (NREAPs)[44]. With regard to individual sectors, the RES-E and the RES-H&C sectors are well on track, while the RES-T sector stays just below the NREAP planned share (7.13% actual versus 7.14% planned).

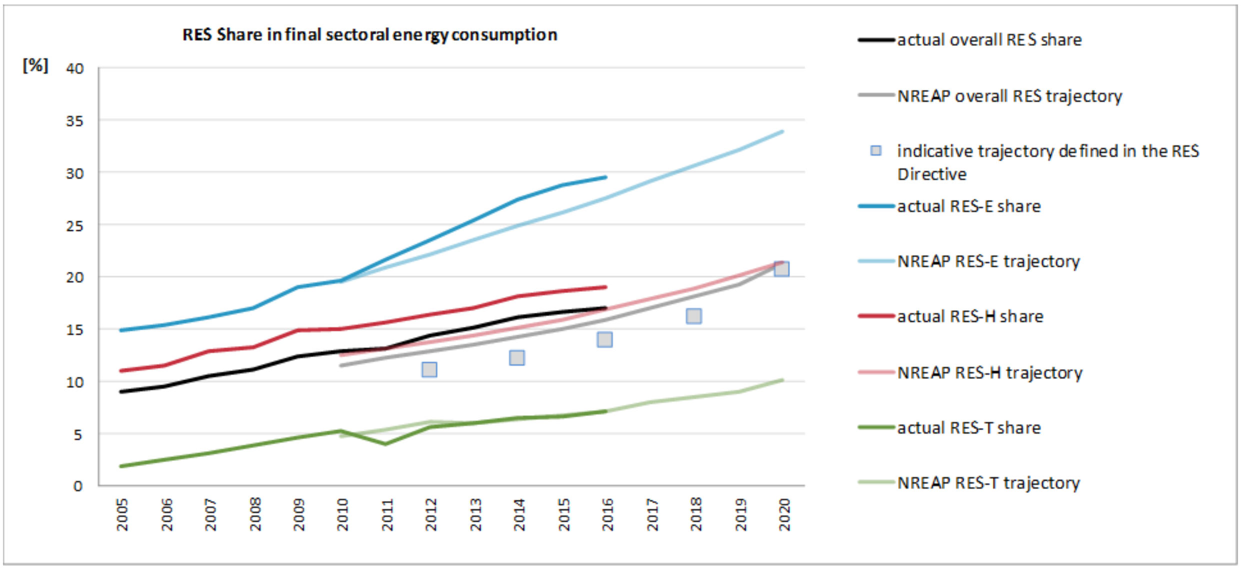

Figure 77. Actual and planned RES shares for the EU-28 (%). Source: Eurostat, NREAPs

23 MS were comfortably above their indicative trajectories for 2015/2016 as defined in the RED. Only France, Luxembourg and the Netherlands were below their indicative trajectories. The largest positive deviations from their indicative trajectories can be observed in Croatia, Hungary and Italy. Ireland and Poland still surpassed their indicative trajectories, albeit by only a slight margin of less than 1%. 19 MS were also above or on track of their (more ambitious) NREAP trajectories.

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[44] In accordance with Article 4 of the RED each MS has submitted an NREAP to the European Commission in 2010 or later. In the NREAPs, the MS provide detailed roadmaps describing how they will meet their legally binding 2020 targets. The roadmaps contain sectoral shares, the technology mix they expect to use and the trajectory they will follow.

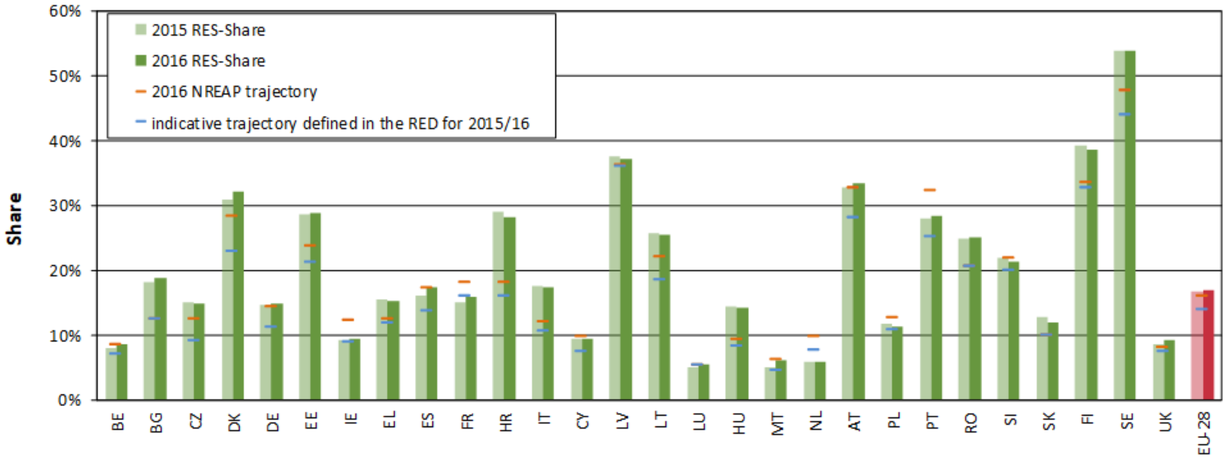

Figure 78. Actual renewable energy shares in 2015 and 2016 compared to indicative trajectories set in RES Directive and NREAP. Source: Eurostat[45]

For RES-E, there is a variety in the types of support schemes used and most MS even have multiple support schemes in parallel. The dominant trend in RES-E support schemes in recent years is the switch to auctions, in most cases combined with feed-in premiums. In most MS that introduced auctions, support levels decreased, which reflects increased competitive pressure (with some exceptions) but also falling technology costs and lower interest rates (financing costs). In some MS, support schemes have been on hold or the transition towards an auction-based RES-E support scheme was a lengthy process. In these cases, no support was available for new investment for one or several years (e.g. in Latvia, Croatia, Portugal, Hungary, Ireland, Slovenia).

In comparison with the RES-E sector, the RES-H&C sector shows a limited but stable support scheme portfolio. The most commonly applied form of support among MS are investment grants. The support instruments that are in place usually apply to a broad range of technologies. The most popular technologies are biogas and solid biomass for heating systems.

The most common support scheme for RES-T in the EU is a biofuel quota obligation. Several MS adjusted their quota schemes and related policies after the implementation of the ILUC Directive in 2015, introducing a cap on conventional biofuels and a sub-target for advanced biofuels. The latter has not yet been implemented in all MS. In the period up until the transposition of the ILUC Directive (which had to be transposed by September 2017), this led to a temporary freeze of the obligation scheme in some MS (e.g. UK), causing a delay in RES-T deployment.

At EU-level a RES share in the range between 18.1% to 20.7% can be expected in 2020 with current and planned RES policy initiatives[46]. This estimate is based on the modelling methodology described in Chapter 3 of this report,

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[45] Quantitative assessments for Malta in this report are based on the National Renewable Energy Action Plan submitted in 2012. Malta submitted a new NREAP in June 2017.

[46] Note that the range indicates the uncertainty related to key input parameter for the model-based assessment of future RES progress. Future energy demand (growth) and the policy implementation play a decisive role in this respect. The report considers policy updates until May 2018.

which is applied to several scenarios and sensitivities. In the case that MS do not implement their planned policy measures, the RES share would not change considerably and would still range between 18.1% to 20.6% (Current Policy Initiatives - CPI scenario). The majority of MS met their indicative RED trajectories for 2016 and are expected to perform well against their 2017/2018 trajectories, and also in meeting their binding 2020 RES target. However, in seven of these MS, namely Austria, Germany, Spain, Latvia, Romania, Slovenia, and Slovakia there is some uncertainty related to achieving the binding national 2020 RES target: if demand increases substantially in forthcoming years, the likelihood of MS achieving their 2020 RES targets decreases[47].

According to the scenario calculations, in the remainder of MS, namely Belgium, Ireland, Greece, France, Cyprus, Luxembourg, Malta, the Netherlands, Poland, Portugal and the United Kingdom, currently implemented RES policies and already planned RES policy initiatives appear insufficient to trigger the RES deployment needed to meet their binding national 2020 RES target if only domestic supply is considered[48]. The situation differs however from MS to MS. Results show that Ireland, Greece, Cyprus, Malta and Portugal may have only a comparatively small deficit (less than 20% deviation from the RES deployment required for their 2020 binding RES target). Belgium, France, Luxembourg, the Netherlands, Poland and the United Kingdom may face a comparatively larger gap (i.e. larger than 20% of required deployment) by 2020, at least under the pessimistic scenarios (and not considering cooperation mechanisms). Thus, cooperation with other MS and/or third countries represents a viable option for them to meet their binding 2020 RES targets, assuming that domestic RES potentials are comparatively costly or difficult to mobilise when needed. However, as of December 2018, only Luxembourg has signed agreements with other MS (Estonia and Lithuania) to close its expected gap in RES deployment by making use of statistical transfers. With these agreements, Luxembourg is likely to meet its binding national 2020 RES target.

Generally, the significant RES deployment deficit in some countries may also reflect deficits in financial support for RES and/or non-economic barriers. Complementary to targeted measures for an accelerated RES development, the success in improving energy efficiency and thereby reducing overall energy demand represents another important pillar for achieving the binding 2020 RES targets, since they are defined as RES shares, i.e. put in direct relation to demand (growth).

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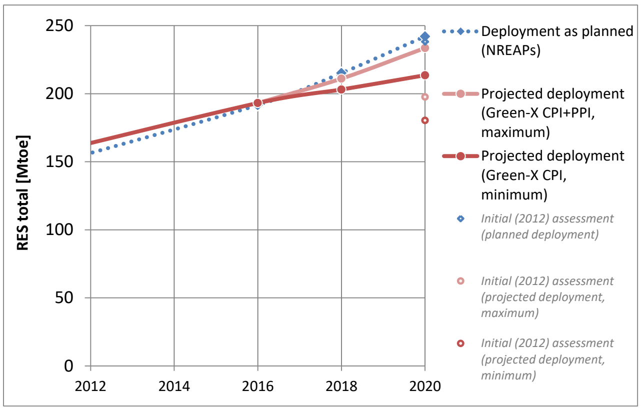
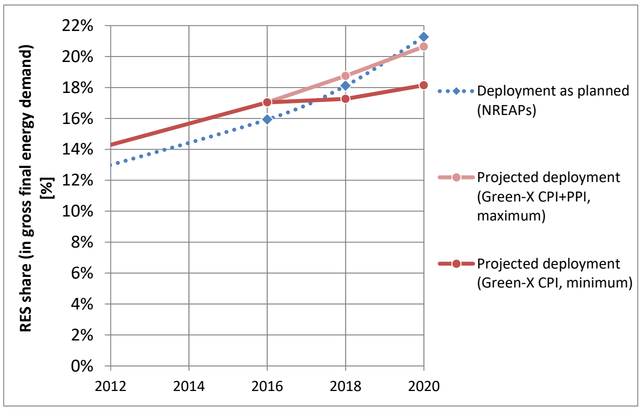
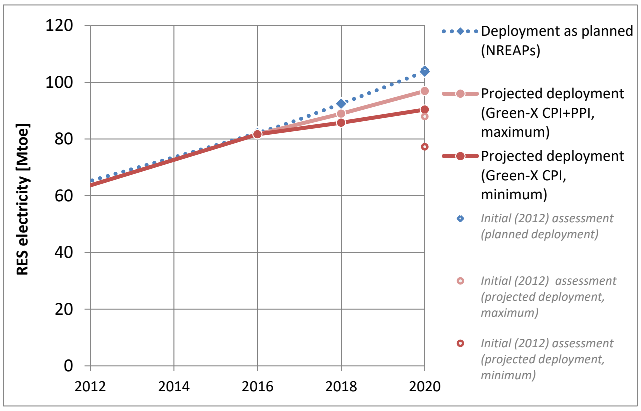
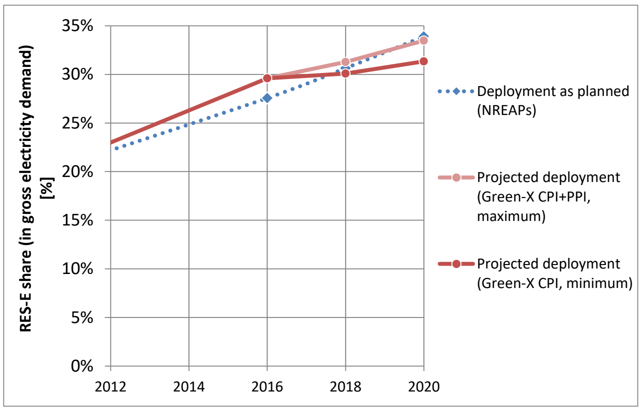
[47] Within the model-based RES prospect analysis expectations on future energy demand are taken from the latest EU reference scenario (EC, 2016) as derived by PRIMES modelling but have been compared with actual data for the status quo (2015 and 2016) and corrected, respectively. It turned out that default PRIMES data indicates generally a higher demand growth than observable in actual statistics. The default demand trend derived from PRIMES was consequently classified as high demand trend and used within this assessment to indicate the lower boundary concerning future RES target achievement. The corrected demand trend serves as basis for the optimistic case of future RES deployment.

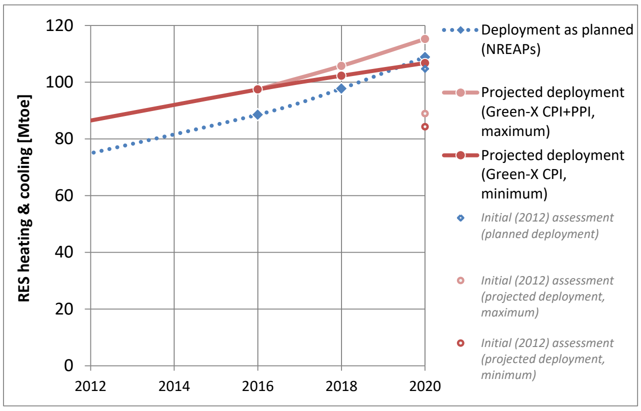
[48] Luxembourg is likely to meet its 2020 RES target when taking into account planned statistical transfers, see below.

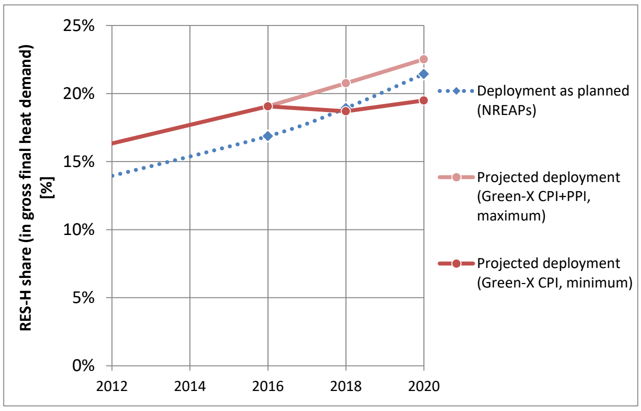

250
200
150
100
50
0
RES total [Mtoe]
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
RES share (in gross final energy demand) [%]
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


120
100
80
60
40
20
0
RES electricity [Mtoe]
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


35%
30%
25%
20%
15%
10%
5%
0%
RES-E share (in gross electricity demand)
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)


120
100
80
60
40
20
0
RES heating & cooling [Mtoe]
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)
Initial (2012) assessment (planned deployment)
Initial (2012) assessment (projected deployment, maximum)
Initial (2012) assessment (projected deployment, minimum)


25%
20%
15%
10%
5%
0%
RES-H share (in gross final heat demand) [%]
2012
2014
2016
2018
2020
Deployment as planned (NREAPs)
Projected deployment (Green-X CPI+PPI, maximum)
Projected deployment (Green-X CPI, minimum)

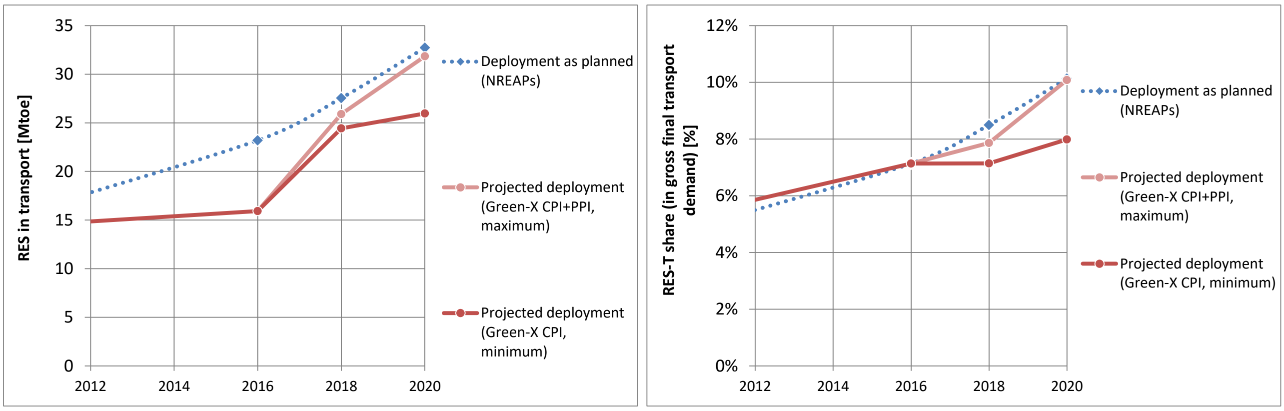


Figure 79. Historic, projected and planned sector-specific RES deployment at EU-level by 2016, 2018 and 2020 in absolute terms (Mtoe, left) and in relative terms (as RES share in corresponding demand, right). Projections based on Green-X modelling

Generally, the RES-E sector shows a comparatively larger gap towards 2020 in comparison to the NREAP sectoral trajectories, ranging from 6.2% to 12.4% as a percentage deviation from the planned 2020 NREAP sectoral trajectory (corresponding with 6.5 to 12.9 Mtoe). Thanks to the strong deployment of photovoltaics in several MS, RES-E was fully in line with NREAP sectoral trajectories in 2016. Due to a slowdown of past progress in several MS, a small deficit (3.4% to 6.7%, equivalent to 3.2 Mtoe to 6.2 Mtoe) can be expected compared to the 2018 NREAP trajectory, and this trend is assumed to continue up to 2020.

The RES-H&C sector is performing the best against the NREAP sectoral trajectories. According to the modelling done in this study, the majority of Member States will be able to meet (and significantly surpass) their planned 2018 NREAP deployment trajectory for RES-H&C. This positive outlook cannot be fully extended to 2020, as some MS may not maintain the same level of progress they had in 2018.

According to the modelling results for the RES-T sector, seven MS will be able to meet (or surpass) their planned 2018 NREAP trajectory (mostly through biofuels), but some will only do so under the more positive scenarios. At EU-level a deficit of 7% to 15% deployment arises, corresponding to a European RES-T share between 7.1% and 7.9% in 2018. In contrast to other sectors and technologies, it can, however, be expected that the situation will improve towards 2020. Thanks to the expected uptake of e-mobility and biofuels (driven by stronger blending shares in several MS), the gap to the planned RES-T deployment is projected to decline to 0.4% at EU-level, still reaching the binding 2020 RES-T target of 10%.

Appendix A Quantitative progress of Member States

In the following sections we present the quantitative progress split for each sector (RES-E, RES-H&C and RES-T), and for each sector an overall view and details split by technology. For the technology graphs, NREAP tables 10, 11, and 12 were compared to Progress Report tables 1b, 1c, and 1d. Where MS did not fill in the tables in sufficient detail, assumptions were made to fill the gaps. These are explained in the text or in footnotes next to the affected figures and tables. An EU-28 figure is provided in each graph. Note that there is no formal commitment on EU-level to 2016 NREAP targets or to a 2015/2016 indicative interim trajectory. The EU-28 figures presented are merely obtained from summing the individual MS' commitments.

RES-E sector Overview

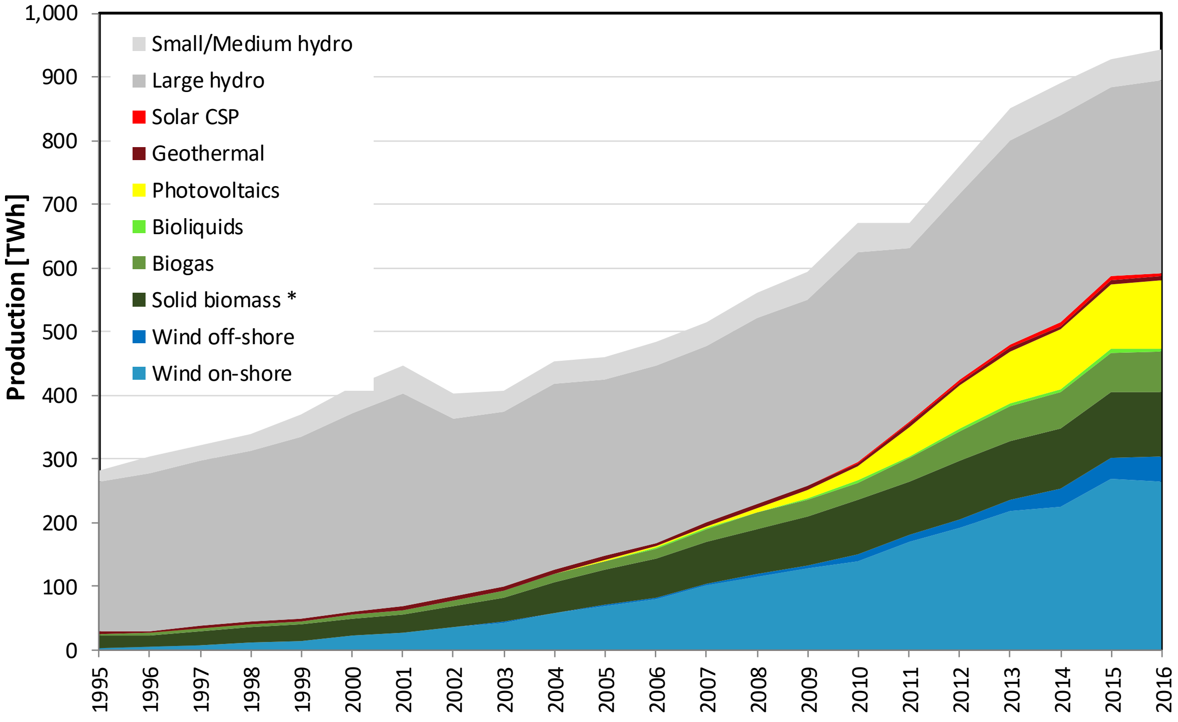


Figure 80. Production of electricity from RES-E technologies in the EU-28 for 1995-2016. Results are based on Eurostat Energy Balances and Member State Progress Reports. Data for wind and hydro are not normalised according to procedures in the RES Directive and may thus differ from the values shown in the table below

Figure 80 shows that 'new' RES-E technologies such as wind, solar, and geothermal energy as well as biomass continue the deployment trend of the passed recent years and increase steeply. In 2016, they already contributed significantly more than the established hydropower, accounting for roughly 592 TWh of electricity produced, compared to a total of 350 TWh for hydro (not normalised). Onshore wind was the largest 'new' RES-E technology with 265 TWh produced in 2016 (not normalised), followed by PV with 106 TWh, solid biomass with 103 TWh, biogas with 63 TWh, and offshore wind with 37 TWh. Geothermal electricity (6.7 TWh), solar CSP (5.6 TWh) and bioliquids (5.1 TWh) played minor roles in the RES-E mix.

The following graphs and tables present details of the development in individual Member States.

Fifteen MS had a RES-E share lower than envisaged in their NREAP indicative trajectory for 2016. In 2014, this had been the case for ten MS only, while in 2012 it had been fifteen MS staying below their indicative NREAP target as well. Because most of these MS - which have not reached their NREAP target - lag behind their targeted share only slightly. Therefore, the EU in sum exceeds the share as planned in the NREAPs of the MS.

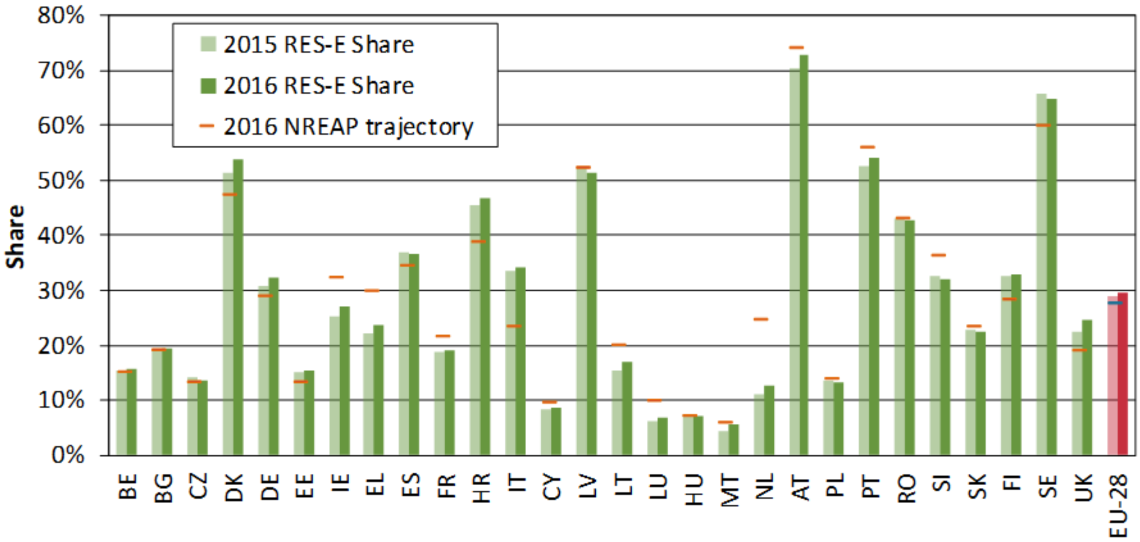


Figure 81. RES-E actual share vs. NREAP indicative sectoral trajectory in 2016 (%). Source: Eurostat and NREAPs

Figure 82 shows that the largest positive deviation from its targeted RES-E share as set in its NREAP was by Italy, followed by the UK and Croatia. The largest negative deviations can be observed in the Netherlands and Malta. In the Netherlands, low growth for solar energy and some resistance regarding wind onshore installations might have contributed to the delay.

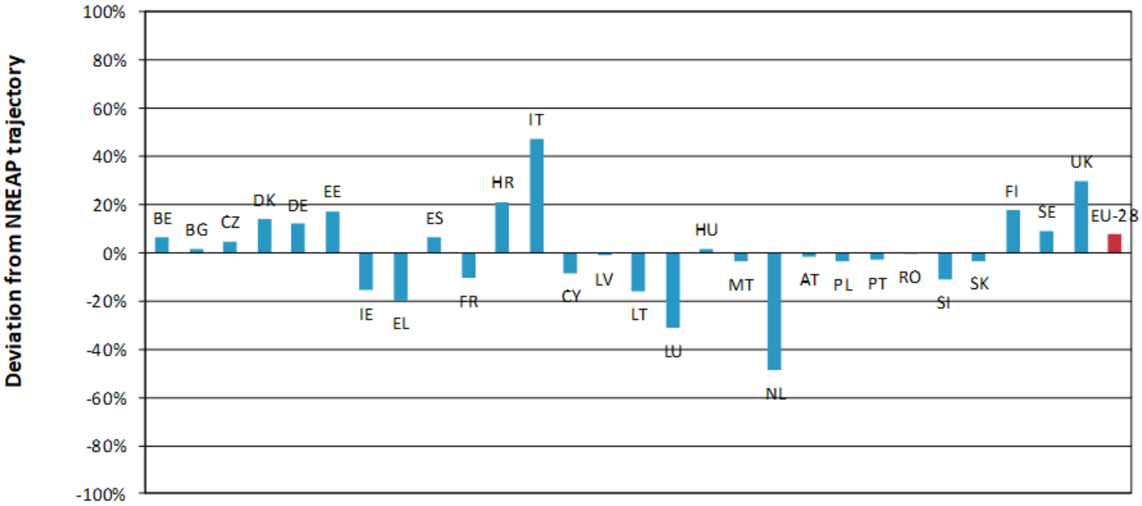


Figure 82. Deviation of actual 2016 share from 2016 NREAP indicative sectoral trajectory for RES-E [change of shares in %]. Source: NREAPs and Eurostat

The following two tables show the growth rate of major RES-E technologies from 2015-2016 as well as their absolute values in 2016. Overall, it becomes clear that offshore wind was the fastest-growing technology in 2016, followed by onshore wind. Both also showed the highest growth in absolute numbers between 2015 and 2016, and together they are the largest RES apart from hydropower in the EU. Biogas and PV growth has slowed down considerably in the EU but both technologies rank third regarding their generation as part of total RES-E generation. However, very high growth rates for PV can still be observed in some individual MS, such as Ireland, Latvia, Poland, Slovakia and Finland, which have still low levels of PV deployment. Large-scale hydro-electricity is still the largest source of renewable energy, mostly resulting from investments before 2000, but the growth in the past decade has been marginal.

Table 22. Growth of RES-E technologies from 2015-2016. Data source: Progress Reports. Normalised data for wind and hydro. See footnotes to Table 23 for assumptions on sector generation figures which provide the basis for growth figures further below

Member State	RES-E [%]	Offshore wind [%]	Onshore wind [%]	Solid biomass [%]	Biogas [%]	Bioliquids [%]	Photovoltaics [%]	Small hydro [%]	Large hydro [%]	Geothermal [%]	Concentrated solar power [%]	Tide, wave, ocean [%]
Belgium	2.04	0.41	14.16	-4.63	3.28	-76.64	1.09	3.13	-1.75	-	-	-
Bulgaria	0.74	-	3.07	7.95	60.50	-	0.22	11.97	-6.27	-	-	-
Czech Republic	0.00	-	-0.38	-1.10	-0.84	-	-5.87	-2.01	-1.46	-	-	-
Denmark	6.59	0.76	4.00	-27.52	8.19	-	23.08	42.05	-	-	-	-
Germany	4.32	72.88	6.87	-2.17	1.90	5.49	-1.62	-2.04	-1.26	30.60	-	-
Estonia	10.21	-	-16.92	1.78	-6.12	-	-	29.63	-	-	-	-
Ireland	9.92	0.00	18.39	71.17	5.47	-	151.23	-2.42	-2.33	-	-	-
Greece	5.94	-	10.39	318.18	17.01	-	0.77	2.29	4.14	-	-	-
Spain	-0.42	0.00	0.90	0.86	-7.71	-	-2.39	-0.94	-2.39	-	-0.25	-
France	4.31	-	12.41	24.04	5.06	0.00	11.57	-0.35	-0.64	5.43	-	2.87
Croatia	3.45	-	20.44	117.85	34.75	-	14.31	4.68	-1.04	-	-	-
Italy	0.45	-	7.98	3.97	0.57	-4.89	-3.65	1.69	0.83	1.68	-	-
Cyprus	10.08	-	8.22	-	1.52	-	16.57	-	-	-	-	-
Latvia	-0.89	-	-12.93	13.00	1.33	-	100.00	-15.90	38.13	-	-	-
Lithuania	12.71	-	29.03	-17.60	42.18	-	-9.28	0.37	1.62	-	-	-
Luxembourg	8.48	-	40.24	3.72	11.54	-	-3.28	-0.19	-	-	-	-
Hungary	-1.08	-	0.63	-10.13	13.75	-	64.27	0.49	1.18	-	-	-
Malta	33.72	-	0.00	-	25.15	-	31.65	-	-	-	-	-
Netherlands	14.17	124.44	2.70	0.46	-2.73	-	38.95	-	-1.01	-	-	-
Austria	4.40	-	14.34	4.52	3.69	-	16.97	6.98	2.88	-	-	-
Poland	1.51	-	24.29	-23.42	13.37	-	118.90	-0.86	0.80	-	-	-
Portugal	3.48	0.00	4.26	-1.47	-3.16	-	3.28	1.21	0.07	-15.72	-	-
Romania	-0.40	-	-6.70	0.76	6.74	-	-8.19	10.22	8.89	-	-	-
Slovenia	-0.34	-	8.33	4.04	7.41	-	-2.44	-0.70	-0.43	-	-	-
Slovakia	0.72	-	0.00	3.03	6.47	-	158.74	0.00	-0.88	-	-	-
Finland	4.76	-	56.32	0.39	10.22	-	80.00	0.54	0.56	-	-	-
Sweden	2.00	-14.85	-4.72	6.57	0.00	-	47.42	-1.45	-0.75	-	-	-
UK	9.21	7.29	9.88	1.52	8.86	-	38.10	20.25	0.54	-	-	-99.55
EU-28	3.43	23.99	6.58	-1.01	3.03	-5.76	3.13	1.55	0.51	1.78	-0.25	2.46

Table 23. RES-E generation in the EU-28 in 2016 per technology. Data source: Progress Reports. Normalised data for wind and hydro

Member State	RES-E [GWh]	Offshore wind [GWh]	Onshore wind [1] [GWh]	Solid biomass [GWh]	Biogas [GWh]	Bioliquids [GWh]	Photovoltaics [GWh]	Small hydro[2] [GWh]	Large hydro[2] [GWh]	Geothermal [GWh]	Concentrated solar power [GWh]	Tide, wave, ocean [GWh]
Belgium	13,359	2,310	3,219	3,390	986	30	3,086	220	118	0	0	0
Bulgaria	7,487	0	1,408	163	191	0	1,386	898	3,441	0	0	0
Czech Republic	9,644	0	519	2,068	2,589	0	2,131	1,120	1,217	0	0	0
Denmark	18,220	4,086	9,369	3,481	515	0	744	25	0	0	0	0
Germany	188,407	12,171	70,980	10,794	33,703	461	38,098	6,306	15,719	175	0	0
Estonia	1,418	0	594	743	46	0	0	35	0	0	0	0
Ireland	7,457	75	5,988	469	212	0	4	121	588	0	0	0
Greece	14,428	0	4,964	5	270	0	3,930	687	4,573	0	0	0
Spain	101,653	15	51,499	4,048	906	0	8,069	5,077	26,460	0	5,579	0
France	97,226	0	22,411	5,645	1,932	1	8,647	6,584	51,408	97	0	501
Croatia	8,482	0	1,019	194	237	0	66	116	6,850	0	0	0
Italy	111,137	0	16,519	6,540	8,259	4,627	22,104	11,915	34,884	6,289	0	0
Cyprus	422	0	222	0	52	0	148	0	0	0	0	0
Latvia	3,482	0	128	427	397	0	0	62	2,467	0	0	0
Lithuania	1,961	0	1,078	262	123	0	67	81	350	0	0	0
Luxembourg	431	0	127	25	74	0	100	104	0	0	0	0
Hungary	2,966	0	706	1,493	333	0	201	62	171	0	0	0
Malta	133	0	0	0	8	0	125	0	0	0	0	0
Netherlands	15,039	2,323	6,041	3,912	1,106	0	1,559	0	98	0	0	0
Austria	48,036	0	5,350	3,956	647	1	1,096	5,606	31,380	0	0	0
Poland	22,469	0	12,041	6,913	1,028	0	124	972	1,392	0	0	0
Portugal	27,730	4	12,509	2,481	285	0	822	1,097	10,361	172	0	0
Romania	27,477	0	6,590	466	65	0	1,820	1,428	17,108	0	0	0
Slovenia	4,834	0	7	137	142	0	268	380	3,901	0	0	0
Slovakia	6,643	0	6	1,155	576	0	533	209	4,164	0	0	0
Finland	28,406	0	3,103	10,630	410	0	18	1,121	13,124	0	0	0
Sweden	93,222	608	14,871	11,431	11	0	143	3,663	62,495	0	0	0
UK	87,042	17,332	23,446	22,337	8,012	0	10,420	1,178	4,317	0	0	0.009
EU-28	949,209	38,925	274,712	103,164	63,114	5,120	105,709	49,067	296,585	6,733	5,579	501.009

[1] DK, IE, PT, and ES provided only a combined figure for wind on- and offshore. For DK, offshore installed capacities by Eurobserv'ER were used, combined with historic full-load hours to estimate offshore production. The remainder of reported production is assumed to be onshore. For ES we assumed offshore installed capacities by Eurobserv'ER, estimating production with an assumed 3000 full-load hours. The remainder of reported production is assumed to be onshore. For PT we assume that offshore production was equal to that of 2014 and the remainder was onshore. For IE, we use the capacities provided in the Progress Report and assume 3000 full-load hours for offshore wind. The remainder of production is assumed to be onshore. [2] NL and EE only provided an overall figure for total hydro. It was assumed that this referred to large hydro, up to the amount planned in the NREAP. Any remaining actual production was considered to be from small hydro.

Offshore Wind

Offshore wind was a costly RES technology in 2010, which is why many MS did not foresee any deployment in their NREAPs. Fourteen MS had planned some offshore wind electricity production by 2016, namely Sweden, Greece, Estonia, Latvia, the UK, Denmark, Belgium, Germany, the Netherlands, Ireland, Spain, Italy, Portugal, and France. Of these, nine49 have reported actual production in their Progress Reports. In absolute numbers, the UK had the highest electricity production from offshore wind in 2016 (16,585 GWh), followed by Germany (12,691 GWh) and Denmark (4,086 GWh). These MS each provide a long-term strategy (deployment targets) for wind offshore and combine it with reliable support policies and reasonable grid connection procedures. In absolute terms small, but nevertheless significant amounts were produced by Belgium and the Netherlands, while Sweden's contribution was small but clearly larger than Ireland's, Spain's and Portugal's generation of offshore wind power. Sweden and Germany are well on track compared to their NREAP indicative sectoral trajectory (see Figure 83. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectory (NREAP) for offshore wind

) while other MS seem to face problems in deploying this technology. The needed lead time from policy planning to tendering, and from the tender to the installation of wind power might have been underestimated, and thus explains partly the delay in MS like France and the Netherlands. Other MS like Latvia lack a support scheme for offshore wind. Malta has indicated that it intends to focus on PV rather than offshore wind in the coming years. In Estonia a new agreement to construct a new offshore windfarm between 700 and 1100 MW has been signed in 2017, but a realisation date is not indicated due to high uncertainties in planning and construction.

In earlier years installing offshore turbines was costly; but costs have about halved within the last six years globally[50]. This development is mirrored in recent auction results of offshore wind (e.g. bids in the UK from around 160€/MWh (2014) to around 70€/MWh in 2017.[51] Auction results in Germany, Denmark and the Netherlands underpin this development. The Netherlands had their first tender in offshore wind without subsidies (two 350 MW farms) but the costs of the grid connection are covered by the government. A similar development was observed in Germany.

Main drivers of this cost decline have been technological development of e.g. turbines (with sizes up to 6 MW[52]), advances in offshore supply chain, new designs and business models and low capital costs. In addition, as one could observe an increasing number of offshore developers in the EU, giving evidence of a growing industry and market competition in this area, prices are expected to be under further pressure. Nevertheless, offshore wind technology risks are still considered high compared to onshore wind. They comprise construction, technology (new turbines, cables), grid connections and weather risks. Another source of uncertainty might be relatively short-termed policies (five to ten years), because for offshore wind a long-term horizon of "certain" revenues is needed[53].

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[49] See remarks under tables 3 and 4 for assumptions on offshore wind production in Denmark, Spain, and Ireland.

[50] BNEF 2018, Beyond the Tipping Point. Flexibility gaps in future high-renewable energy systems in the UK, Germany and Nordics.

[51] ICIS 2017, Power Perspective Insight Paper: Europe goes renewable: The evolution of renewable subsidy schemes. A case study for Germany, UK and Poland; M. Ferdinand, I. Peltegova, M. Jones, Karlsruhe & London, Oct. 2017

[52] WindEurope 2018, Wind in power 2017- Annual combined onshore and offshore wind energy statistics, WindEurope 2/2018; Financing and investments trends - The European wind instustry in 2017, WindEurope 4/2018

[53] Source: http://energypost.eu/14694-2/ energy post, April 6, 2017 by Karel Beckmann: The growing risks of offshore wind: can we rely on the sea for our power supply?

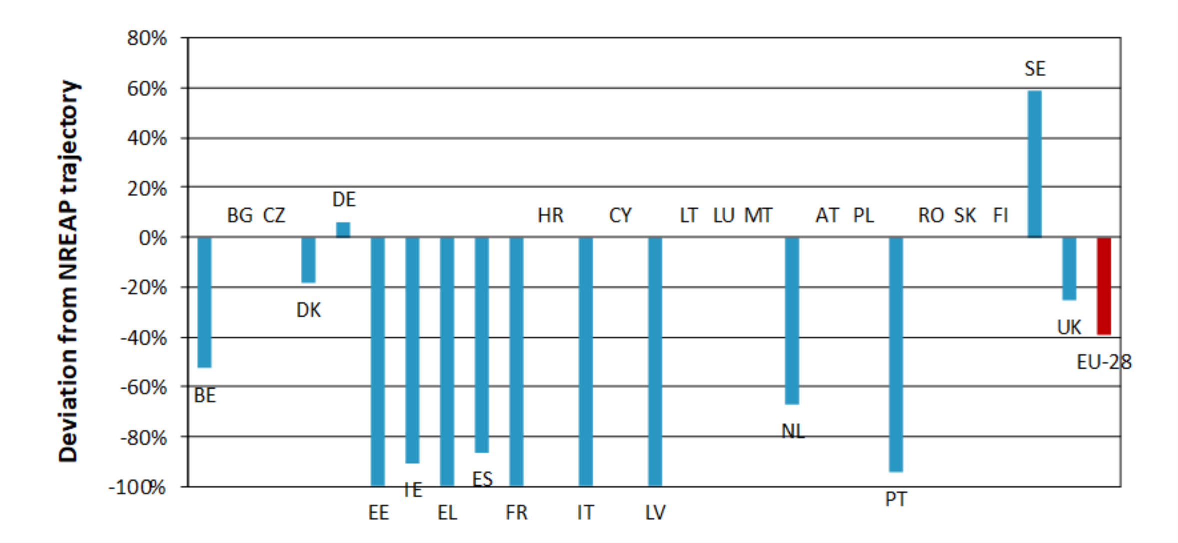

Figure 83. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectory (NREAP) for offshore wind[54]

Note: Those MS with 100% deviation have not yet generated any electricity from wind offshore – even though in some MS e.g. France projects are commissioned but not yet implemented.

Onshore Wind

Being a comparatively mature and therefore low-cost RES technology, many MS planned significant deployment of onshore wind in their NREAPs. In six MS, namely Germany, the UK, France, Belgium, Ireland and Croatia, installations (new capacities) in wind power reached a new record in absolute terms. The 28 MS together have almost exactly reached the total as planned in their NREAPs production for 2016. The largest producers in absolute numbers were Germany with 69,952 GWh, Spain with 51,476 GWh, and the UK with 23,499 GWh. While onshore wind is seeing positive growth rates in almost all MS (see Table 22), actual development is lagging behind their NREAP indicative sectoral trajectory in 17 MS. The largest negative deviations can be observed in Slovakia (6 GWh actual vs. 480 GWh planned) as well as in Slovenia (7 GWh actual vs 109 GWh planned).

The main support scheme for wind onshore are feed-in premiums or tariffs, often in combination with a tender such as in Germany, Ireland, Spain, Croatia, the Netherlands, Poland, Portugal and the UK. Some MS apply tradeable certificates (quota) to support wind onshore deployment (Belgium, Romania, Sweden) or a combination of feed-in and quota (e.g. Italy, the UK). Past changes in policies and partly low (e.g. Bulgaria, Cyprus, Hungary, Slovenia, Slovakia) or no support (e.g. Malta) or uncertain revenues from sales (e.g. Spain) have inhibited an accelerated deployment of wind onshore. In addition, non-cost barriers such as long lead times for administrative and grid access procedures, aviation safety and spatial planning and environmental issues still slow down the deployment of onshore wind. In Slovenia, conservation area and environment protection limit wind onshore deployment. Similarly, in Greece, the construction of a wind power complex (154 MW) with an expected operation in 2019 had been announced in June 2017 but the construction has been halted along with other wind power projects due to an appeal by local environmental organisations. In 2018, however, about 170 MW of wind capacity was auctioned off

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[54] WindEurope 2/2018, Wind in power 2017- Annual combined onshore and offshore wind energy statistics.

for prices between 6.8 and 7.2 €ct/kWh[55].

In Latvia, the support scheme for wind onshore was suspended, Malta did not support wind onshore, while Luxembourg experienced a considerable delay in project development but installed a significant amount of onshore wind after 2016. Croatia has already overachieved compared to its NREAP RES-E sectoral trajectory and has put its support policy on hold.

Cost are still declining as auction results for onshore wind suggest. The average size of turbines installed varies in a range of 1 MW to about 3.5 MW from MS to MS (in 2017) and depends on regulatory restrictions on tip height, project duration and wind speeds. As installations become more and more adjusted to the characteristics of the location – height, power, weak-wind – and thus, improve the cost-revenue relation, competitiveness of wind power is expected to increase further, driving future installations as well[56].

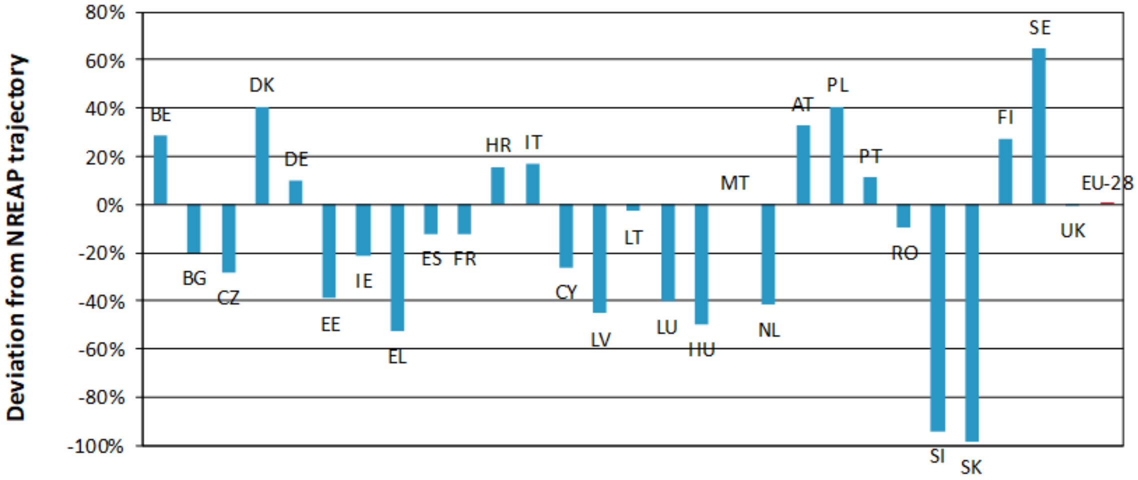

Figure 84. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectory (NREAP) for onshore wind

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[55] https://balkangreenenergynews.com/greece-awards-277-32-mw-of-capacity-in-1st-regular-competitive-auctions-edp-wins-largest-wind-project/

[56] Wind Europe4/2018, Financing and investments trends - The European wind industry in 2017

Photovoltaics

As system costs for PV have dropped much faster than was estimated by MS at the time of drafting the NREAPs, deployed amounts have far surpassed the NREAP planned sectoral trajectories in many MS. This trend had already become apparent in previous Progress Reports. Cyprus, Germany and Portugal were above their NREAP planned PV trajectory for 2016. Another 18 MS have even surpassed the production as envisioned in their NREAP for 2020. Only Latvia, Estonia, Spain and the Czech Republic remain below their planned production. The latter two MS have had phases of rapid PV deployment earlier in the decade, leading to an explosion of support costs at the time. After this, policy makers severely limited the support given to PV installations, which resulted in a halt in growth. Latvia had, in their NREAP, only planned a small amount (2 GWh) for 2016 and reported no production. Estonia, Ireland and Finland had not planned any deployment until 2020 in their NREAP, but while Estonia reports zero actual production, the latter two produced small amounts. Germany continues to be the largest producer by far with 38,098 GWh, in 2016, followed by Italy with 22,104 GWh and the UK with 10,420 GWh. Several MS such as the Netherlands, the UK, Hungary and Austria show a strong growth since 2014, others such as Belgium had a slower increase in deployment than the years before, but investments are ongoing (e.g. a 100 MW solar park in Lommel[57]).

For the future, an ongoing growth of installations is expected. This expectation is based on the assumption of further declining prices for modules (learning rate of 28,5% during the last 40 years according to BNEF 2018), which makes electricity from PV a competitive energy source that will be further deployed, especially if appropriate feed-in tariffs ensure a certain revenue. For example, in Hungary a great number of PV project developers (amounting to 1.350 MW) applied for the feed-in tariff by end of 2016. And in Greece, an auction in 2018 awarded bids in the magnitude of about 106 MW in total, with the lowest price ranging around 6.3 €ct/kWh[58]. However, some MS have no support scheme for solar electricity, such as Latvia. Or, they have abolished the feed-in scheme without setting up an alternative support scheme in time, e.g. the Czech Republic, which, however, is slowly recovering from this stop in 2014 and is now setting up alternative support programmes[59].

The main support instruments are feed-in tariffs and premiums in sixteen MS. Four MS apply quota and tariff subsidies (Austria, Poland, Finland, Sweden) and green certificates are applied in Romania.

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[57] http://www.tommelein.com/eerste-grote-zonnepark-sinds-2013-in-lommel/

[58] https://balkangreenenergynews.com/greece-awards-277-32-mw-of-capacity-in-1st-regular-competitive-auctions-edp-wins-largest-wind-project/

[59] https://www.pv-magazine.com/2017/10/30/czech-solar-association-calls-for-policies-to-support-industry-growth/

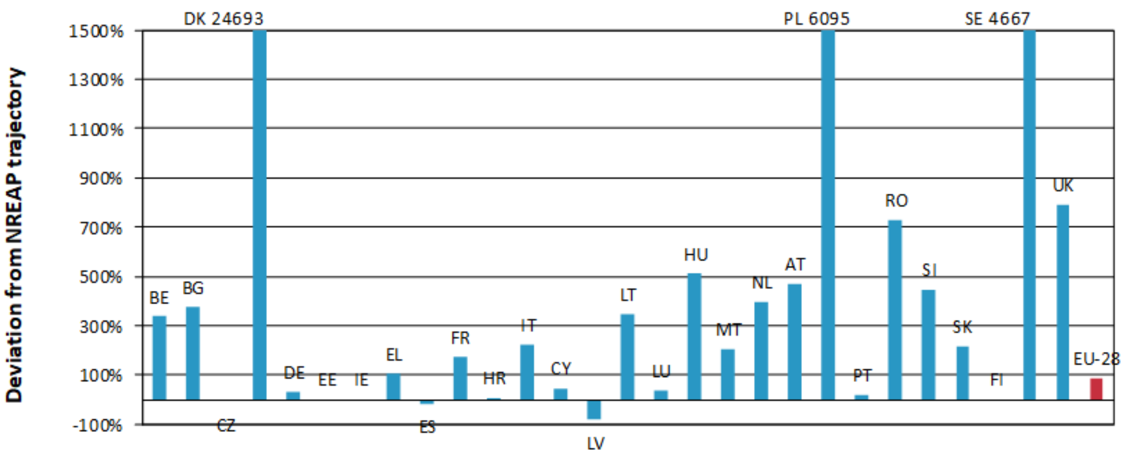

Figure 85. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectory (NREAP) for solar PV. MT changed its NREAP in 2017 stating a new indicative sectoral target for PV for the year 2020. However, as the updated NREAP does not contain a trajectory for PV, data from its previous NREAP is used

Solid Biomass

The vast majority of MS plan for significant amounts of electricity generated from solid biomass in their NREAPs, and the technology has made significant contributions to the RES-E sector throughout the last decade. However, growth has been slow and was even slightly negative between 2015 and 2016 (-1.01%). Over the last years, the number of MS who stayed below their NREAP-planned amounts has been increasing. In 2016, 20 MS underachieved, compared to nineteen in 2015 and seventeen in 2014. The highest positive deviation can be observed in Estonia, the highest negative in Malta, followed by Greece. Malta has an abundance of solar intensity, but limited landmass, a difficult sea floor, small wave sources and only low-energy wind resources[60]. Subsequently, Malta considers rooftop solar installations as the main renewable energy source, and thus, puts most policy efforts into this energy source and less into biomass deployment. Even though Greece displays a high deviation from its indicative NREAP sectoral trajectory, it had the highest growth rate in electricity generation from solid biomass among the MS, and a new biomass CHP capacity of 25 MWe is planned[61], contributing to a significant increase of Greece’s biomass share in electricity generation. Due the economic crisis, capital for renewable energy projects was constraint as well, but the EBRD eased this shortage when it signed a framework contract (in 2018) with Greece to finance renewable energy investments in Greece. Despite Belgium’s large potential for biomass, the sub-target for large scale electricity production from biomass has been more than halved in one of its regions (Flanders) because the expected construction of a large biomass plant was cancelled.

The use of biomass as energy source – heat - has a long tradition. The costs of electricity from biomass is more driven by operating expenses for the fuel than in wind or solar power and technology costs are not predicted to decline considerably. Therefore, a main driver for biomass use is the relation of fuel costs to revenues (support schemes). This is described by the example of Bulgaria. While in earlier years generous subsidies were provided for electricity from renewables, the government cut back support (prices and supported amounts) to stop the strongly increasing costs related to this support, which were being passed on to electricity prices of final energy consumers. In 2015, a tax of 5% was introduced retroactively to all power producers, including renewable energy power generation receiving feed-in payments. This acted as further disincentive for biomass use compared to other

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[60] https://energytransition.org/2017/04/maltas-energy-transition-a-slow-but-promising-start/

[61] https://www.ppcr.gr/en/biomassft

renewables. Currently, only indirect use of biomass up to 5 MW is supported (residues and animal substances). These low incentives for and uncertainties in biomass deployment could explain why Bulgaria underperformed in this technology.

Contrary to this overall trend, the UK has experienced a steep increase in electricity production from biomass in the last three years, specifically in electricity production from wood and wood wastes. This made it the largest producer in absolute terms in 2016 with 22,337 GWh, followed by Sweden with 11,431 GWh, as well as Germany and Finland (10,794 GWh and 10,630 GWh, respectively). With these amounts, these four MS represent more than half of the EU's production of electricity from solid biomass.

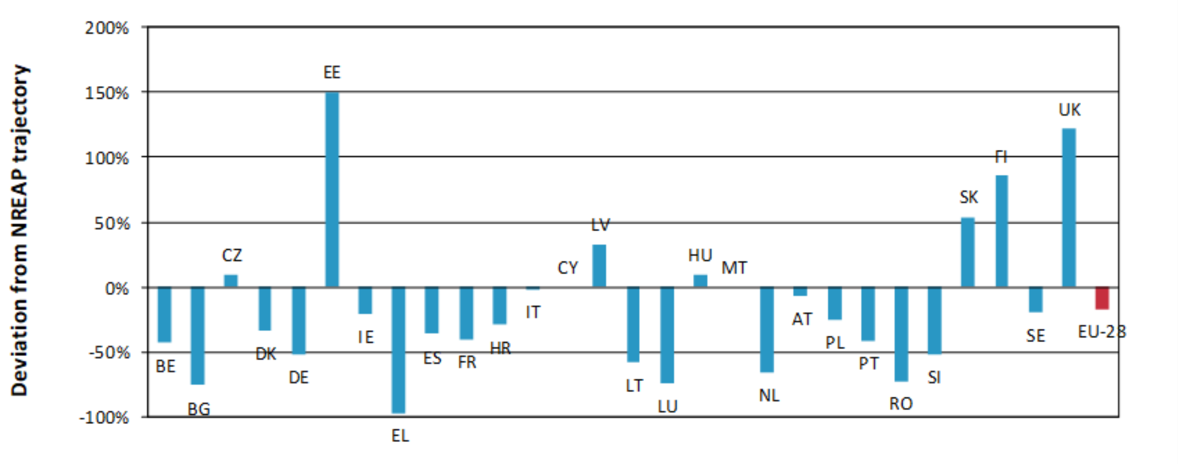

Figure 86. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for solid biomass

Biogas

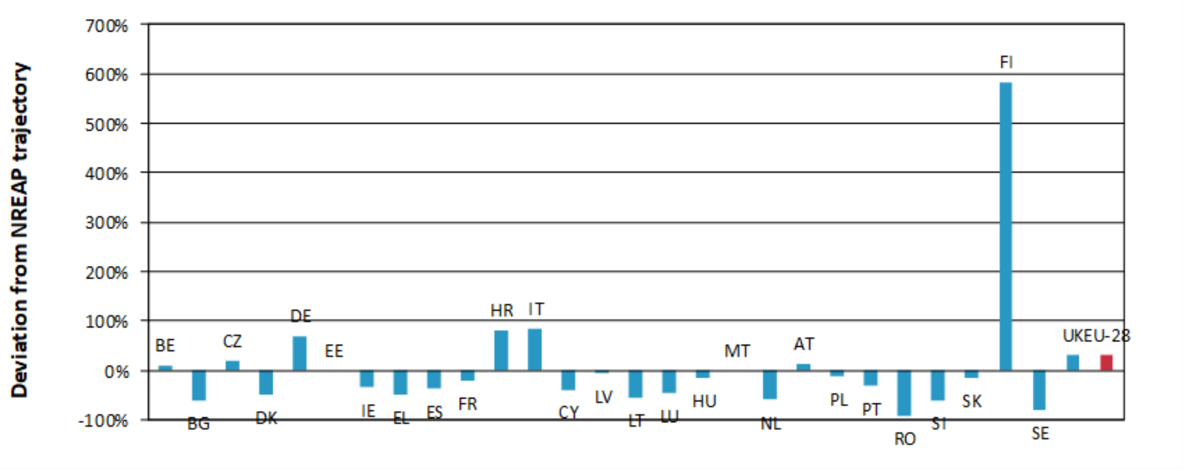

Figure 87. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for biogas

The sum of all electricity production from biogas in the EU in total was on track compared to the sum of sectoral trajectories from the NREAP in 2016. However, there is large variation between MS. Finland has continually been above its planned NREAP sectoral trajectory since 2010 and in 2016 showed the largest positive deviation among all MS with 410 GWh actual production versus 60 GWh planned in its NREAP. In contrast, eighteen Member States stayed below their planned NREAP deployment.

In absolute terms, Germany was by far the largest producer in 2016 with 33,703 GWh, more than all other MS combined. However, growth in Germany has slowed after a support scheme change in 2014 aimed at limiting the development of biogas based electricity. In contrast, despite relatively small absolute production in Lithuania and Bulgaria (123 GWh and 191 GWh, respectively), very high growth could be observed in both MS in recent years.

Biogas is not a new renewable energy source, but its deployment has varied across MS and times, and costs depend less on the technology (investment), but on operating costs. The drivers and barriers are described by the example of Romania. Romania, like Bulgaria, has a large potential of feedstock (mainly crops residues and manure) for production of biogas as energy source. If about 10% of the potential would be realised, the 2020 NREAP indicative sectoral target would be by far overachieved. Even so, biogas production in Romania started in the 1960s (mainly wastewater treatment and sludge) and generation grew to 180 GWh in 1989, the transition to a market economy led to decreasing investments and a fall in biogas production. The production increased again with the introduction of the green certificate scheme but remained below its NREAP indicative sectoral trajectory. The government has approved a new support scheme (2016/17) aimed to encourage the use of biomass, biogas and geothermal resources (which have not been exploited at their full potential). The scheme provides non-refundable funds granted to private small and medium-sized or public projects. In addition to financial challenges, overcoming of other barriers, such as complicated permitting procedures (grid access, environmental assessments, etc.) and low credibility/reliability of the policy/politics (sudden changes in 2014) is a prerequisite for a successful deployment, as are modern farms for setting up an efficient value chain for biogas[62].

Small Hydro

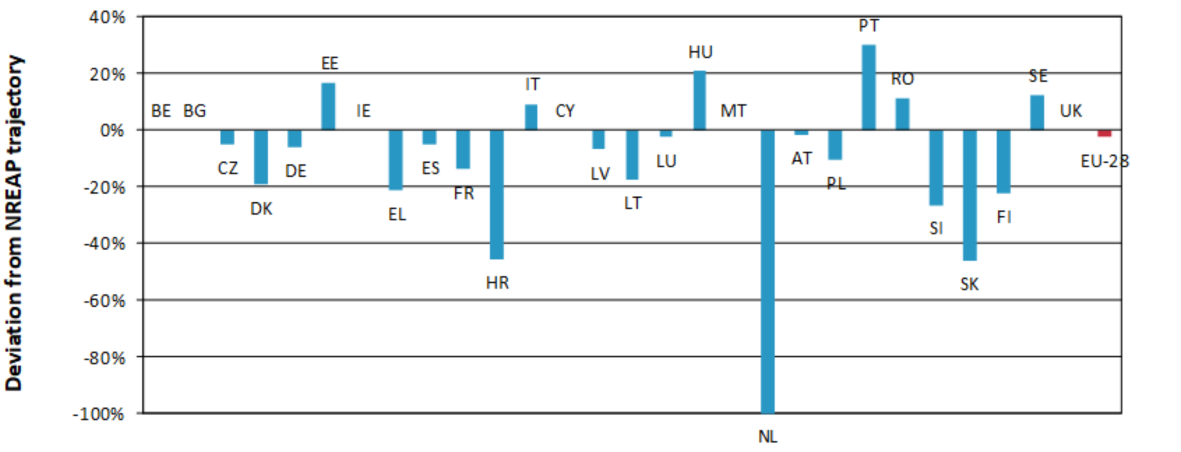

Figure 88. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for small hydropower[63]

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[62] https://www.enpg.ro/biogas-a-high-potential-sustainable-yet-untapped-fuel-in-romania/, https://www.lexology.com/library/detail.aspx?g=5a105fba-5c99-46cc-8679-fe5a44679ae6

[63] For Belgium, Bulgaria, Ireland and the UK, no subcategories were given in the NREAPs. We therefore assume that for small hydro, planned production was equal to actual production, and the remaining planned production was meant to be large hydro. The Netherlands and Estonia provided no subcategories for

The category small hydro is comprised of those installations of less than 1 MW, and those of 1-10 MW. Of a total of 47,219 GWh produced in 2016, Italy contributed 9,834 GWh, France 6,997 GWh, Germany 6,617GWh, and Austria 5,844 GWh. In 2016, a total of sixteen Member States stayed below their planned NREAP indicative sectoral trajectory, while six overachieved. In general, there are several reasons for the delayed development of small hydropower. The investment per unit power – and hence the levelized cost of electricity - is in average higher for small hydro than for large hydro. These costs are mainly driven by location and site conditions and uncertainties associated with site-specific civil works. Thus, technology development has less impact on total investments than for example in solar energy and costs are expected to be minor drivers of future installations[64]. Furthermore, hydropower faces large environmental concerns and often implies physical changes to the landscape and downsizing of hydro power plants does not significantly reduce those impacts. Thus, the installation of many small hydropower plants entails as many concerns as number of plants are planned. The case of small hydropower is described by the example of the Netherlands. The hydropower potential is low in the Netherlands and lies mainly within the national waterways. In general, electricity generation of small hydropower is affected by warm summers, which might increase in the course of time due to climate change. In addition, the primary objective of many weirs is water balancing or water feeding of canals, and not electricity generation. Another area of conflict are ecological concerns – damage to fish - which oppose green energy objectives. If there are suitable locations for small hydropower (stable water flows, suitable place for plant, existing infrastructure/weir) investors still face the problem of legitimizing hydropower in the Netherlands as developments are not backed by a clear public mandate[65].

Large Hydro

The category large hydro refers to installations of more than 10 MW. Large hydro is the most mature RES-E technology, with the majority of potentials already being exploited in most Member States. Most countries have thus planned for low growth rates in this technology. Although electricity production from ‘new’ RES-E technologies in sum has overtaken the production from large hydro installations, large hydro nevertheless remains, for the time being, the single most important RES-E technology, contributing the largest share to RES-E generation. A comparison between large and small hydropower suggests that large hydropower contributes more to energy and water security and has less impact on the environment and ecology in relative terms. Of a total absolute production of 296,585 GWh, the largest contributions came from Sweden (63,282 GWh), France (54,387 GWh), Austria (33,085 GWh), and Italy (31,551 GWh). Significant potentials for capacity expansion in large hydro remain in France, Italy, Portugal, Greece, Romania, Austria, and Poland. In 2016, 14 Member States stayed below the planned production envisioned in the NREAP. Among those with the largest deviation in relative terms are Belgium and the Netherlands, both with low planned contributions of around 100 GWh in absolute terms. In contrast, the deviation of France and Greece in relative terms is lower than Belgium’s and the Netherlands’, but their deviation from their planned contribution (which is above 6,200 GWh and 4,800 GWh, respectively) is in absolute terms a multiple of Belgium’s

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hydro in their Progress Report. We thus assume that all their actual production was large hydro, up to the planned amount. Any remaining amounts are considered small hydro.

[64] https://www.hydroworld.com/articles/hr/print/volume-36/issue-7/articles/making-small-hydro-development-affordable-and-acceptable.html

[65] https://doi.org/10.1016/j.rser.2015.12.100

and the Netherlands' planned contributions.

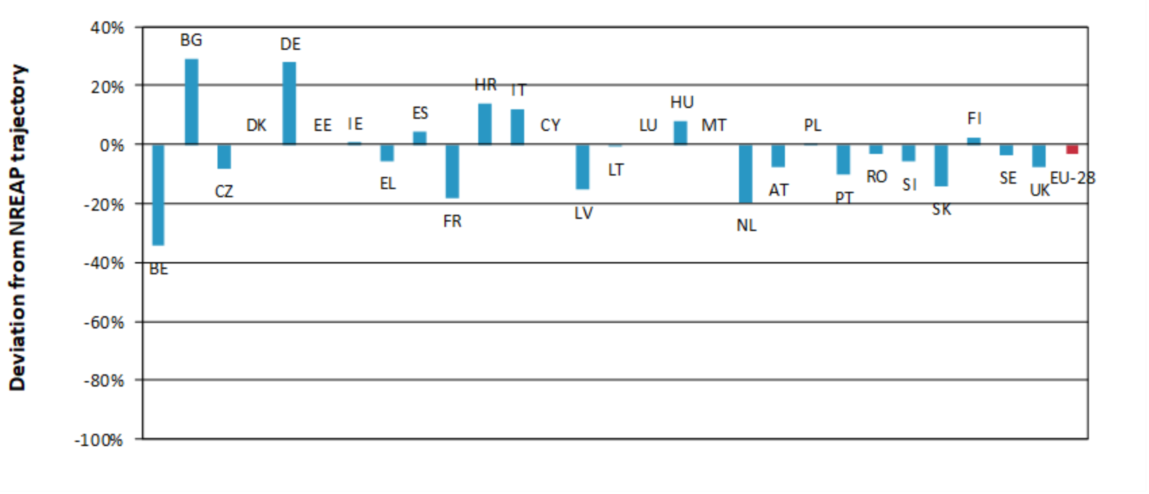

Figure 89. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for large hydropower

Mixed Hydro

While table 10 of the NREAP had only differentiated between the hydro subcategories “<1 MW”, “1-10 MW”, “>10 MW” and “of which pumped”, the Progress Report template introduced a new category called “mixed”, which in accordance with the new Eurostat methodology refers to the renewable portion of electricity produced in mixed (pumped and non-pumped) hydropower plants. Due to the absence of NREAP-planned figures, no comparison for this subcategory is provided here.

Bioliquids

The contribution of bioliquids to renewable electricity generation in 2020 is about three percent of wind energy or about eight percent of biomass-based electricity and the targeted NREAP share of bioliquids in the RES-E mix is about one percent of all RES-E sources in the EU. Thus, the significance of bioliquids with respect to its magnitude is minor in RES-E generation. Only three MS had in their NREAP planned any significant amount of electricity generated from bioliquids for 2016: Finland with 4,580 GWh, Italy with 3,619 GWh and Germany with 1,450 GWh. Of these, Finland and Germany stayed well below their indicative NREAP sectoral trajectory, while Italy was above its trajectory with 4,627 GWh of actual production. Sweden, Austria, Belgium and Denmark (in descending order) had planned very small amounts ranging between 65 and 3 GWh. Belgium, even though having planned only minor contributions, was the only other MS above its NREAP sectoral trajectory (30 GWh of actual production versus 29 GWh of planned production).

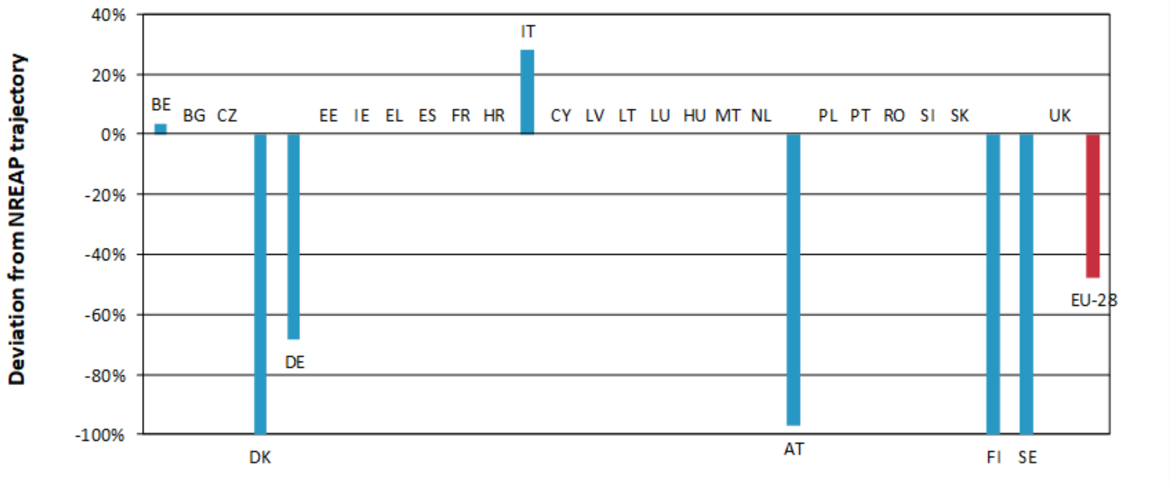

Figure 90. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for bioliquids

Geothermal Electricity

Similar to bioliquids, the in the NREAPs planned contribution of geothermal based electricity to renewable power generation is minor at the EU-level – less than one percent of total RES-E sources. Geothermal electricity is lagging behind the amounts as planned in the NREAPs. Most MS did not foresee any geothermal based electricity production by 2016. Of the 6,733 GWh actually produced, 6,289 GWh came from Italy, putting it almost exactly on track with its NREAP indicative sectoral trajectory. France, Germany and Portugal, all three with NREAP planned contributions between 200 and 550 GWh, report small amounts, but stayed well below their planned trajectories. Greece and the Netherlands planned a generation of around 120/100 GWh in their NREAP trajectories but had no production. A further five MS report zero production even though having foreseen some small contributions ranging between 2 and 60 GWh in their NREAPs. Long lead times from initial project ideas to actual installations as well as limitations of geothermal resources to certain locations and the costly evaluation might explain some of the delays. In addition, geothermal based electricity faces acceptance problems in some MS, as the environmental impact of the technology – impacts on ground water, seismology – is in some regions highly disputed.

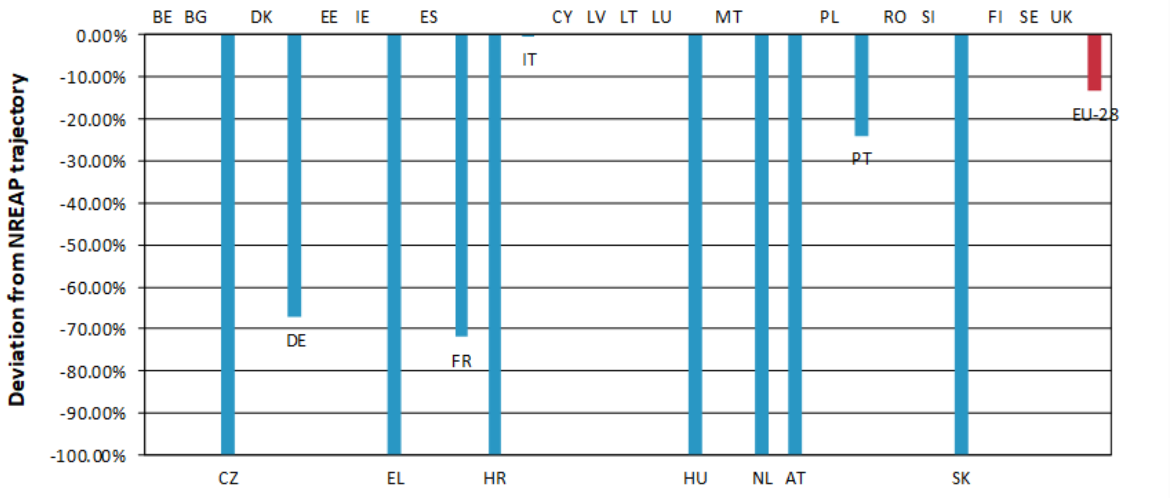

Figure 91. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for geothermal installations

Concentrated Solar Power

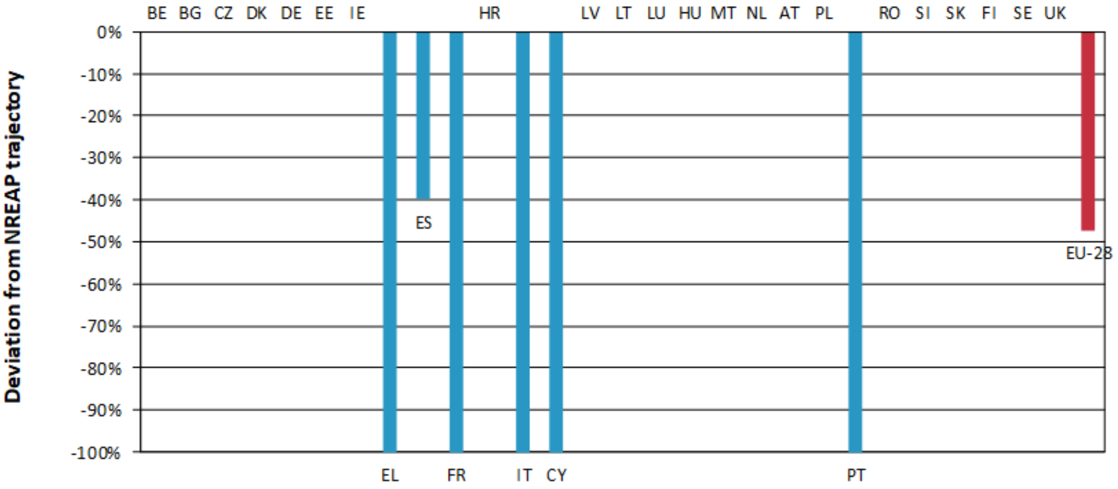

Figure 92. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for concentrated solar power

CSP deployment in the EU is significantly below the sum of the planned amounts from the NREAPs. EU-wide, six MS had planned a total of 10,562 GWh of CSP based electricity production for 2016 and have actually achieved roughly half of this. Most of this planned amount and all of the actually realised production of 5,579 GWh came from Spain. The other five MS had planned only small amounts in their NREAPs trajectories ranging between 60 and 600 GWh and report an actual production of zero. In Spain, the total installed capacity of 2.3 GW has remained the same since 2013, and the deviation from its indicative NREAP sectoral trajectory has thus been increasing. One major reason for this delay is that the costs of installations remain high. A study of Fraunhofer and NREL[66] report LCOE ranging between 10 - 15 €ct/kWh for a location with a direct normal irradiance of 2000 kWh/(m²a). However, if technology development continues and leads to higher efficiency of modules, cells and system and the market grows, LCOE are expected to fall to about 4.5 - 7.5 €ct/kWh, thus reaching grid parity and becoming a competitive technology for electricity supply.

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[66] Fraunhofer ISE and NREL 2018, Current status of concentrator photovoltaic (CPC) technology, 4/2018

Tide, Wave and Ocean Energy

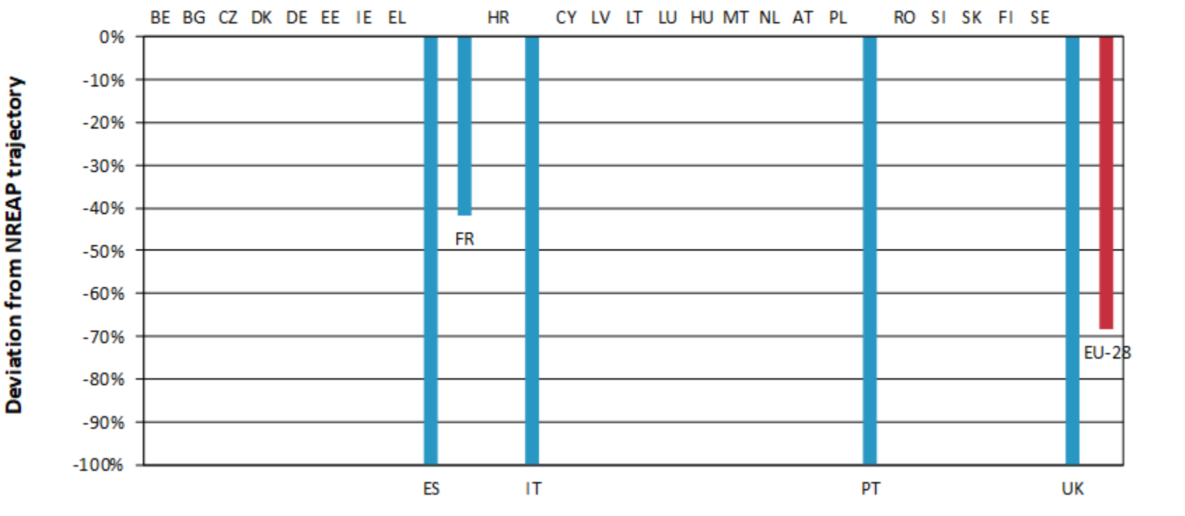

Figure 93. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for tide, wave and ocean energy

Electricity production from tide, wave and ocean technologies is developing much slower than planned in the NREAP sectoral trajectories. It is also the technology with the lowest planned contribution to the RES-E mix. Of the five MS who had foreseen any production, only France reports a production of 501 GWh. The installed capacity of 240 MW has remained the same since 2009, so production has remained constant with only slight fluctuations. The UK is the second MS that planned some significant contribution of almost 700 GWh in its NREAP, but actual production is marginal. However, currently several projects (totalling about 4 GW) are under development or in the planning phase in the UK[67]. If they are all realised, the UK's contribution to tidal and wave energy generation will be closer to levels as planned in their NREAP. The other three MS have NREAP indicative sectoral trajectories ranging between 1 and 22 GWh.

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[67] http://www.emec.org.uk/marine-energy/wave-and-tidal-projects/

RES-H&C Sector Overview

RES-H&C consumption has been growing slowly and steadily over the last two decades. Solid biomass is by far the largest contributor to the sector with 80,825 ktoe in 2016. Heat consumption from heat pumps stood at 9,816 ktoe, biogas at 3,600 ktoe, solar thermal heating at 2,184 ktoe, with smaller contributions from deep geothermal heating at 767 ktoe and bioliquids at 247 ktoe. Almost all MS promote the deployment of RES in the heating/cooling sector. The main support schemes used are financial incentives, such as grants, loans, subsidies (in about 21 MS) and fiscal incentives, such as tax return, deduction, exemption (in eight MS), A significant number of MS combine fiscal and financial support schemes, for example tax return and subsidy. Three MS offer no support scheme (Spain, Latvia and Portugal)[68].

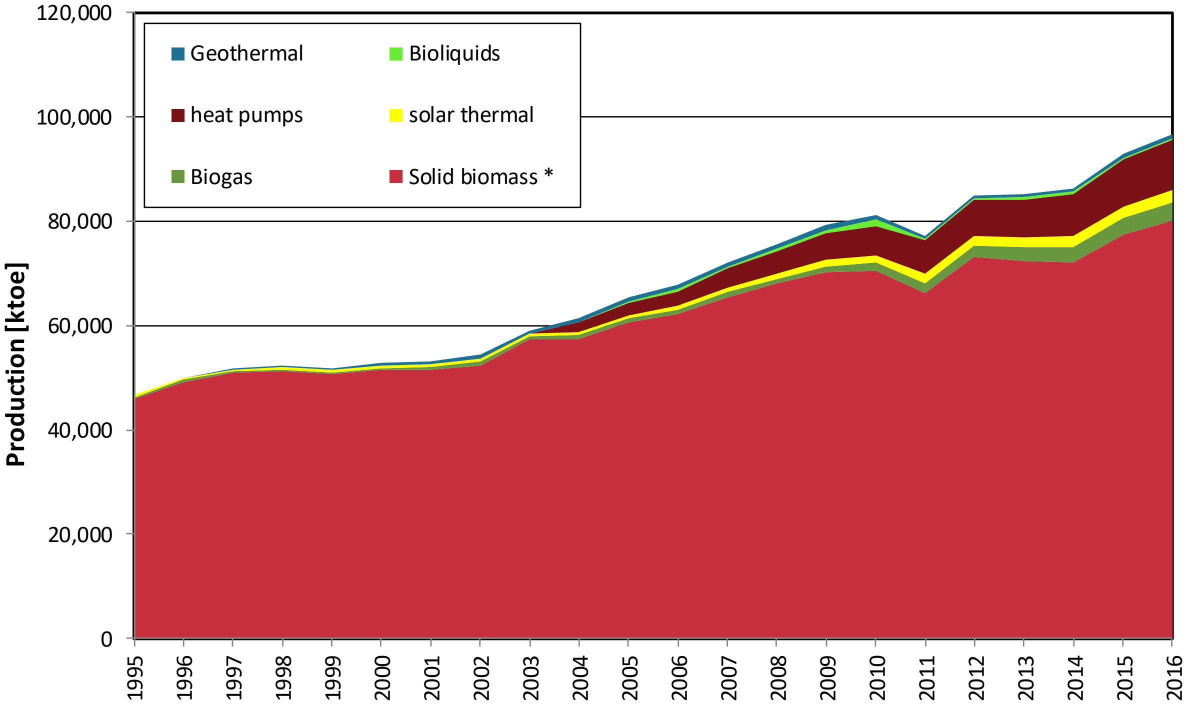

Figure 94. Production of heating and cooling from RES-H&C technologies in the EU-28 for 1995-2016. Results are based on Eurostat for 1995-2009 and on Member State Progress Reports for 2010-2016

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[68] JRC 2017, Renewables in the EU

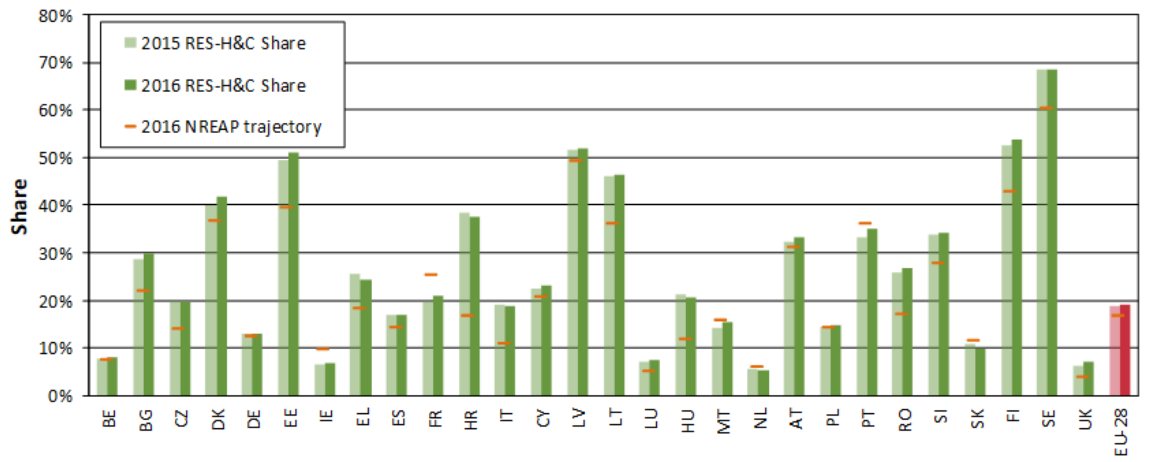

Figure 95. RES-H&C actual share vs. NREAP indicative sectoral trajectories in 2016 (%). Source: Eurostat and NREAPs

While five MS (Ireland, France, the Netherlands, Portugal and Slovakia) stayed below their in their NREAPs envisioned RES-H&C consumption in 2016, the remaining 23 MS were above their NREAP indicative sectoral trajectories. Ireland missed its sectoral trajectory in biomass and biogas, while France, in spite of applying several support instruments, mainly failed their sectoral trajectory for solar and geothermal energy, as did Slovakia. The Netherlands were unsuccessful in meeting their NREAP sectoral trajectory mainly in geothermal energy and heat pumps. But they increased the volume of their RES-H&C policy fund (Investment Subsidy Renewable Energy) and extended the circle of participants to public entities in 2017. Both measures are expected to lead to a larger participation of actors in and installation of RES-H&C in the nearby future.

Fifteen MS, namely Malta, Italy, Hungary, Bulgaria, Greece, Romania, Croatia, Slovenia, Finland, the Czech Republic, Lithuania, Sweden, Austria, Estonia, and Denmark have already achieved the shares as envisioned in their NREAP indicative sectoral trajectories for 2020. The largest positive deviations can be observed in Croatia and Malta.

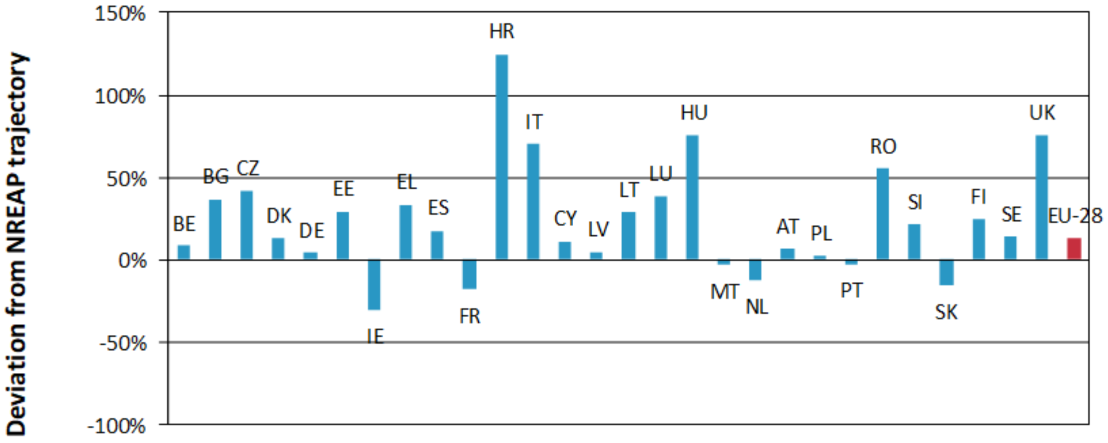

Figure 96. Deviation of actual 2016 share from 2016 NREAP sectoral trajectories share for RES-H&C. Source: Eurostat and NREAPs

The following two tables show the growth rate of RES-H&C technologies from 2015-2016, as well as their absolute values in 2016. Generally, growth rates for RES-H&C technologies are lower than in the RES-E sector. The sector's total growth rate is low due to the large contribution of the well-established and slow-growing solid biomass combustion. Geothermal heating is the fastest-growing technology but contributes very little in absolute terms. Biogas and heat pumps, however, both show strong growth and are also significant in absolute figures.

Table 24. Growth of RES-H&C technologies from 2015-2016. Data source: Progress Reports

Member State	RES-H [%]	Solar thermal [%]	Solid biomass [%]	Biogas [%]	Heat pumps [%]	Geothermal [%]	Bioliquids [%]
Belgium	7.00	3.00	8.30	-1.65	11.14	5.33	-36.19
Bulgaria	4.92	0.00	0.50	550.00	8.00	6.06	-
Czech Republic	0.00	5.56	1.41	15.48	16.72	-	-
Denmark	8.25	34.88	5.63	81.55	11.83	58.82	-42.86
Germany	3.05	0.00	3.36	1.58	9.21	20.48	-4.82
Estonia	3.31	-	2.85	-17.65	12.23	-	-
Ireland	5.84	6.92	2.68	10.23	22.22	-	-
Greece	-8.48	1.93	-15.20	-8.23	15.43	2.02	-
Spain	2.40	5.96	1.40	-12.52	6.32	0.00	-
France	9.77	3.11	9.63	24.74	9.45	10.66	-
Croatia	-2.54	11.54	-2.93	30.77	6.04	2.25	-
Italy	-1.39	5.26	-2.62	0.80	0.97	8.27	0.00
Cyprus	2.79	1.64	6.55	-0.11	0.00	-	-
Latvia	-0.55	-	1.30	2.67	-	-	-
Lithuania	4.21	-	4.06	9.38	-	25.00	-
Luxembourg	6.94	5.26	4.65	18.28	17.14	-	-
Hungary	0.36	4.67	-0.71	8.18	15.22	20.17	-
Malta	11.67	2.33	-8.33	14.29	22.03	-	50.00
Netherlands	2.04	0.00	0.89	-3.09	14.81	17.24	-22.73
Austria	2.96	0.00	6.43	30.61	8.33	-4.35	0.00
Poland	6.89	16.22	5.61	14.82	106.23	2.30	-
Portugal	2.89	4.61	2.80	3.53	-	-6.67	-
Romania	2.89	0.00	2.67	33.33	-	23.35	-
Slovenia	3.91	0.00	3.51	-9.89	-	14.03	-
Slovakia	-8.64	0.00	-8.51	-13.73	-	25.00	-
Finland	7.26	0.00	7.23	5.26	4.41	-	-
Sweden	2.72	0.00	1.15	11.76	13.38	-	-
UK	11.83	1.18	9.80	52.13	7.87	0.00	-
EU-28	3.97	3.08	-0.93	9.81	7.75	12.59	1.84

Table 25. RES-H&C consumption in the EU-28 in 2016 per technology. Data source: Progress Reports. Biomass data for Estonia is from Eurostat Energy Balances

Member States	RES-H [ktoe]	Solar thermal [ktoe]	Solid biomass [ktoe]	Biogas [ktoe]	Heat pumps [ktoe]	Geothermal [ktoe]	Bioliquids [ktoe]
Belgium	1,501	23	1,325	103	45	2	4
Bulgaria	1,174	22	1,010	26	81	35	0
Czech Republic	2,742	19	2,438	179	106	0	0
Denmark	2,754	50	2,347	157	196	3	2
Germany	13,142	671	9,566	1,675	972	100	158
Estonia	779	0	711	6	62	0	0
Ireland	309	14	230	10	55	0	0
Greece	1,359	200	896	15	239	10	0
Spain	4,769	293	4,008	52	375	19	22
France	13,296	166	10,575	242	2,178	135	0
Croatia	1,220	12	1,176	7	16	9	0
Italy	10,539	200	7,292	252	2,609	144	42
Cyprus	102	69	27	4	2	0	0
Latvia	1,154	0	1,123	31	0	0	0
Lithuania	1,122	0	1,110	11	0	1	0
Luxembourg	80	2	63	11	4	0	0
Hungary	2,161	11	2,012	17	5	115	0
Malta	14	4	1	1	7	0	0
Netherlands	1,448	27	1,024	157	155	68	17
Austria	4,632	183	4,154	64	208	22	1
Poland	5,399	52	5,170	102	53	22	0
Portugal	1,892	84	1,798	9	0	1	0
Romania	3,507	1	3,465	10	0	32	0
Slovenia	648	11	585	8	0	44	0
Slovakia	571	6	516	44	0	5	0
Finland	7,365	2	6,897	40	426	0	0
Sweden	9,842	11	8,418	57	1,356	0	0
UK	3,920	51	2,888	314	666	1	0
EU-28	97,439	2,184	80,825	3,600	9,816	767	247

Solar Thermal

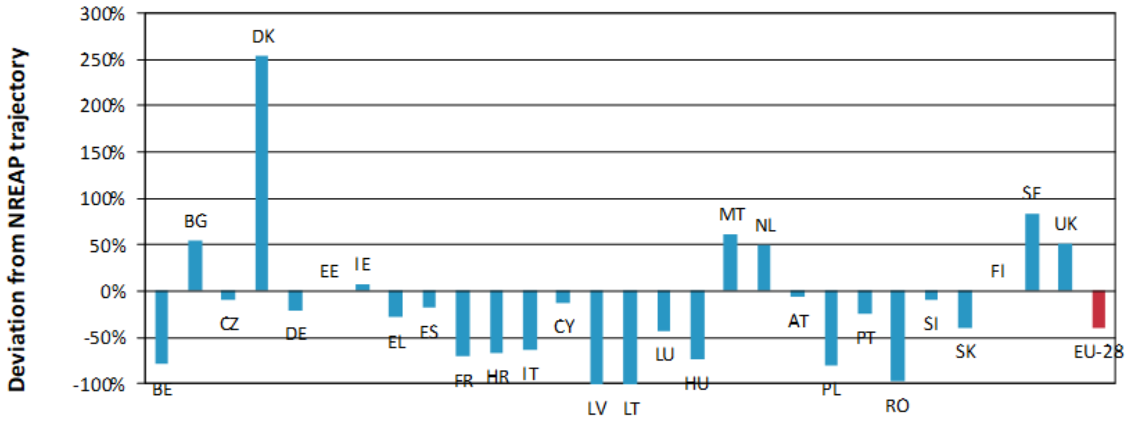

Figure 97. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for solar thermal installations. MT changed its NREAP in 2017 stating new solar thermal energy targets for the year 2020. However, as the updated NREAP does not contain a trajectory for solar thermal, data from its previous NREAP is used

With a total consumption of 2,184 ktoe in 2016, solar thermal is one of the smaller contributors in the RES-H&C sector. Most MS had planned relatively small amounts of solar thermal heating. The technology is now generally showing an even slower development than was expected at the time the NREAP sectoral trajectories were drafted. Only six MS report a consumption of more than 100 ktoe for 2016 (Austria 183 ktoe; Spain 293 ktoe Germany 671 ktoe; Greece 200 ktoe; Italy 200 ktoe and France 166 ktoe). As shown in the figure, all six of these large consumers remained below their NREAP planned amounts. In total, nineteen MS are behind their envisaged NREAP indicative sectoral trajectory. Lithuania had planned 6 ktoe but provided no information on actual production in its Progress Report. Latvia and Finland had planned no production, but Finland reported 2 ktoe in 2016.

In Romania, a lack of awareness on the benefits of solar thermal energy, especially in rural areas, as well as low governmental support for diffusion seem to be part of the reason why it does not exploit its large solar thermal potential and displays a delayed deployment compared to its NREAP sectoral trajectory. However, in 2016 it relaunched its Green House Programme from 2011 with a budget of about €17.7 million, which supports solar thermal systems as well as heat pumps[69]. The low resources of solar thermal energy in Latvia and Lithuania (sunshine of about 1200 h/a or 1000 kWh(m²a)) provide a low incentive for its deployment, while in Southern Europe the potential is higher and so are the trajectories as set in those NREAPs. In Belgium, uncertainties on the subsidy scheme and lower support in earlier years still have an effect on deployment levels in 2016[70].

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[69] http://www.solarthermalworld.org/taxonomy/term/44031

[70] http://www.sunwindenergy.com/system/files/swe_0215_020-021_review_solar_thermal_in_the_benelux.pdf

Solid Biomass

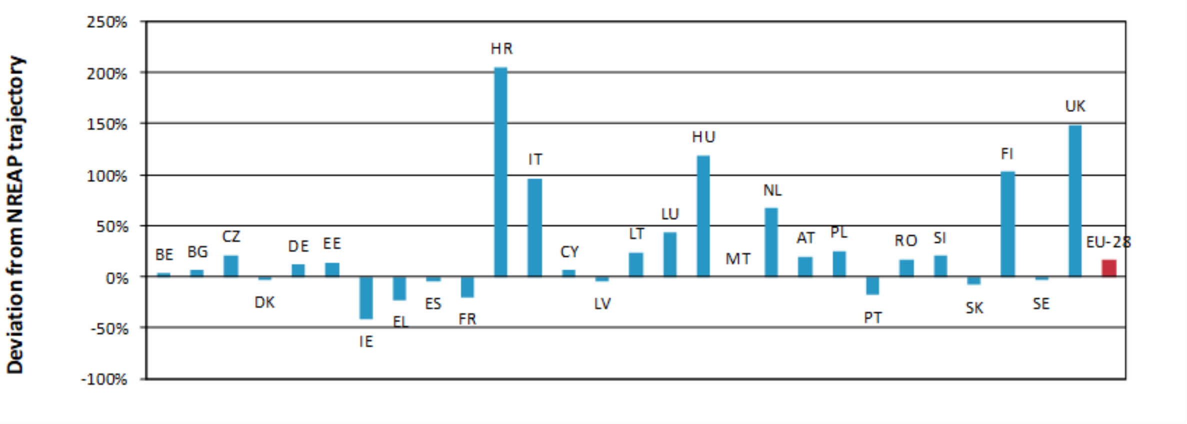

Figure 98. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for solid biomass. Eurostat Energy Balances data used for Estonia

Solid biomass provides by far the largest contribution to RES-H&C consumption with 80,825 ktoe in 2016 out of a total of 96,427 ktoe of RES-H&C. In absolute terms, the largest consumers of heating and cooling produced from solid biomass were France with 10,575 ktoe, Germany with 9,566 ktoe, Finland with 8,418 ktoe and Italy with 7,297 ktoe. Roughly one sixth of the consumption is from grid-connected units, while the rest is from decentralised heating. The use of solid biomass had already been well established in some MS before 2010, who did thus not foresee any large net increase of solid biomass use for H&C in their NREAPs. The focus is rather on replacing traditional biomass installations with newer, more efficient ones. Finland had actually planned a decrease of solid biomass heat production compared to 2005 levels but reported an increase from 5,450 ktoe in 2005 to 6,897 ktoe in 2016. 19 MS have overachieved their 2016 planned consumption, thirteen of which are even already above their indicative sectoral trajectory for 2020. These include Malta, which had planned no deployment at all until 2020 but actually reports 1 ktoe, and Finland, Hungary, Poland, Lithuania, Croatia, Austria, Slovenia, Germany, the Netherlands, the Czech Republic, Italy and Estonia. Ireland shows the largest deviation from its NREAP sectoral indicative trajectory but has introduced a new support scheme for biomass in 2017 that was initially planned for 2014. Thus, an increase in the number of installations is expected. Overall, in contrast to electricity, heat from biomass is generated and consumed mostly locally. Thus, local authorities could play a more important role in deployment of this technology. However, when coupling of heat and electricity generation takes place, then national authorities are needed as well as a stable policy and regulatory framework.

Biogas

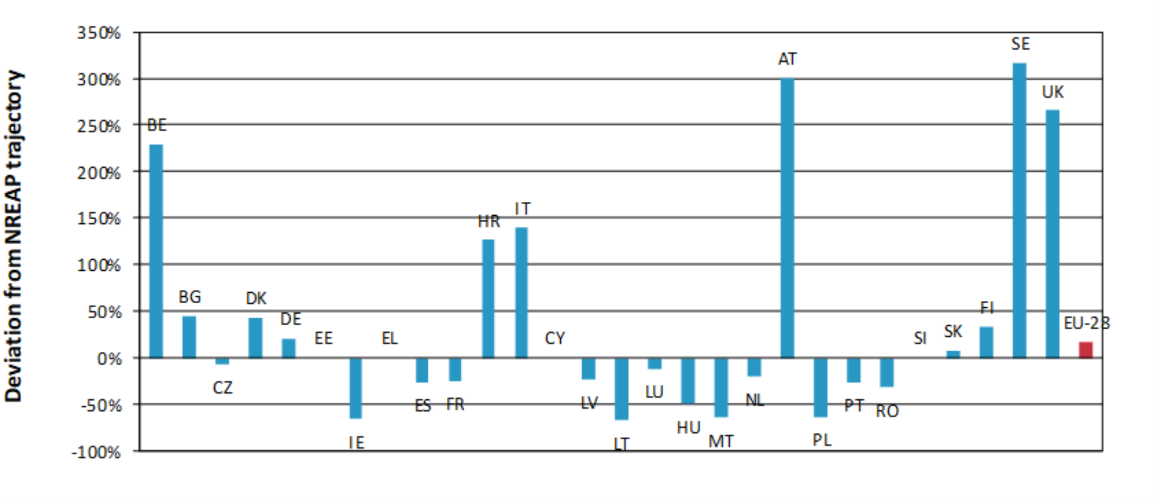

Figure 99. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for biogas. Eurostat energy balances data used for Estonia

With 3,600 ktoe consumed in 2016, biogas was the third largest technology in RES-H&C after solid biomass and heat pumps. Germany was by far the largest consumer of biogas for heating with 1,675 ktoe, almost half of the EU total. It was followed by the UK with 314 ktoe, Italy with 252 ktoe and France with 242 ktoe. Thirteen MS consumed less biogas for heating in 2016 than they had been planned for in their NREAPs sectoral trajectories. Among them was Poland, which is said to have a high biogas potential but with a weak support policy: in 2016 grid connection for CHP biogas plants was not guaranteed and the procedure complicated. Overall uncertainty regarding regulations prevailed but the political situation seems to become more favourable towards biogas, as it is recognised as an important pillar of energy security and great opportunity for the agricultural regions[71]. Other MS such as Sweden, Austria, the UK and Belgium showed significant overachievement. In total, the EU is above the sum of the sectoral trajectories as set in the NREAPs for biogas heating. Estonia, Greece, Cyprus and Slovenia had not foreseen any production for 2016, but all report small amounts.

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[71] http://biogasaction.eu/biogas_pl/

Heat Pumps

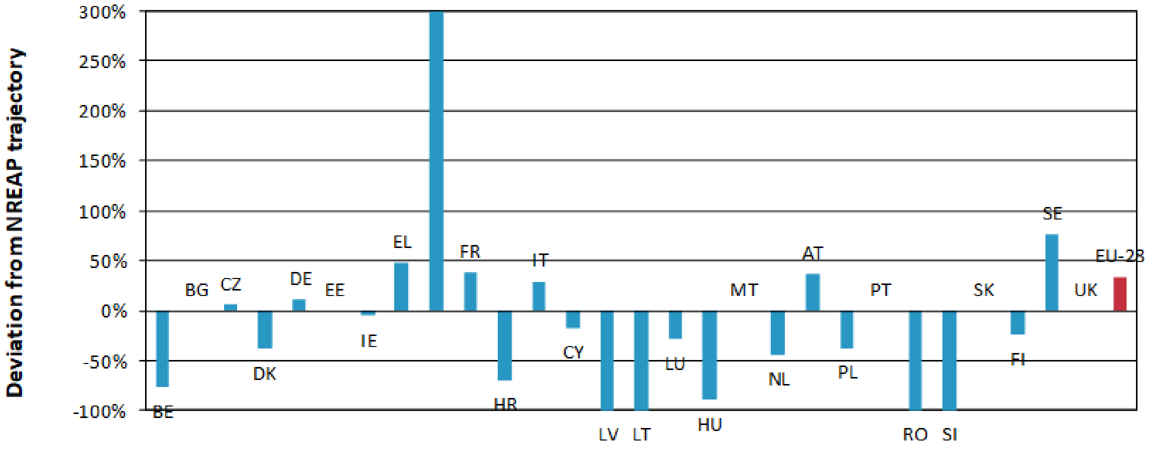

Figure 100. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for heat pumps. MT changed its NREAP in 2017 stating heat pump targets for the year 2020. However, as the updated NREAP does not contain a trajectory for heat pumps, data from its previous NREAP is used

9,816 ktoe of heat from heat pumps was consumed in 2016, making this technology the second-largest contributor to the RES-H&C sector after solid biomass, but with much faster growth in the recent years. Spain reported over ten times more deployment than planned in its NREAP sectoral trajectory, with an actual consumption of 375 ktoe versus 34 ktoe as planned in their NREAP. Italy remained the biggest consumer of heat from this technology with 2,609 ktoe, followed by France with 2,178 ktoe and Sweden with 1,356 ktoe. In Germany, heat pumps achieved a share of almost 43% (2017) in building permissions[72]. Heat pumps are a crucial cross-sectional technology for the German energy transition and play a major role in many low-carbon scenarios. Implementation of heat pumps is affected by several EU-level policies such as the RED, Ecodesign, Performance of Building, Energy Labelling and Energy Efficiency Directive.

Latvia, Lithuania, Romania and Slovenia report no deployment of heat pumps, but had also planned only small amounts in their NREAPs. Belgium's deployment is delayed. There have been different regional support programmes up to 2014. Currently, at the national level heat pumps are eligible for tax reliefs, which are expected to have a small or medium, positive impact on the sales of heat pumps[73].

In contrast to biomass combustion technologies, heat pumps are a more recent technology (even though they have been used for more than 40 hears for heating purposes), and from a functional perspective they can fully replace gas or oil-fired systems. Their significance has grown in line with the energy transition, but at different levels in the different MS. For example, markets like the UK, Germany, Austria and Belgium are growing but are still on the first part of the diffusion curve (total number of buildings), while Sweden is close to market saturation[74]. In some MS the size and expertise of the local market is still in its infancy (e.g. Slovenia, Slovakia) and, thus, contributes to a certain degree to a slow deployment of heat pump systems in these countries.

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[72] https://www.waermepumpe.de/presse/zahlen-daten/

[73] https://www.ehpa.org/about/news/article/heat-pump-implementation-scenarios-was-released/

[74] http://www.ehpa.org/fileadmin/documents/03._Media/Studies_and_reports/Heat_Pump_Implementation_Scenarios.pdf

Geothermal Heating

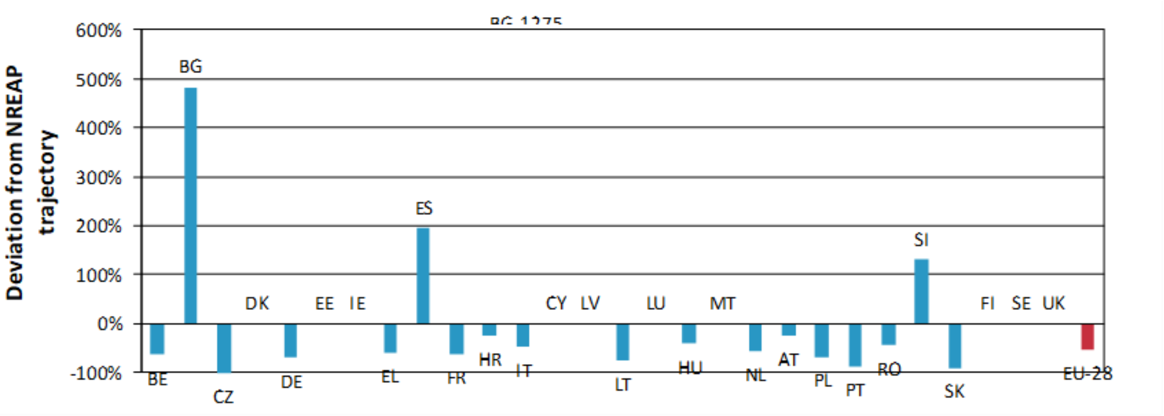

Figure 101. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative target (NREAP) for geothermal installations

Geothermal heat (still) plays a marginal role in RES-H&C but displays the highest growth rate of all technologies in this sector. Ten MS had not planned any consumption of geothermal heating in 2016, among which Denmark, Sweden, the UK and Cyprus, but do report some small amounts of actual consumption. Fifteen MS underachieved compared to their NREAP sectoral trajectories, putting the EU in total below the sum of the NREAP sectoral trajectories. In absolute numbers, Italy consumed 144 ktoe, France 135 ktoe, Hungary 115 ktoe and Germany 100 ktoe in 2016, while all other MS report a consumption of less than 100 ktoe.

Bioliquids

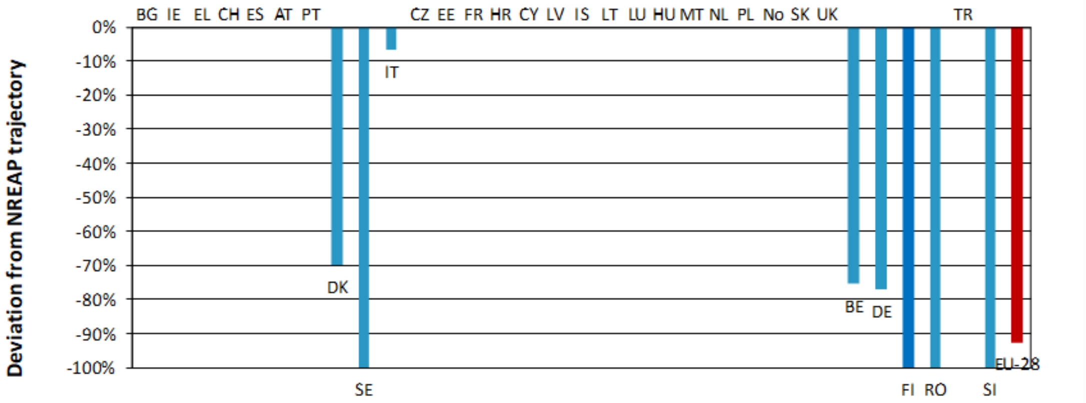

Figure 102. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for bioliquids

Heating and cooling from bioliquids contributes only a small amount to the RES-H&C sector and their growth rate is the smallest in the EU, apart from solid biomass. Most MS did not plan any deployment in their NREAP sectoral trajectories for 2016. Germany was the largest consumer in 2016 with 158 ktoe, followed by Spain with 22 ktoe consumption, Italy with 42 ktoe, Austria with 17 ktoe, Belgium with 4 ktoe and Denmark with 2 ktoe. Belgium, Denmark and the Netherlands display a negative growth rate. Sweden, Finland, Romania and Slovakia had planned some consumption in their NREAP sectoral trajectories, but did not realise any consumption. In total, the EU is lagging behind the sum of the envisioned trajectories in the NREAPS for this technology.

RES-T Sector Overview

All MS have national trajectories depicting how they plan to achieve the overall binding national target of 10% RES share in the transport sector by 2020 as set in the RED. The main instrument in most MS to promote consumption of RES in the transport sector is the RES quota in fuels – an obligatory minimum share in petrol and diesel. However, Sweden relies on a tax mechanism and Estonia relies on subsidies, respectively. Note that several MS combine the quota with tax regulations and other subsidies to further stimulate RES-T deployment. Since a cap of 7% on the amount of biofuels made from crops has been implemented in 2015 (ILUC Directive), biofuels from lignocellulose and waste (and some other feedstock like algae) have to fill the remaining gap to 10%.[1] These feedstocks are considered to have less (indirect) environmental impacts and also count twice towards achieving the targets. The implementation of the ILUC Directive in 2015 has caused some delays in RES-T achievement in some of the MS, for example if they temporarily paused obligations/support schemes while implementing the consequences of the ILUC Directive in their national system.

The template for the 2017 MS Progress Reports foresaw a more detailed listing of biofuel types (table 1d) compared to the original Progress Report template or the NREAPs. While seventeen MS used the new template, Austria, Belgium, the Czech Republic, Estonia, Finland, France, Croatia, Hungary, Portugal, Sweden and Slovenia reported in the old format. For comparison with NREAP-planned values, categories were summed up accordingly for those Member States which had used the new template.

The dominating renewable energy source in transportation is biodiesel, followed by bioethanol and renewable electricity – mainly in non-road transport. Similar to heat pumps in the H&C sector, e-mobility in transport relies on a cross-sector energy source - electricity -, which plays a major role in long-term energy transition scenarios as do low ILUC biofuels.

Figure 27 shows the development of biofuels and RES-E consumption in transport since 1995. Use of all fuels except bioethanol/-ETBE has grown since 2009. Bioethanol/-ETBE use has been falling since 2012 and amounted 2,476 ktoe in 2016. In sum, the growth in biofuel use has slowed down. The most widely used fuel in 2016 was biodiesel, with 10,278 ktoe. "Other biofuels", a category, which includes vegetable oils and biogas among others, has been on a growth track again since 2012 and amounted 664 ktoe in 2016. The use of electricity grew slowly but steadily, amounting 1,701 ktoe in 2016. Virtually all of the electricity consumption was in non-road transport. Overall, the RES-T share in the EU has grown to 7.1% in 2016.

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[1] https://www.eea.europa.eu/data-and-maps/indicators/use-of-cleaner-and-alternative-fuels/use-of-cleaner-and-alternative-13

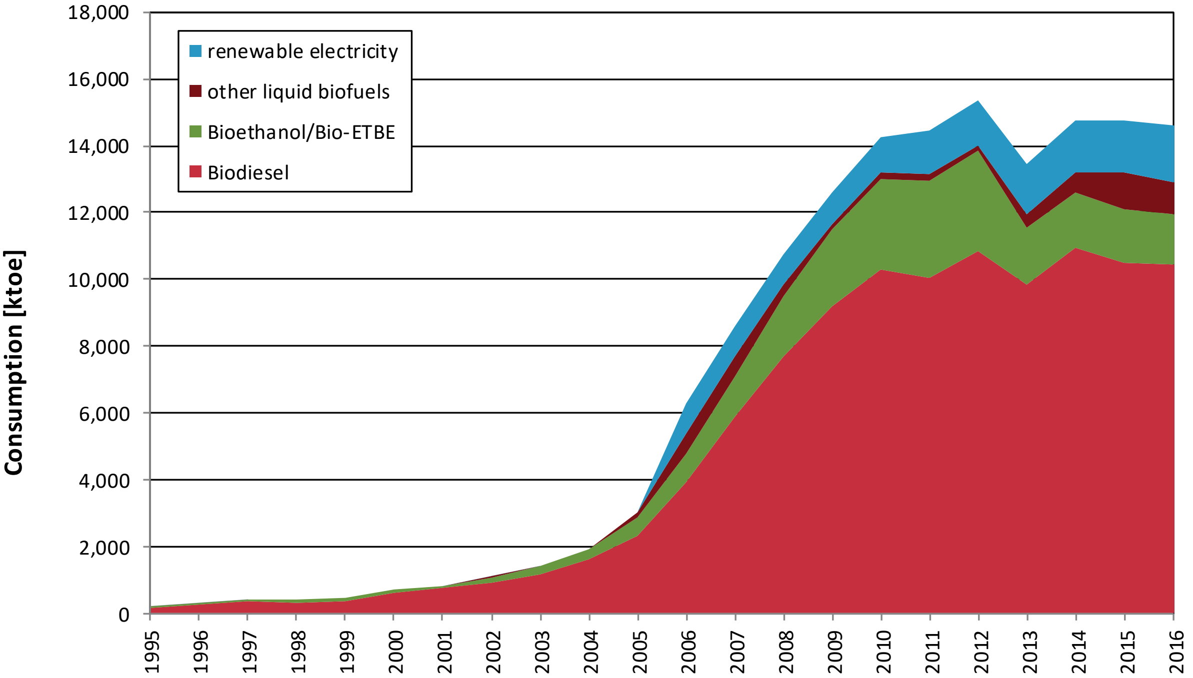

Figure 103. Consumption of energy in transport (RES-T) in the EU-28 for 1995-2016. Results from 1995-2009 are based on Eurostat. Results from 2010-2016 are based on Member State Progress Reports. Until 2010 all consumed biofuels are included; as of 2011 only those compliant with Articles 17 and 18 of the RES Directive are included here, as reported in the Progress Reports

The following graphs and tables detail the developments in the RES-T sector for individual MS.

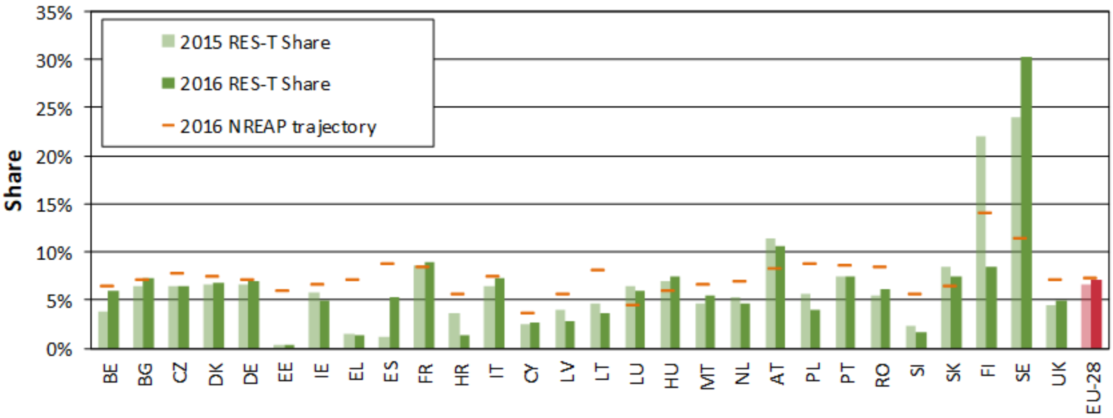

Figure 104. RES-T actual share vs. NREAP indicative sectoral trajectories 2016 (%). Source: Eurostat SHARES & NREAPs

The RES-T sector has seen slower progress than the RES-E and RES-H&C sectors. A total of nineteen MS are below their in their NREAPs envisioned shares of RES-T for 2016, six of which have achieved less than half the share they were planning for in their NREAP indicative sectoral trajectories. The highest share, and at the same time the highest positive deviation can be observed in Sweden, where the RES-T share stands at 30%. This already far surpasses the 14% foreseen for 2020 in their NREAP sectoral trajectory. Austria's share of RES-T is already at he level of the binding national RES-T 2020 target and overachieved its 2016 indicative sectoral trajectory. Besides Sweden and Austria, most of the other MS are not close to their envisioned NREAP sectoral trajectory. While Spain displays the highest increase in its share of RES-T, Finland shows the largest decline from 2015 to 2016 of renewables use in the transport sector.

Annual variation in biofuel consumption in the transport sector is explained by Finland's biofuel legislation, allowing distributors to flexibly meet their obligation, e.g. in advance. Thus, even though consumption of renewables grew slightly compared to the previous year, the share decreased as the amount of other fuels grew more than renewable energy sources[2]. However, Finland's target in the transport sector is to increase its RES-T share to 30% in 2030. To achieve this target, Finland plans to further exploit its abundant resources (forest) and explore technological know-how regarding advanced biofuel production.[3] Thus, it designs special policies to support technological development and growth of production facilities.

Overall, growth of the RES-T sector is low in the EU. Several factors cause the delay, such as delayed implementation of sustainability verification or enforcing systems, pausing of obligations related to ILUC Directive, limited resources from crops, high risk projects to produce advanced (lignocellulose based) biofuels, high upfront costs, and thus, very high investment costs translating into high abatement costs of CO_2. Regarding e-mobility reasons behind the slow uptake are economic (consumers find electric cars currently still too expensive), market, geopolitical challenges in battery supply for e-mobility as well as (still) limited production capacities (slow structural changes in companies) for electric cars and uncertainty about the most promising future energy source/mobility technology.

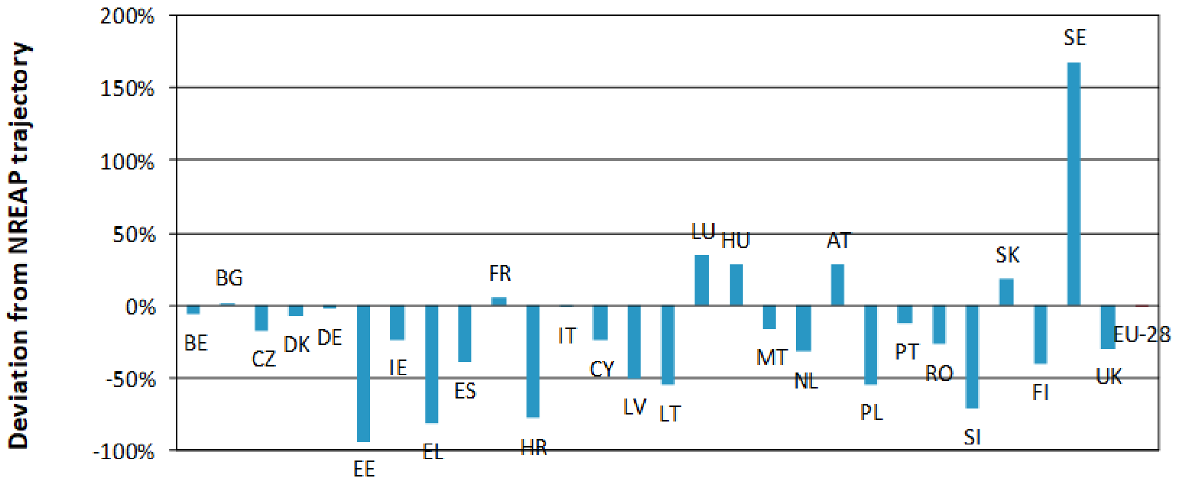

Figure 105. Deviation of actual 2016 share from 2016 sectoral trajectories for RES-T. Source: Eurostat and NREAPs

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[2] https://bioenergyinternational.com/markets-finance/finlands-use-renewable-energy-record-level-2016

[3] https://www.comsynproject.eu/app/uploads/2018/06/Kurkela_Challenges-and-opportunities-of-biofuel-production-in-Finland.pdf

Table 26. Growth rates in RES-T consumption in the EU-28 from 2015-2016 per technology. Data source: Progress Reports and Eurostat SHARES. RES-T totals include double counting from relevant biofuels and electricity in road-based transport

Member State	RES-T [ktoe]	Bioethanol/ Bio-ETBE [ktoe]	Biodiesel [ktoe]	Renewable electricity [ktoe]	Other biofuels [ktoe]	Hydrogen [ktoe]
Belgium	0.57	6.78	80.41	11.33	-	
Bulgaria	0.12	2.17	15.82	9.09	-	
Czech Republic	0.03	-23.81	8.58	11.76	-	
Denmark	0.04	0.00	1.76	0.00	-	
Germany	0.09	-2.83	0.31	15.45	0.00	
Estonia	0.08	-	-	7.42	-	
Ireland	-0.09	9.71	-12.19	9.18	-	
Greece	-0.02	-	123.98	-8.24	-	
Spain	3.42	-32.13	23.09	-	-6.68	
France	0.04	9.22	3.08	6.39	-	
Croatia	-0.65	-	-96.50	10.15	-	
Italy	0.12	46.15	-7.92	9.75	-41.92	
Cyprus	0.12	-	-6.86	-	-	
Latvia	-0.30	6.49	-86.09	3.83	-	
Lithuania	-0.14	-32.99	-13.32	16.44	-	
Luxembourg	-0.12	28.57	7.28	31.85	-100.00	
Hungary	0.09	4.65	7.63	8.77	-	
Malta	0.17	-	3.80	41.89	635.00	
Netherlands	-0.13	-20.42	-23.18	15.79	0.00	
Austria	-0.05	-5.00	1.64	3.91	-52.05	
Poland	-0.21	9.25	-42.04	14.47	-	
Portugal	0.04	-3.06	-21.93	32.69	-30.96	
Romania	0.21	-100.00	-94.54	-1.67	-	
Slovenia	-0.24	-35.59	-37.93	11.63	-	
Slovakia	-0.02	-10.96	-2.62	9.09	-	
Finland	-0.63	3.03	-74.77	0.52	-5.00	
Sweden	0.39	-19.12	30.92	5.07	20.00	
UK	0.14	-0.38	11.76	11.76	74.27	
EU-28	0.11	-3.72	-0.69	8.87	-15.03	

Table 27. RES-T consumption in the EU-28 in 2016 per technology. Data source: Progress Reports and Eurostat SHARES. RES-T totals include double counting from relevant biofuels and electricity in road-based transport and can therefore be higher than the sum of individual technologies

Member State	RES-T [ktoe]	Bioethanol/ Bio-ETBE [ktoe]	Biodiesel [ktoe]	Renewable electricity [ktoe]	Other biofuels [ktoe]	Hydrogen [ktoe]
Belgium	534	41	391	39	0	0
Bulgaria	186	33	130	8	0	0
Czech Republic	400	48	253	38	0	0
Denmark	279	44	173	19	0	0
Germany	3890	721	1632	284	195	0
Estonia	3	0	0	1	0	0
Ireland	207	33	86	1	0	0
Greece	70	0	50	8	0	0
Spain	1497	15	739	0	405	0
France	3871	474	2641	233	0	0
Croatia	24	0	1	10	0	0
Italy	2377	32	931	321	76	0
Cyprus	17	0	9	0	0	0
Latvia	27	8	2	5	0	0
Lithuania	62	7	50	2	0	0
Luxembourg	115	9	81	4	0	0
Hungary	323	45	141	28	0	0
Malta	11	0	5	0	1	0
Netherlands	478	113	116	44	3	0
Austria	894	57	372	186	105	0
Poland	642	168	290	78	0	0
Portugal	410	22	236	17	2	0
Romania	353	0	8	88	0	0
Slovenia	30	4	14	5	0	0
Slovakia	172	20	119	14	0	0
Finland	371	68	109	19	2	0
Sweden	2814	110	1249	145	120	0
UK	2031	398	589	110	30	0
EU-28	22091	2467	10417	1706	939	0

In the following, bioethanol/bio-ETBE, biodiesel, renewable electricity, and other biofuels are described more closely.

Bioethanol/Bio-ETBE

EU-wide, a total of 2,467 ktoe of bioethanol and bio-ETBE were consumed in 2016. Reported consumption reached its peak in 2012 with 3,000 ktoe and has since been falling. In absolute numbers, the biggest consumers in 2016 were Germany with 721 ktoe, France 474 ktoe, and the UK with 398 ktoe. Relative to the NREAP-planned sectoral trajectory, there is only one MS who is above track: With its 33 ktoe, Bulgaria reports more than double its planned amount of 15 ktoe (NREAP sectoral trajectory). Estonia, Greece, Croatia, Cyprus, Malta and Romania report zero consumption.

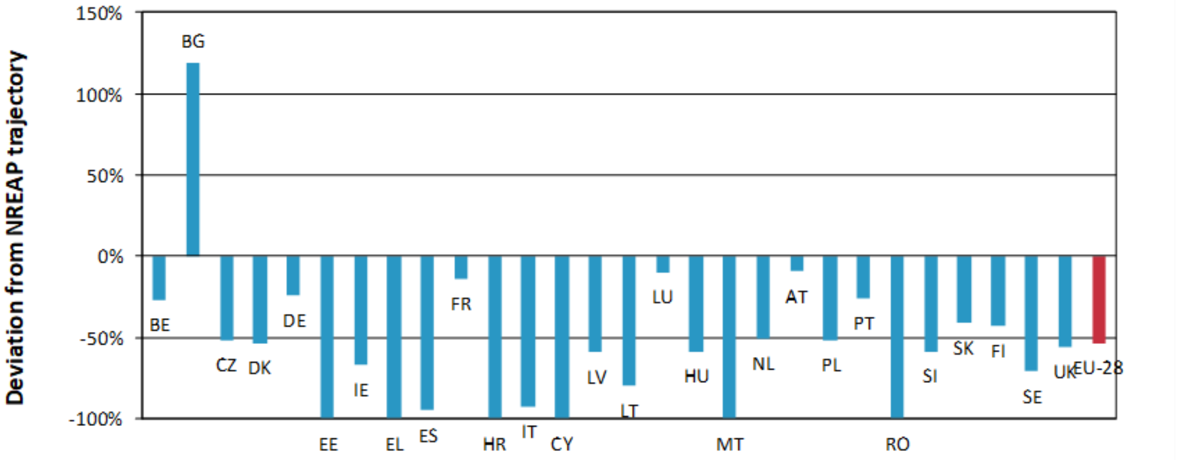

Figure 106. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for bioethanol/bio-ETBE

Biodiesel

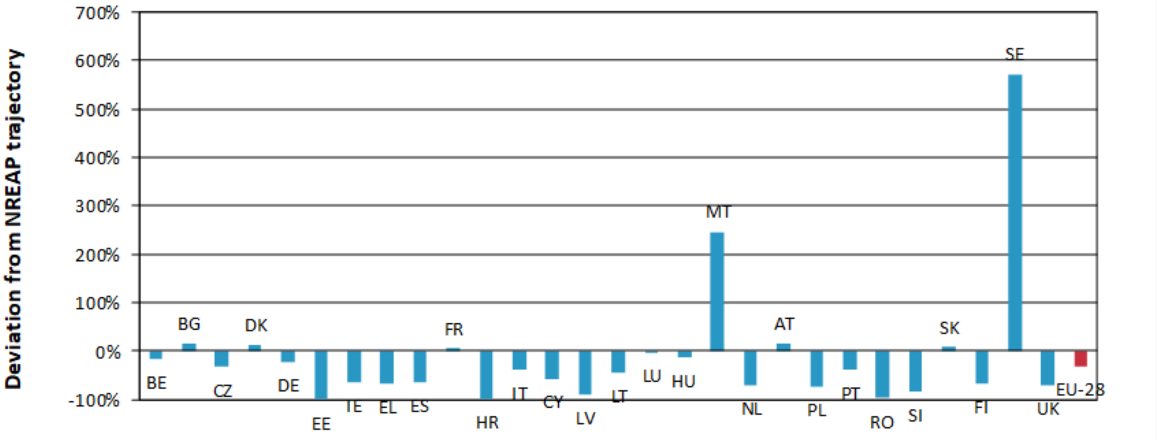

Figure 107. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for biodiesel. MT changed its NREAP in 2017 stating new targets for biofuels in transport for the year 2020. However, as the updated NREAP does not contain a sectoral trajectory and a specification, data from its previous NREAP is used

Biodiesel is the largest contributor to the RES-T sector with a total of 10,417 ktoe consumed in 2016. Only seven MS were above track in 2016, with a very large positive deviation to be observed in Sweden where 1,249 ktoe were reported as actual consumption versus 186 ktoe planned in its NREAP indicative sectoral trajectory. Sweden was also the third largest consumer in absolute numbers, after France with 2,641 ktoe and Germany with 1,632 ktoe.

Renewable Electricity in Transport

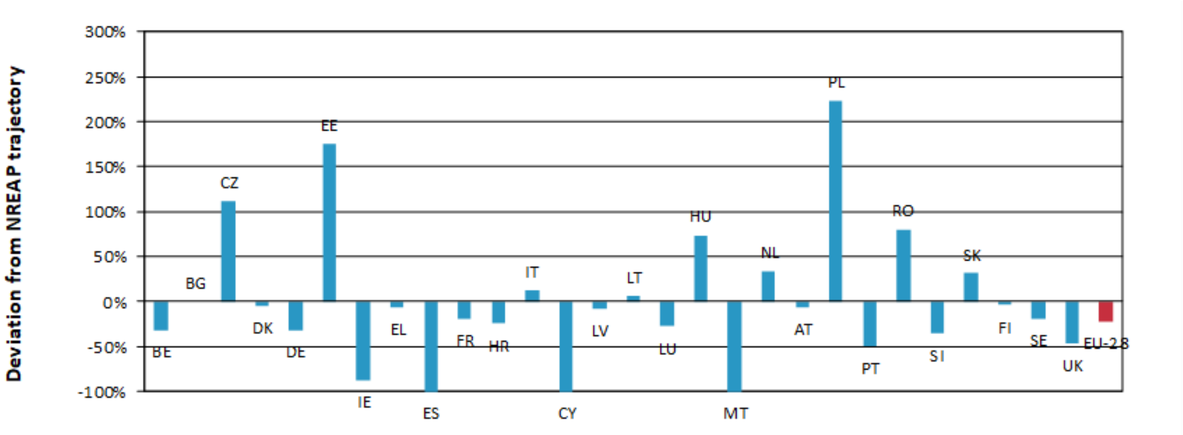

Figure 108. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for electricity in transport. MT changed its NREAP in 2017 stating new targets for renewable electricity in transport for the year 2020. However, as the updated NREAP does not contain a sectoral trajectory, data from its previous NREAP is used

After biodiesel and bioethanol/bio-ETBE, renewable electricity made the third-biggest contribution to the RES-T sector with 1,706 ktoe consumed in 2016, the vast majority of which came from rail transport. In absolute terms, the largest consumers were Germany (284 ktoe), France (233 ktoe), Austria (186 ktoe), and Sweden (145 ktoe). The latter two MS have very high RES-E shares and can thus have significant renewable electricity consumption even with a moderate degree of electrification in the transport sector.

Other Biofuels

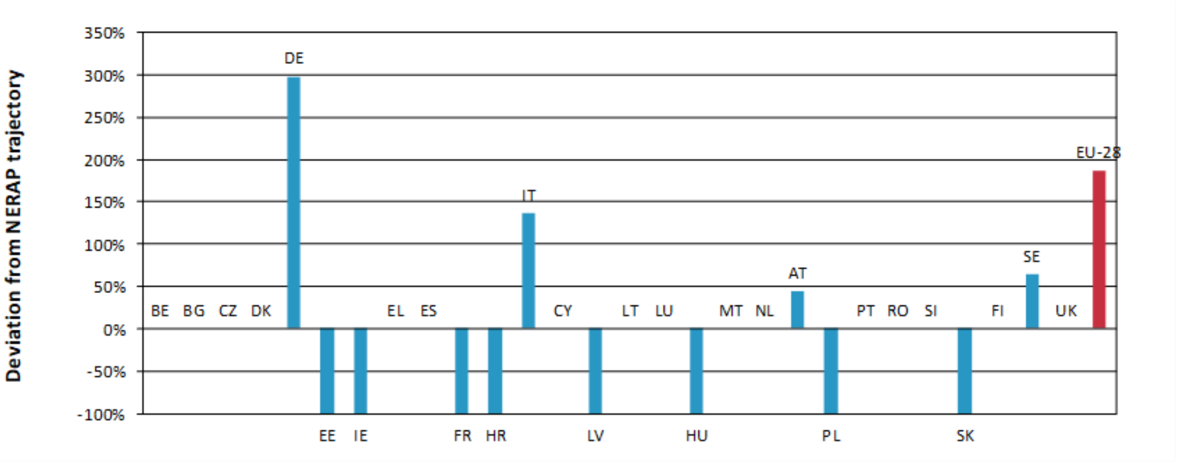

Figure 109. Deviation of actual 2016 deployment (Progress Report) from 2016 indicative sectoral trajectories (NREAP) for other biofuels

This category includes, among others, biogas and vegetable oils. Consumption in the EU-28 was higher in 2015 (1,105 ktoe) than in 2016 (939 ktoe). Twelve MS had planned any consumption in this category for 2016 in their NREAP sectoral trajectories, of which only Germany, Austria, Italy and Sweden show a positive deviation. Spain and the UK had planned no production but report 405 ktoe and 30 ktoe, respectively.

Hydrogen

No Eurostat data is available for hydrogen from RES consumed in the transport sector. Also all NREAPs indicative sectoral trajectories estimate zero deployment and all Progress Reports report zero consumption or provide no data. Therefore, an assessment of this technology is not done at this stage.

Appendix B Implemented and planned policy measures

In this Annex, we will present a detailed analysis of the MS policies and measures to identify:

1) What is the **progress of the MS in implementing the policies and measures** they committed to in their NREAP and in their Progress Report.
2) What is the progress of the MS in implementing policies and measures providing a sufficient **long-term security**.

For Question 1 we analysed:

- Whether or not the MS report in their 2017 Progress Report that they have actually adopted the planned measures they indicated in their NREAP and 1st, 2nd and 3rd Progress Report.
- Whether they have maintained their existing policies.
- Whether they have reviewed the measures they planned to review.

For each of the sectors, an evaluation is made regarding whether or not a MS fulfils earlier commitments (yes/no/partially). This qualitative evaluation is based on the implementation of measures, not on the progress made in terms of renewables deployment and thus likeliness of target/trajectory achievement. The evaluation therefore deviates significantly from the assessment of target/trajectory progress. Reasons for not or only partially fulfilling earlier commitments can be manifold, e.g. the non-implementation, non-enforcement, change or cancellation of related policies or allocated budget. Some MS are already overshooting their binding overall 2020 RES targets as defined in the RES Directive and have reduced their policy commitments (e.g. Bulgaria, Czech Republic and Croatia).

For Question 2 we analysed:

- Whether MS provide information on whether and how support will be maintained in the coming years, e.g. by providing a schedule for the allocation of support over the coming years. Such schedules increase the planning certainty for investors.
- Whether or not MS have made retroactive changes to their support schemes.

The evaluation of the long-term security of the support instruments (high/low/moderate) reflects the continuity and reliability of support policies and budgets. In order to provide ‘moderate’ or ‘high’ long-term security of support, a clear schedule for the allocation of support at least until end of 2020 had to be provided. In addition, it is taken into consideration whether MS’ RES support framework has seen many regulatory changes in the past, which can impact regulatory and market stability. In cases where retroactive changes occurred, investor confidence and long-term security of support schemes is significantly undermined.

Belgium

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  Belgium has fulfilled its commitments expressed in the NREAP and earlier Progress Reports in terms of policy support for RES-E. Green certificates remain the key support mechanism, with slight differences in application and price levels between the regions. Belgium distinguishes two levels of policy administration (national and regional), with a strong autonomy to shape renewable energy policies at the level of the three regions: Flanders, Wallonia and the Brussels Capital Region. In general, renewable energy is a regional matter; only offshore wind and hydropower are governed by national regulations. Each of the regions operates their own green certificate (GC) scheme that obliges electricity suppliers to prove that a certain proportion (quota) of the electricity they supply was generated from renewable sources. The schemes in Wallonia and Brussels are relatively similar, whereas the Flanders scheme differs in that it differentiates the minimum price for GCs per technology[75]. The (GC) quota scheme at the federal level was amended in 2014 for offshore wind from a fixed price to a variable price scheme. The level of support will be determined by a factor estimating the economic cost of offshore wind power.

  In Flanders, a revision of the certification scheme in 2013 made the certificate support finite (ten years support) and introduced technology-specific ‘banding’ (i.e. the amount of electricity to be produced for one certificate varies across technologies) to correct for differences in production costs. As of 14 June 2015, the certification scheme in Flanders is also no longer eligible for installations with a maximum capacity of 10kW. The quota in Flanders was 16.7% in 2016 and is set to increase to 21.5% after 2018[76]. The Walloon government reviewed its wind policy in 2013, setting a wind energy production target of 3800 GWh by 2020. In Wallonia, electricity suppliers were required to achieve a green certificate-level of 34% in 2016, which will increase to 38% in 2024. The Brussels Capital Region has summarised the continuation of their efforts in the Integrated Plan for Air, Climate and Energy (PACE), agreed in 2016. A key target in this plan is that Brussels will double its production of energy from RES and thereby achieve 849 GWh of renewable energy by 2020. The green certificate quota was 8.2% in 2016 and is set to increase to 14% in 2025[77].

- **Long-term security of support for RES-E: Moderate**
  The green certificate quota system revision in Flanders in 2013 aimed to reduce overcompensation by decreasing the level of support both in terms of duration and amount. At the same time, it stabilised the overall system because a surplus of green power certificates on the market is avoided, which affected the value of the certificates and the stability of the investment climate for renewable energy[78]. In 2015, a government decree determined the new quota levels in Wallonia, rising to 38% until 2024.

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[75] http://www.elia.be/en/products-and-services/green-certificates/Minimumprice-legalframe

[76] http://www.vreg.be/sites/default/files/document/mede-2017-04.pdf

[77] https://www.brugel.brussels/nl_BE/actualites/quotuminlevering-gsc-57

[78] http://www.res-legal.eu/search-by-country/belgium/single/s/res-e/t/promotion/aid/flanders-quota-system-groenestroomcertificaten/lastp/107/; https://www.stibbe.com/en/news/2013/january/the-new-flemish-support-scheme-for-green-power-and-cogeneration-further-elaborated

Following a drop in PV prices, support levels for solar PV have decreased in Wallonia, and are now subject to Qualiwatt investment grants (the Qualiwatt investment grant scheme however has ended on 30 June 2018 without replacement), which provide an annual grant for five years based on a set of predefined conditions and the distribution network. This was met with opposition from investors, since many investments were made based on the old support levels[79]. Currently, it is not clear if/how investments in (small-sized) PV will be supported by the Walloon and Flemish governments. In 2019, Flanders will start the distribution of digital meters, which will induce a revision of the present net-metering scheme. As of 2020, the prosumer tariff is likely to meet an end. The Brussels Capital Region, through the 'Adaptation of the green energy legislation', has agreed to abolish net metering in 2020

Total subsidy amounts for renewable electricity increased slightly for the Brussels Capital Region and Walloon Region, but decreased in Flanders. However, the abolishment of the Qualiwatt regulation will have a future impact on the total subsidy amount for the Walloon Region.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  The main elements of federal RES-H&C policy support have remained stable (tax deduction for investments and a certificates scheme for cogeneration), while some strengthening of support has taken place especially at regional level. At regional level, investment assistance for companies and energy subsidies are the most frequently applied policy measures.

  In June 2017, the concept paper Heat Plan 2020, the successor to the Green Heat Action Plan, was approved by the Flemish government. The Heat Plan 2020 contains various measures to fast-track the application of green heat in Flanders, including measures on heating networks, deep geothermal, biomass, heat pumps and solar boilers. This has already resulted in increased grants for solar boilers and heat pumps for households and SMEs. In October 2016, the Brussels government adopted its renewable energy strategy, including a strong increase in the deployment of heat pumps. No significant changes to RES-H&C policy were observed in Wallonia, where the main H&C policy are investment grants that are available to individuals for the installation of biomass boilers, heat pumps and solar thermal panels.

- **Long-term security of support for RES-H&C: Moderate**
  The overall budget for renewable heat in all of the Belgian regions decreased slightly from 2015 to 2016. Besides the Heat Plan 2020, which is supposed to run until at least 2020, there is no guarantee of other RES-H&C policies to continue beyond this term.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  In contrast to RES-E and RES-H&C, support for RES-T is mainly arranged at federal level. The Federal support is largely focused at further developing the use of biofuels in the transport sector and the main policy, the biofuel mandate, is still in place. As of 2017, the Federal Government increased the mandatory

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[79] http://www.iea-pvps.org/index.php?id=93&eID=dam_frontend_push&docID=3260

blending percentage (on an annual basis) for petrol to 8.5% by volume. Tax relief and grants for electric vehicles and charging points were discontinued at Federal level in 2012 and transferred to the regions.

- **Long-term security of support for RES-T: Moderate**
  There have been no abrupt changes to the long-term support levels in RES-T policy since the 2nd Progress Report.

Bulgaria

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  Bulgaria has partially fulfilled its policy commitments regarding RES-E. In the past, legislation has changed frequently and unexpectedly. However, Bulgaria is on track of its 2020 NREAP RES-E sectoral trajectory. After the latest changes to the Energy Act from 8th May 2018, the previous support scheme based on a feed-in tariff was replaced by the payment of a premium to the affected producers by the Electricity System Security Fund. This change will also affect existing installations.

  Since 1st July 2018, all producers of electricity from RES with a total installed capacity of at least 4 MW are obliged to sell their energy on the market and not as before - at preferential tariffs to Natsionalna Elektricheska Kompania EAD - NEK (National Electricity Company). The RES producers will receive premium contracts to offset the difference between the power exchange price and the long-term contracts they have with NEK.
- **Long-term security of support for RES-E: Low**
  There have been multiple retroactive changes to Bulgaria's RES-E support policies, such as the 2015 removal of the feed-in tariff for new projects of certain technologies, a 20% revenue tax on solar and wind power producers (which was later repealed) and a 5% fee on all electricity producers. As for the feed-in tariff scheme, there is no specific tariff degression regulated by the law, but tariffs can be significantly reduced for new projects. As of the 1st of July 2018, the RES producers receive premium contracts to offset the difference between the power exchange price and the long-term contracts they have with NEK. The methodology for determining the premiums implies a significant risk for the RES producers, as the reference market price and premiums for electricity are set annually by the regulator for the year ahead and do not match actual values.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  RES-H&C in Bulgaria is primarily supported through loans and tax incentives. The Bulgarian Energy Efficiency Fund is a revolving fund that offers financing loans for projects that improve the energy efficiency of buildings. Eligibility criteria include a payback period of seven years and half of the project's benefits coming from energy savings. The Fund contributes 10-25% in equity and recipients pay reduced interest rates of 4-7%/year, depending on a credit risk assessment and the type of project that is funded. With funding from the World Bank, DZI Bank, the Government of Austria, Bulgaria and a range of private companies, among others, the level of total funding in 2014 was around €35 million. A wide range of technologies are eligible, including aerothermal, geothermal, hydrothermal, solar thermal, biogas and biomass energy. A few smaller grant schemes were also in place in 2017, funding around €7 million in heat energy production projects for the built environment.

  The tax regulation mechanism provides that buildings with an energy certificate "C" or higher, put into service before 1990, are exempt of property tax for a period of seven years following the issuance of the certificate, or ten years if renewable energy is generated and used in the building.

  New CHP installations are no more stimulated through the feed-in tariff.

- **Long-term security of support for RES-H&C: Moderate**
  Both the Bulgarian Energy Efficiency Fund and the tax regulation mechanism have existed for a considerable period, and there is no sign that Bulgaria's RES-H&C policy will change in the near future.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**
  RES-T in Bulgaria is mainly supported through a biofuel quota for fuel suppliers and a tax regulation mechanism. As of 1st March 2019, the fuel for petrol engines should contain at least 9% bioethanol produced from biomass. Furthermore, as of 1st April 2019, diesel fuel should have a minimum of 6% biodiesel, with at least 1% biodiesel being biofuel of a new generation, ie. made from wastes such as straw, algae, grape marc, animal manure, sludge, etc. In case of not meeting these requirements, significant financial penalties are in place. In addition to the quota, petrol with blended bioethanol is eligible for a reduced excise duty, as is gas oil blended with biodiesel. The reduced rate is applicable for two years and concerns a reduction of around 10%.

- **Long-term security of support for RES-T: Moderate**
  Biofuel quota targets have been laid down into law up until 2019 but will likely remain in place after this year.

  Bulgaria has defined and presented to the European Commission a national target for the consumption of new generation biofuels at a rate of 0.05% of the required share of renewable energy in all modes of transport. The target must be achieved by 2020. A requirement to detect and track raw materials for the production of new generation biofuels throughout the value chain is introduced.

Czech Republic

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  The Czech Republic supported RES-E through a guaranteed feed-in tariff or a feed-in premium, which is paid on top of the market price. Under these schemes, plants with an installed capacity of up to 100 kW were supported, with the exception of 30 kW for solar PV and 10 MW for hydro. Tariff levels are not pre-determined for a longer period, but instead set one year in advance by the Energy Regulatory Office. This counts for support caps as well. However, as of 2014 the Czech government discontinued these schemes for new renewable projects, with the exception of hydropower, and ongoing projects using biomass, wind and geothermal energy. This was done because in that year, the Czech Republic was set to overshoot their RES-E sectoral trajectory and had already almost achieved the required 2020 level for their sectoral trajectory. As a consequence of the decision to discontinue the support schemes in 2014, the share of RES showed a declining trend between 2015 and 2016. For example, solar share in 2016 was below its level of 2011.

  With regard to the recent developments, in November 2018, the Ministry of Industry and Trade (MPO) submitted a major reform of RES Act (No. 165/2012 Coll. on Promoted Energy Sources) to an inter-ministerial commentary procedure. Based on the draft law, operational support will be provided solely in the form of an hourly green bonus for RES installations up to 1 MW. Furthermore, auctions for large-scale RES installations exceeding 1 MW, resp. 6 MW in case of wind plants, will be introduced. According to the current version of the amendment, large-scale PV plants will not be supported by auctions. The amendment also includes the assessment of adequacy of support for RES (so-called 'Revision Mechanism') put into operation in the period of 2006-2015 by the State Energy Inspection (SEI). On the other hand, the law insufficiently reflects the new EU’s requirements for the so-called energy communities and prosumers and does not guarantee any financial support for RES enshrined directly in law, according to the Chamber of RES ('Komora OZE'). The aforementioned changes to the Czech RES framework should be applied starting from 2021, and the inter-ministerial commentary procedure was ongoing until 7 December 2018.

  In addition, the Czech Republic runs an Operational Programme Enterprise and Innovations for Competitiveness, funded by the European Regional Development Fund. This fund provides investment grants for distributed renewable energy and is mainly targeted at biomass and biogas CHP plants as well as small hydropower (i.e. up to 10 MW). The size of the grant can vary between approx. €10,000 and €4 million and depends on the size of the company. The more employees, the lower the share of funded expenses. Moreover, the Operational Programme Environment supports the installation of rooftop and façade solar PV systems in public buildings.

  Furthermore, there is also the New Green Savings Programme in place, promoting RES-E and RES-H&C installations. The Programme of the Ministry of Environment provides subsidies for homeowners and house builders (individuals and legal entities). Regarding RES-E technologies, the installation of PV systems in family houses as well as apartment buildings is supported.

- **Long-term security of support for RES-E: Low**

Long-term security for investors is guaranteed through a threshold that the payback time should not be higher than fifteen years and that the profit rate per unit of electricity generated is stable over the support period, except for biomass projects.

The abrupt policy changes and in particular restrictive changes, which are characterised as retroactive by stakeholders, e.g. the abolishment of RES tax holiday, recycling fee for PV panels, so-called solar tax introduction, non-transparent and unclear support mechanism for historic RES, revision mechanism on adequacy of the amount of the state-granted support to renewable energy projects, 'system of dispatching management' etc. have created investment uncertainty and arguably resulted in higher cost of capital for current and future renewable investment. In addition, technical and legal obstacles to domestic energy generation from renewable resources persist, for example, with regard to grid connection and charges. In addition, numerous barriers hinder the further development of hydropower plants in the country. Taking the aforementioned barriers into account, the planned market-based support schemes for RES will be crucial in ensuring the reestablishment of investment certainty, but also in improving the public image of renewables within the population that has suffered in the past. However, the legislative proposal of large-scale PV plants' exclusion from RES supported through auctions from 2021 was strongly criticised by RES associations in late 2018. Furthermore, the Chamber of RES highlighted the insufficient reflection of the new EU's requirements for the so-called energy communities and prosumers in the draft act and the fact that it does not guarantee any financial support for RES enshrined directly in law, which exacerbates predictability and increases the uncertainty of investors in RES.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Renewable heating in the Czech Republic is primarily supported through the Operational Programmes and tax incentives. The deployment of biomass plants, biogas CHP, and solar thermal collectors in enterprises is supported through the Operational Programme Enterprise and Innovations for Competitiveness, while biomass boilers and solar thermal collectors in public buildings are also supported under a different Operational Programme, namely the Operational Programme Environment. Finally, there is also the New Green Savings Programme in place, promoting RES-H installations, i.e. solar thermal systems in households.

  Besides the Operational Programmes, the Czech Republic also maintains a real estate tax exemption for renewable heating plants. Biogas, biomass, hydrothermal, geothermal and air-source heat pumps are eligible for this scheme. Direct combustion of biomass is not eligible, as are hydropower plants with an installed capacity of over 1 MW.

- **Long-term security of support for RES-H&C: Moderate**
  The Operational Programmes that are funded by the ERDF are specified for the period 2014-2020. Budgets after this period will be specified as part of the NECP.

  However, from a stakeholder perspective, the Czech Republic exhibits a lacking reliability of the general RES-H&C strategy and the support framework (see Appendix C on non-economic barriers for more details). The sector experienced frequent restrictive measures over the past years, leading to the financing institutions' substantial financial straits, ultimately impacting the installations' cash flows. The instable framework raises the financial costs for the development of RES-H&C installations in the MS and undermines investors' confidence in RES technologies.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  RES-T in the Czech Republic is stimulated through a biofuel quota scheme and tax exemptions. Contrary to some other MS, no trajectory has been established for the increase of biofuels in the energy mix. The minimum percentage of biofuel in petrol is 4.1%, whereas this is 6% for diesel. An amendment has been submitted that would introduce double counting for the period 2018-2020, which would ensure the Czech Republic to achieve their targets as specified in their NREAP. The total contribution of conventional biofuels to the RES target is be limited to a maximum of 7% post 2020. The tax regulation mechanism allows the biofuels or the percentage of biofuel in the fuel to be exempt from consumption tax. However, the consumption tax for biofuels was already lower compared to regular petrol, varying from approx. €62 to €84 per 1,000 litres.

  In addition, there are plans to foster electric mobility. The 'Memorandum on the Future of the Automotive Industry' and the 'Action Plan on the Future of the Automotive Industry in the Czech Republic' propose eleven measures to foster the development of electro mobility in the period of 2017-2025. For instance, accelerated depreciation or labelling of electro mobiles should also be introduced in the future. Various subsidy programmes led by ministries (MPO, MŽP, MD) have incentivised either the direct purchase of alternative propulsion vehicles (incl. electric ones) or the infrastructure development. For instance, in December 2018, two new calls started to promote the purchase of electric vehicles (by companies and public institutions) and infrastructure (public sector).

- **Long-term security of support for RES-T: Moderate**
  The Czech Republic's tax mechanism has been in place since 2003 and is not scheduled to change in the near future, the same applies to the biofuel quota scheme. However, as no trajectory has been established for the increase of biofuels in the energy mix and the implementation of measures proposed by the National Action Plan for Clean Mobility (2015) promoting e-mobility is considered slow and unsatisfactory, the long-term security of support is moderate.

Denmark

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  Denmark has fulfilled the commitments adopted in their NREAP and previous Progress Reports in terms of RES-E policies. The main support scheme is a feed-in premium which applies to wind, solar and hydro power as well as biogas and biomass. In the premium scheme, there are two types of premium payments. Most installations receive a variable premium on top of the market price, where the sum may not exceed a certain technology-specific maximum. In some cases, for hydro and non-utility onshore wind power, a fixed premium is granted on top of the market price instead. As additional measures to the feed-in premium, net metering is available to RES-E plant owners and loans are granted for local initiatives to finance feasibility studies prior to the construction of wind energy plants.

Furthermore, Denmark is tendering offshore wind sites since 2015. First contracts for a total of 1.35 GW of offshore wind were signed in 2015 and 2016, of which 400 MW will be situated at Horns Rev, 600 MW at Kriegers Flak and 350 MW nearshore.

While the level of premium payments has been set administratively in the past, also Denmark is moving to tendering schemes and will determine some support levels in a competitive process. After a strong increase in applications in early 2016, Denmark stopped the premium scheme for solar PV of more than 400 kWp and introduced tenders for solar PV instead. A first 20 MW pilot auction for solar PV was held in December 2016[80]. A regular tender specifically for solar PV is planned for 2018 as well as a technology-neutral tender for solar PV and wind power for 2018/2019.

- **Long-term security of support for RES-E: High**
  The main policy support mechanisms for RES-E described in their NREAP and the 1st Progress Report are still in place, they have been updated and there is no planned end date. Increased tariffs for biogas, domestic wind turbines and offshore pilot projects have been introduced. For some technologies the feed-in-premium is provided for a fixed number of years, for others the support period is based on a defined number of full-load hours. In general, long-term support is granted (between 8 to 20 years).

  The support for solar PV changed in 2016 when the premium scheme was stopped for solar plants greater 400 kWp due to its low-cost efficiency, creating a gap in support for new solar PV installations and insecurity for investors. However, with the introduction of technology-neutral PV & Wind tendering schemes in 2018, the investment security has been re-installed.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Denmark has fulfilled all the commitments adopted in their NREAP and previous Progress Reports in terms of RES-H&C policies. Renewable energy fuels are exempted from the energy tax on fuels for heating purposes. Furthermore, Denmark has introduced a premium tariff for biogas for transport, processing and heat. In this scheme, 1.34-3.5€/GJ biogas are paid to consumers using biogas for heating purposes.

- **Long-term security of support for RES-H&C: High**
  The tax exemptions have been in place since 1996, with no major changes. The adoption of additional measures such as the premium tariff for biogas and the new tax reductions for heating is an indication of long-term stability of support in this sector.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  Denmark has fulfilled the commitments adopted in their NREAP and previous Progress Reports in terms of RES-T policies. The main instrument is a biofuel quota which obliges importers and manufacturers of petrol or diesel to ensure that biofuels make up at least 5.75% of their total annual sale of fuel in Denmark.

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[80] https://ens.dk/service/aktuelle-udbud/pilotudbud-af-pristillaeg-elektricitet-fra-solceller

Furthermore, biofuels are exempt from the CO_2 tax and there is a premium for the use of biogas for transport.
In addition, electric vehicles (EVs) were supported via research schemes and exemptions from the registration tax and the 'green ownership' tax until 2015. However, in 2015 the Danish government decided to repeal the tax exemption and to let the registration tax for electric vehicles progressively rise over a five-year period (20% in 2016, 40% in 2017, etc.) to the same level as other cars[81]. This change let to a steep decline of EV sales, which again caused the government to revise its decision in 2017 and set the EVs registration tax at 20% until another 5000 EVs will be registered[82].

- **Long-term security of support for RES-T: Moderate**
  The biofuel quota was implemented as communicated. However, changes in the tax breaks for EVs in 2015 and 2017 have destabilised the Danish EV market and hamper its long-term planning security.

Germany

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  Germany has fulfilled its earlier commitments regarding RES-E policy. A market premium scheme is the main instrument of support for electricity from renewable sources. For most installations, the award and the level of the market premium is determined through a tendering process.

  The support for electricity from RES is determined by the "Renewable Energy Sources Act" (EEG), which has been amended several times in recent years. Since 2014, most new installations no longer receive a feed-in tariff. Instead, producers receive a feed-in premium on top of the market price for electricity. Small installations (≤ 100 kW) are exempted from this adjustment and continue to receive a feed-in tariff. The 2014 amendment also introduced an auction process for ground-mounted solar PV with first auctions taking place in 2015. The technology-specific auction system was extended to wind and rooftop PV (for installations ≥ 750 kW) and biomass (for installations ≥ 150 kW). First auctions for onshore wind took place in 2017.

  The 2014 amendment also introduced a deployment path with envisaged annual deployment corridors for each technology, which have been slightly adapted in the subsequent amendments. Since 2017, the annual deployment corridors are 2,800 MW for onshore wind (2,900 MW as of 2020), 2,500 MW for solar PV (of which 600 MW are auctioned for installations larger than 750 kW), 150 MW per year for biomass from 2017-2019 (200 MW from 2020-2022). For offshore wind yearly deployment is projected as follows: 500 MW yearly in 2021 and 2020, 700 MW yearly in 2023-2025 and 840 MW yearly in 2026-2030.

  In 2017, a law came into effect to help tenants to benefit from renewable energy ("Mieterstromgesetz"). To this effect, small PV plants up to 100 kW on residential buildings are supported through the tenant

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[81] https://www.dr.dk/nyheder/politik/ny-aftale-om-elbiler-skal-saette-gang-i-bilsalg

[82] https://electrek.co/2017/04/19/denmark-electric-vehicle-incentive/

electricity surcharge, if the electricity is supplied and consumed within the building itself. This support is lower than the feed-in tariff, but other factors like network charges, taxes etc. are avoided.

- **Long-term security of support for RES-E: High**
  Despite multiple amendments to the EEG, the long-term stability of policies supporting the production of electricity from RES is generally high. The EEG 2017 defines long-term targets for the share of RES-E in gross electricity consumption (40-45% until 2025, 55-60% until 2030 and at least 80% until 2050). The definition of yearly deployment corridors and auction volumes per technology beyond 2020 provide long-term certainty for investors. Germany has set a cap of 52 GW on total installation of solar PV. Once this cap is reached, feed-in tariffs/premiums will no longer be available for new PV plants.

  Feed-in premiums for large installations and feed-in tariffs for small installations are paid for a period of twenty years and hedge against revenue risks resulting from fluctuating electricity prices.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Germany is fulfilling commitments regarding policies and support for the use of RES-H&C that were made in the NREAP. The main programme to foster the use of RES for heating is the Market Incentive Programme (Marktanreizprogramm - MAP), which contains two support instruments. The first instrument are investment grants for the installation of solar thermal energy, heat pumps and small biomass installations in existing buildings. The second instrument are low interest loans for the erection, expansion or purchase of installations for heat generation from renewable energy sources. It is a long-term and low interest loan with a fixed interest period of five or ten years including a repayment-free start-up period. In 2015, a total of €167 million were paid out under both schemes, triggering investments of about €630 million. The MAP programme was expanded in 2015, increasing the available funding to target specifically the more efficient facilities and commercial buildings. As a result, in 2016, a total of €243 million were paid out triggering investments of about €1 billion.

  In addition to the MAP, regulatory requirements for the construction of new buildings are implemented to aim for a higher share of renewable sources. According to the Renewable Energy Heat Act (“Erneuerbare-Energie-Wärmegesetz”), owners of new buildings and buildings under renovation are obliged to use a particular share of heating and cooling produced from RES. Public buildings are also bound by this obligation. The quota varies according to the RES and whether it is a new building or a renovation of an existing building. For example, the obligations are fulfilled for new buildings if the heat demand is covered by 15% from solar thermal, or by 50% from installations using biomass or waste heat.

  Since 2016, new CHP installations that replace old coal-fired CHP installations receive a bonus of 0,6c/kWh for the entire funding period (e.g. 60,000 hours of full utilisation for CHP installations up to 50 kWel capacity).

  Germany has set a trajectory share for RES-H&C of 14% in 2020. In 2016, the RES-H&C-share amounted to 13%.

- **Long-term security of support for RES-H&C: High**

The long-term security of support for RES-H&C is high. The Market Incentive Programme has been operating since 2000 and has already supported 1.8 million installations[83]. The two support instruments are expected to continue for the coming years without any major changes.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  The main instrument to promote the use of renewable sources in transport is a greenhouse gas reduction quota applicable to all fuels. The GHG reduction quota was implemented in 2015 to replace the biofuel production quota that had been in place since 2007. As part of the reform, tax reliefs for biofuels including biomethane have been terminated by the end of 2015.

  The GHG reduction quota obliges suppliers to ensure that the GHG emissions of their average fuel mix (containing gasoline, diesel fuel and biofuels) remain below those of a reference values based on fossil fuels. As of 2015, GHG emissions had to be lower than the reference value by 3.5%. The percentage is set to increase to 4% in 2017 and 6% in 2020. The use of biofuels is one option for suppliers to follow the provisions.

  In 2016, Germany has introduced a bonus for the purchase of electric, plug-in and hydrogen passenger cars. Depending on the technology, buyers can receive a bonus of €1,500 or €2,000 from the state if the car manufacturer provides an additional bonus of €1,500 or €2,000. A total state budget of €600 million is available for this scheme until June 2019, with the aim to support the purchase of 300,000 cars. However, the uptake is limited. By May 2018, only 63,285 bonus applications had been made.

  Another indirect support mechanism for electric and hybrid vehicles is the reduced tax for electric company cars. Compared to conventional vehicles, which are monthly taxed with 1% of the list price, this tax is only half for electric and hybrid vehicles. This tax reduction paid by the employee using the company car, starts from 1st January 2019 and expires on 31st December 2021.

  From 2019 on, electric and gas-driven trucks are exempted from the highway tolls. For gas-driven trucks, the exemption phases out after 2020, whereas an official review process will decide on the toll of electric trucks.

- **Long-term security of support for RES-T: Moderate**
  The long-term security of support for RES-T is moderate. The GHG reduction quota sets a clear path until 2020. The bonus for the purchase of electric, plug-in and hydrogen passenger cars is available until June 2019. However, beyond this date, no targets or support policies are defined yet.

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[83] https://www.bmwi.de/Redaktion/DE/FAQ/Marktanreizprogramm-MAP/faq-marktanreizprogramm-map.html

Estonia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  Estonia has fulfilled its earlier RES-E policy commitments. The original RES-E policy commitments, as defined in the NREAP, were:
    - A feed-in tariff
    - Certificate of origin
    - Support for investment for the broader use of renewable energy sources for power production
    - Support for investment in bioenergy production
    - Diversification towards non-agricultural activity
    - Support for investment in adding value to forestry products
    - National Energy Technology Programme – ETP
    - Development Plan for Enhancing the Use of Biomass and Bioenergy for the Period 2007 to 2013-R&D

  All of the above-mentioned measures were already marked-up as existing at the time when they were listed in the NREAP. Over the years, additional measures were introduced, and the accentuation of the measures changed.

  The 1st Progress Report also had a strong focus on measures related to electricity, such as an investment support for electricity producers who use wind as a source of energy, a thematic plan for using wind power in the best-suited counties and an electrical mobility programme of Estonia. The following Progress Reports, on the other hand, set a stronger focus on measures that incentivised the use of RES in the other sectors. In those, measures to incentivise the production of electricity were not very prominent anymore.

  Regarding measures and policies planned until 2020 in the electricity sector, the underlying document is the Energy Economy Development Plan for 2030 (ENMAK 2030), which outlines the targets and vision for each sector until 2030. The main support scheme for electricity production is the premium tariff. The transmission system operator shall pay a bonus on top of the selling price to an electricity producer who sells electricity on the free market. All renewable technologies are eligible for support. However, some caveats exist. For wind power producers, the tariff scheme will be suspended for the current calendar year as soon as a total of 600 GWh of electricity from wind energy has already been supported. For biomass, the electricity must be generated by high-efficiency CHP plants. The bonus is fixed and amounts to €0.0537 per kilowatt hour and does not differ for the individual technologies. However, CHP plants with a production capacity below 10 MW using waste, peat or oil shale retorting gas are eligible for a tariff amounting to €0.032 per kilowatt hour. Eligibility to the premium support scheme system is limited to a maximum of 12 years from the date of commissioning for all technologies[84]. According to statistics published by Elering, Estonia's TSO, who also conducts support scheme payments, renewable energy and CHP subsidies in 2017 were at €78.3 million, which is 13% more than in 2016[85].

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[84] Electricity Market Act (in Estonian): https://www.riigiteataja.ee/akt/130062017028 (26 June 2018)

[85] https://elering.ee/en/renewable-energy-covered-168-cent-total-electricity-consumption-previous-year (26 June 2018)

This system will be gradually replaced with a new, tendering-based support scheme that was adopted in June 2018[86]. According to the bill, micro-producers (capacity up to 50 kW) may receive support until late 2020 under the current support scheme. Small-scale producers (up to 1 MW) must participate in tendering rounds in order to receive support. Support under the existing scheme is also available for those producers who have made significant investments into production devices before 2017. The first tender for installations with a capacity between 50 kW – 1 MW will be held in 2019. For installations with a capacity above 1 MW, the situation is less clear; a tender will be launched probably in 2020[87].

- **Long-term security of support for RES-E: Moderate**
  The long-term security of support was merely moderate because over the past seven years, there were constant discussions whether and how the Electricity Market Act should be amended to change the premium tariff scheme. A law aiming at introducing a tender scheme has now been adopted, which should create clarity among market participants and for potential investors. However, a plan and procedure for tendering rounds is still to be published.

Heading and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Estonia has fulfilled its earlier RES-H&C policy commitments. The original policy commitments, as defined in the NREAP, covered RES-H&C only indirectly through:
  - Support for investment in bioenergy production
  - Diversification towards non-agricultural activity
  - Support for investment in adding value to forestry products
  - National Energy Technology Programme – ETP
  - Development Plan for Enhancing the Use of Biomass and Bioenergy for the Period 2007 to 2013 – R&D

  Over the years, additional measures were introduced that had a specific focus on RES-H&C: The 2nd Progress Report set a stronger focus on measures that incentivised the use of RES during the renovation of small residential buildings. The trend of measures addressing the building sector was further continued in the third report which introduced financial support for modernising the heating systems of small residential buildings. The 4th Progress Report mentioned measures that increased the effectiveness of energy use in district heating systems.

  Regarding measures and policies planned until 2020 in the heating and cooling sector, the underlying document is the Energy Economy Development Plan for 2030 (ENMAK 2030), which outlines the targets and vision for each sector until 2030. Several investment subsidies for heating and cooling exist in Estonia. 1) Investment support for the renovation of apartment buildings – Investment is given to support renovation and a variety of energy efficiency-related activities in apartment buildings that have been built before the year 1993 and belong to apartment associations or to local municipalities. All thermal energy sources are eligible. The subsidy may be up to 40% of a project's costs but no more than €1,200,000[88]. 2) Investment eligibility conditions for the renovation of heating systems – Under this measure, the acquisition and

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[86] https://www.riigikogu.ee/tegevus/eelnoud/eelnou/469fc0ff-35d7-472a-b01a-3bc968dae72b/Elektrituruseaduse,%20energiamajanduse%20korralduse%20seaduse%20ja%20maagaasiseaduse%20muutmise%20seadus (26 June 2018)

[87] RES LEGAL Europe (to be published end of January 2018)

[88] https://www.riigiteataja.ee/akt/113042017004 (26 June 2018)

installation of a heating system for small residential houses is supported. Aerothermal, geothermal and solar thermal technologies are eligible. The grant rate is up to 40% of the eligible costs related to the supported activities. The maximum possible support amount is €4,000 per applicant[89]. 3) Investment eligibility conditions for the promotion of RE in welfare centre buildings – The measure aims at improving energy efficiency, reducing GHG emissions, reducing energy supply and building maintenance costs, or promoting the use of RE through investments in public buildings. It is not specified which technologies are eligible. The amount of the subsidy is 40%-70% of the projects' costs[90]. 4) Investment eligibility conditions for the promotion of energy efficiency and renewable energy use in child day care buildings – The measure aims at improving energy efficiency, reducing greenhouse gas emissions, reducing energy supply and building maintenance costs, or promoting the use of renewable energy through investments in public buildings. It is not specified which technologies are eligible. The amount of the subsidy is 40%-70% of the projects' costs[91].

- **Long-term security of support for RES-H&C: Moderate**
  The long-term security of support for RES-H&C is moderate as the availability of the funds vary, and they are dependent on financing from the EU Structural and Investment Funds and state budget. Thus, in case of changing budget allocations, these support schemes could be changed or even abolished.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  Estonia has fulfilled its earlier RES-T policy commitments. The original policy commitments, as defined in the NREAP, covered RES-T – partially indirectly – through the following measures:
  - Support for investment in bioenergy production
  - National Energy Technology Programme – ETP
  - Development Plan for Enhancing the Use of Biomass and Bioenergy for the Period 2007 to 2013 – R&D

  The First Progress Report introduced an electrical mobility programme of Estonia, and measures facilitating the use of biomethane in the transport sector were in the third Progress Report, too.

  Regarding measures and policies planned until 2020 in the transport sector, the underlying document is the Energy Economy Development Plan for 2030 (ENMAK 2030), which outlines the targets and vision for each sector until 2030. There are three support schemes in place for the promotion of the transport sector. 1) Biomethane subsidies – subsidies are paid to create an infrastructure for biomethane petrol stations and to promote biomethane use in public transport systems in municipalities. Biofuels are eligible. For the development of biomethane petrol stations, the maximum share of costs that can be subsidised is 35% per project and the highest possible amount is €350,000 per project. For the public transport system, the maximum share of costs that can be subsidised is 30% per project and the highest possible amount is €4,000,000 per project. A total budget of €9,000,000 is available through this measure: €6,000,000 for projects in the public transport system in municipalities, and €3,000,000 for biomethane petrol stations. The funds are available until the year 2020[92]. 2) Biomethane Market Development Support – support is given to

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[89] https://www.riigiteataja.ee/akt/114102016007 (26 June 2018)

[90] https://www.riigiteataja.ee/akt/121112017003 (26 June 2018)

[91] https://www.riigiteataja.ee/akt/106042018025 (26 June 2018)

[92] https://www.riigiteataja.ee/akt/112012018003 (26 June 2018)

biomethane producers. The cost of production of certified biomethane delivered to final consumer as transport fuel per megawatt hour and the cost of production of certified biomethane delivered to the final user in the gas system fall under this scheme. For biomethane delivered to the final consumer as transport fuel, the amount of the subsidy is €100 per megawatt hour, from which the average market price of natural gas of the current month will be deducted. For biomethane delivered to the final consumer in the gas system, the amount of the subsidy is €93 per megawatt hour, from which the average market price of natural gas of the current month will be deducted[93]. 3) Biofuel quota: As of 1 May 2018, Estonia has a biofuel distribution obligation. A fuel seller must have, in the total energy quantity of petrol, diesel and biofuel released for consumption, a proportion of at least 3.1% of total energy quantity of biofuel. As of 1 January 2019, the biocomponent must be 6.4% and as of 1 January 2020, the requirement is 10%. From 1 November 2018 until 31 March 2019, diesel fuel is exempted from the requirement of that time. All this is regulated through the Liquid Fuel Act (in Estonian: Vedelkütuse seadus)[94]. The quota was only recently implemented, thus has not generated a huge amount of results yet.

- **Long-term security of support for RES-T: Moderate**
  The current support schemes are temporary and will run until 2020. As of now, it is not clear how the support of the sector will continue.

Ireland

Electricity

- **Fulfilment of earlier RES-E policy commitments: No**
  Currently, there is no RES-E support scheme in place in Ireland. The former feed-in-tariff scheme for onshore wind energy, biomass and hydro plants has been discontinued in December 2015. There were plans to replace the former scheme, but no new support measure has been established in recent years. Considerations for a new support scheme - moving to a tendering system – were outlined in an Options Paper by the Irish government[95]. Latest news from the Irish government are that the first RES-E auctions under a new support scheme are planned for 2019[96]. However, no details as the available volume have been communicated, yet.

  The main support instruments in the past have been the RE FIT (Renewable Energy Feed-in Tariff) schemes. RE FIT 1 was in place from 2007 to 2009 and provided feed-in-tariffs for a period of 15 years to 400 MW of wind, hydro and biomass/landfill gas power plants[97]. RE FIT 2 succeeded RE FIT 1 in March 2012 and was in place until December 2015. It supported another 4,000 MW of the same technologies[98]. In addition, REMIT 3 supported biomass CHP from February 2012 to December 2015[99].

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[93] https://www.riigiteataja.ee/akt/115092017009 (26 June 2018)

[94] https://www.riigiteataja.ee/en/eli/ee/528062018005/consolide (28 August 2018)

[95] https://www.dccae.gov.ie/documents/23052017%20RE FIT%20-ISEM%20options%20paper.pdf

[96] https://renewablesnow.com/news/ireland-getting-ready-for-2019-renewable-power-auction-600134/

[97] https://www.dccae.gov.ie/documents/RE FIT1termsandconditionsSept2013.pdf

[98] https://www.dccae.gov.ie/documents/Updated%20RE FIT%202%20Terms%20and%20Conditions.pdf

[99] https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/electricity/renewable-electricity-supports/Pages/Renewable-Electricity-Supports.aspx

- **Long-term security of support for RES-E: Low**
  The long-term security of support for RES-E in Ireland is low. The main instrument has been discontinued for the second time now and a new support scheme is not in place yet. However, a new RES-E tendering scheme is foreseen to start in 2019.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  Ireland has partially fulfilled the policy commitments of its NREAP. The 'ReHeat' programme as well as the 'REMIT 3' scheme have been terminated in 2010 and 2015 respectively. The 'Greener Homes' programmes was replaced by the less extensive 'Better Energy Homes' programme, which provides an investment grant of €1,200 to home owners for the installation of a solar thermal installation. The scheme also supports heat pumps[100].

  In addition, the Accelerated Capital Allowance scheme supports companies' uptake of heat pumps (aerothermal, hydrothermal and geothermal) as well as solar thermal energy. In the year of purchase, companies can depreciate 100% of the purchase value of the equipment.
  In December 2017, the Department of Communications, Climate Action and the Environment announced the initiation of the "Support Scheme Renewable Heat". Eligible technologies are biomass, anaerobic digestion and heat pumps. Air-, water- and ground- source heat pumps are eligible for a grant (of up to 30%). Biomass and anaerobic digestion can benefit from operational support (for a period up to fifteen years) based on useable heat output. The support is set at €5.66 c/kWh for biomass and €2.95 c/kWh for anaerobic digestion. Other technologies such as biomethane are expected to be introduced in later stages of the scheme. This initial stage of the scheme has a budget of €7 million. The Sustainable Energy Authority of Ireland (SEAI) was planned to accept applications in mid-2018 after publishing the terms and conditions of the programme[101].

- **Long-term security of support for RES-H&C: Moderate**
  Several support schemes promoting RES-H&C that were described in the NREAP ended due to budgetary constraints. These circumstances create uncertainty for potential investors. Ireland is currently not on track to meet its 2020 RES-H&C trajectory.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**

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[100] https://www.seai.ie/grants/home-grants/better-energy-homes/

[101] https://www.seai.ie/sustainable-solutions/support-scheme-renewable-/

Ireland’s main support instrument for RES-T is a Biofuels Obligation Scheme (BOS). It obliges suppliers of fuels to include a certain percentage of biofuels in their annual fuel sales. Currently, the biofuel quota is set at 8.695% (by volume)[102] of solid fuels. For 2019, the rate will be increased to 10%[103].

Furthermore, Ireland supports the uptake of electric mobility through a series of measures, including the construction of public charging points as well as an electric vehicle (EV) grant scheme[104]. The scheme provides investment grants of up to €5,000 per EV. Additionally, electric vehicles exempted from the Vehicle Registration Tax (VRT), which amounts up to €5,000[105].

- **Long-term security of support for RES-T: Moderate**
  The biofuel obligation was put in place in 2010 with the aim of achieving a share of 10% biofuels by 2020. There have been no unexpected changes so far. The biofuel quota has been raised each year as expected.

  The support for electric vehicles continues for 2018. The continuation beyond 2018 is unknown, which causes insecurity.

Greece

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  As many other MS, Greece amended its RES-E support policy to comply with the 2014 EU State Aid Guidelines. In 2016, the main RES-E policy instrument of the past, a feed-in tariff, has been replaced by a feed-in premium that is granted to installations that have successfully participated in a tendering process to comply with EU regulations.
  RES-E installations of up to 500 kW (3 GW for wind power pants) may still receive the feed-in tariff, which amounts from 9.8 (wind) to 27.8 (CSP) €ct/kWh and is granted for 20 years. Larger solar PV and wind installations are eligible for the tendering process. In this context, a 40 MW pilot tender for solar PV has been held in December 2016, which resulted in an average weighted reference tariff of 9.9 €ct/kWh for installations under 1 MW and 8.3ct/kWh for installations above 1 MW respectively. The first regular tender of the new system was held in July 2018 and awarded a total of 277 MW in three categories: solar PV up to 1 MW, solar PV of 1 MW to 20 MW and wind power of 3 to 50 MW. The average prices of the categories ranged from 6.391 €ct/kWh for the second solar PV category, 6.953 €ct/kWh for wind power to 7.842 €ct/kWh for the first solar PV category[106].Since the initial planned yearly auctioned total capacity for the technology specific auctions was set at 600MW, a complementary auction was organised in December 2018 for these technologies resulting to a total awarded capacity of 221,6MW, of which 61.5MW were

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[102] http://www.nora.ie/biofuels-obligation-scheme.141.html

[103] https://www.dccae.gov.ie/en-ie/news-and-media/press-releases/Pages/Minister-Denis-Naughten-announces-increase-to-the-biofuel-obligation-rate-to-come-into-effect-from-1-January-2019.aspx

[104] https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/transport/electric-vehicles/Pages/Supports-Available.aspx

[105] https://www.seai.ie/grants/electric-vehicle-grants/grant-amounts/
and https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/transport/electric- vehicles/Pages/Supports-Available.aspx

[106] https://cleantechnica.com/2018/07/06/first-greek-renewable-energy-auction-awards-277-megawatts-for-wind-solar/

awarded to solar PV installations up to 1 MW, with an average price of 6.66 €ct/kWh. Additionally, 159.65 MW were awarded to wind power installations between 3 and 50 MW, with an average price of 5.858 €ct/kWh. The auction for the second PV category was cancelled after Regulator's decision and is planned to be re-launched on January 2019. Considering all the wind and PV auctions held in 2018 the total awarded capacity amounted to almost 500MW (i.e. 498,6MW).

For 2018, two further auctions were planned: a joint solar and wind power auction and an auction especially for wind and PV plants that are located to the south-east part of the island of Evvoia on the grounds of a dedicated grid interconnection to uplift RES congestion issues, with an end connection point at the Attica region. However, these auctions are going to be postponed for early 2019. For 2019 and 2020, regular separate tenders for wind and PV and a joint PV and wind auction are already foreseen and announced by a relevant Ministerial Decision. The yearly caps for the separate tenders are set at 300 MW, while for the joint auction a yearly cap of 400 MW is set. Any remaining capacity from previous auctions will be transferred to the next ones[107]. Apart from that, there is a yearly technology cap of 20 MW for other large RES plants (i.e. above 1MW), such as biomass, biogas, CSP, small Hydro and CHP that are eligible for a feed-in premium. If the caps for each respective technology are reached (i.e. sign of relevant contracts under feed-in-premium within a calendar year), this technology will take part in an auction next year[108]. Additionally, there have been special provisions concerning hybrid RES plants and their support on non-interconnected Greek islands (involves RES installation and integrated storage plant behind the grid connection point)[109][110], which however are planned to be revised and to also introduce specific auctions.

In addition, Greece has a net metering scheme in place for solar PV installations up to 500 kW (up to 1MW for energy communities and other entities of public benefit), which became effective mid-2015 and was amended in 2017 introducing virtual net metering[111]. Furthermore, a new tax regulation mechanism and grants are available under the 2016 Development Law. The tax regulation mechanism allows income tax reliefs to companies for CHP plants and RES plants. However, no direct investment grant is foreseen for RES-E plants, with the exemption of small hydro plants and high efficiency CHP RES plants. The minimum level of investment should amount to €50,000 - 500,000, depending on the size of the company. The level of support depends on the size of the companies and ranges from 30%-65% of eligible costs.

In January 2017, the Bill on Energy Communities was approved. The bill enables citizens, local administration authorities, as well as private and public law entities to participate in the production, distribution and supply of energy. It should be underlined that Greece is the first MS that defines a clear legislative framework on energy communities[112].

- **Long-term security of support for RES-E: Moderate**
  The long-term security of RES-E support in Greece is moderate. Between January 2017 and June 2018 no tenders have been held due to the outstanding approval by the European Commission. However, a specific timetable with the scheduled auctions was approved in April 2018. Nevertheless, the lack of long-term

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[107] http://www.ypeka.gr/LinkClick.aspx?fileticket=K7XWZzM3vp0%3d&tabid=555&language=el-GR

[108] http://www.ypeka.gr/LinkClick.aspx?fileticket=J2x87fg077w%3d&tabid=555&language=el-GR

[109] http://www.ypeka.gr/LinkClick.aspx?fileticket=rWuqcD8R%2buc%3d&tabid=555&language=el-GR

[110] http://www.ypeka.gr/LinkClick.aspx?fileticket=Ip0CICeBceY%3d&tabid=555&language=el-GR

[111] http://www.ypeka.gr/LinkClick.aspx?fileticket=MMfrWK6%2f4ow%3d&tabid=555&language=el-GR

[112] http://www.ypeka.gr/Default.aspx?tabid=389&sni[524]=5377&language=el-GR

planning, retroactive changes in the past, as well as insecurity related to the financing of the fund for the RES support are still harming investment security. Moreover, during these two years almost 450 MW of new wind parks come into operation (a national record capacity for two consecutive years for the wind technology), demonstrating a change in the investment environment.

In the past, the Government of Greece imposed a retrospective tax levy on RES producers' turnover for the period 2012-2014. The levy ranged between 10% and 30% and was technology specific. Additionally, feed-in tariffs for PV were retroactively reduced in April 2014, on the basis of high returns of investment. These reductions were also seen necessary in order to address the liquidity problems of the RES special accounts, that is run by the Electricity Market Operator. These factors, along with a standstill for support for new PV projects until 2016, have led to a downturn in investments and affected the confidence of creditors. However, the participation volumes in the recent RES auctions and the relevant new applications for productions licenses during the last two years demonstrate a swift for both new investors and projects in the Greek RES sector. Moreover, the liquidity and medium-term sustainability of the special RES account has been drastically improved and stable surplus is projected for the next years, while a buffer of €70 million has been regulated in order to safeguard the account's sustainability.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Greece has fulfilled its earlier policy commitments regarding RES-H&C. The main support measures are subsidies and tax relief measures, which were introduced under the 2016 Development Law. Similar measures are applicable to RES-E and RES-T, too.

  The first tax regulation measure, based on law No. 2238/1994, provided for an income tax relief for natural and legal persons who have performed an energy upgrading of their building. Up to 10% of the project costs could be deduced from taxable income (up to a maximum of €3,000). Eligible technologies were aerothermal, hydrothermal, geothermal and solar thermal energy as well as biogas and biomass plants. This tax relief is not active at present. The second tax regulation mechanism grants income tax reliefs to companies for CHP plants and RES-H&C plants. Their minimum level of investment should amount to €50,000 - 500,000, depending on the size of the company. The level of support depends on the size of the companies and ranges from 30%-65% of eligible costs. The granted subsidies range from €50,000 – 500,000 and 30%-65% of eligible costs, too.

  Additionally, the programme "Exsoikonomisi kat' oikon II" was introduced in March 2018. The programme builds upon the previous successful programme that was implemented during the previous programmatic period (2007-2013) and aims at realising energy efficiency measures in domestic residences in all administrative prefectures in Greece. Among others, the upgrading of H&C systems (installation of heat pumps, biomass plants and geothermal exploitation) as well as the installation of solar thermal installations and heat pumps for warm water are supported. Support is provided through the provision of grants and interest-free loans. The grant level is defined by each applicant's annual income (between 0%-70% of the total expenditure) while for the rest of the sum an interest-free loan is offered[113]. The programme received a

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[113] https://exoikonomisi.ypen.gr/welcome

great number of applications. Therefore, the Ministry of Environment and Energy announced the doubling of funds for the whole programme and beneficiaries will increase from 40,000-45,000 households to 90,000-95,000 households. The programme stopped receiving new applications in May 2018[114] but it is expected to re-initiate in 2019 and fund more than 200,000 households[115].

- **Long-term security of support for RES-H&C: Moderate**
  Greece' RES-H&C support measures are scheduled to run until 2020, thus, the long-term security of support is moderate. As the recent success of the "Exsoikonomisi kat'oikon II" showed, if support measures are set in a transparent manner, RES-H&C will be promoted more efficiently.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  Greece has fulfilled its earlier RES-T policy commitments but is lagging behind its 2020 RES-T sectoral trajectory. The main support measure regarding RES-T in Greece is a biofuel quota. It obliges fuel suppliers to blend their fuel with 7% share of biofuel. Recently by law, a similar obligation for the blend of bioethanol to gasoline was introduced with the share to be set to 3,6% for 2020.

  In addition, also for RES-T there is a new tax regulation mechanism and subsidy available under the Development Law. The tax regulation mechanism grants income tax reliefs to companies for the production of sustainable biofuels which are not based on edible plants and are not subject to a supply obligation or blending eligible for support. There are minimum levels of investment to be eligible for support - €50,000 – 500,000, depending on the size of the company – and the level of support depends on the size of the companies – 45%-65% of eligible costs. The granted subsidies range from €50,000 – 500,000 and 45%-65% of eligible costs, too.

  Additionally, in June 2018, the ILUC Directive was transposed, including biofuels from non-edible cultivations, biofuels for the aviation sector and electricity for the calculation of the RES-T share[116]. Additionally, since 01.01.2019, bioethanol or bio ethers from biological origin should be contained in all transport fuels. The percentage is set at 1% in 2019 and 3.3% from 2020 onwards 117.

- **Long-term security of support for RES-T: Moderate**
  The long-term security of support for RES-T in Greece is moderate. Despite the fact that the biofuel quota is scheduled to be in place until 2020, biofuel facilities do not operate at their full potential[118]. Moreover, infringement procedures and fines in case of non-compliance with biofuel quota obligations have only been introduced in 2016. As a result, RES-T share until now remains very low (1,4%), being one of the lowest in the EU.

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[114] https://exoikonomisi.ypen.gr/-/prothesmia-epexergasias-kai-epanypoboles-aiteseon

[115] http://www.avgi.gr/article/10951/9378124/erchetai-to-2019-neo-programma-exoikonomese-kat-oikon-

[116] https://www.hellenicparliament.gr/Nomothetiko-Ergo/Anazitisi-Nomothetikou-Ergou?law_id=c3631fb9-579d-48e9-85dd-a8e400d4cb13

[117] https://www.hellenicparliament.gr/Nomothetiko-Ergo/Anazitisi-Nomothetikou-Ergou?law_id=c3631fb9-579d-48e9-85dd-a8e400d4cb13

[118] http://www.insider.gr/epiheiriseis/energeia/69510/hellastat-i-ellada-ysterei-se-viokaysima

Spain

Electricity

- **Fulfilment of earlier RES-E policy commitments: No (but exceeding 2016 RES-E NREAP sectoral trajectory)**
  Spain has not fulfilled its policy commitments regarding RES-E. Because of the recession between 2009 and 2013, the electricity market in Spain accumulated important overcapacities. Subsequently, a large tariff deficit was caused by a combination of factors, i.a. decreasing wholesale market prices, regulatory limits to the increase in retail prices, the increase of transmission costs and high public burdens resulting from increasing RES support costs. The tariff deficit peaked at €29 billion at the end of 2013.
  At the beginning of 2012, a moratorium was put on any support for new renewable energy (RE) installations. Moreover, as of 2010, several retroactive measures were taken:

  - Existing power plants were charged with a 7% tax on every kilowatt-hour generated to recover partially the tariff deficit.
  - Renewable power plants under the FIT scheme saw the number of remunerated production hours reduced.
  - The FIT for existing installations was further reduced by skipping the tariffs' annual adaptation to the inflation rate so that the value of the paid FIT diminished with rising operational costs and taxes.
  - In June 2014, the remaining reduced FITs for existing renewable power plants finally were all stopped.
  - The market premium also phased out in 2013 without any substitution

  The energy reform of 2013 established the new principles for economic support for RES-E installations. Under the new scheme, which applies to new installations as well as retroactively to existing plants, RES-E installations receive an investment-based remuneration (instead of the generation-based remuneration paid under the previous FITs and FIPs) complementary to market revenues with the aim of guaranteeing a "reasonable rate of return on investment". The complementary remuneration is administratively calculated for existing plants; for new plants, the remuneration level is determined via tenders.

In the tenders of 2016 and 2017, 8,737 MW of renewable energy capacity were awarded[119]. Eligible technologies included onshore wind energy, solar PV and biomass. Onshore wind was the technology awarded the largest capacity with 4,608 MW, followed by solar PV with 3,910 MW, biomass with 200 MW, and other RES with 19 MW. The installations awarded will be built without subsides: renewable operators will rely on the revenues from the sale of electricity in the market. To hedge against market price fluctuations, some developers are seeking to establish PPAs. Awarded projects need to be operating by 31 December 2019. However, the timely project realization of these projects is currently uncertain. Projects need to obtain approval roughly 12 months after the auction to begin construction. As of August 2018, all awarded projects (rounds 1-3) should have obtained an approval but this is not the case. Reasons why the start of project construction has been slow include delays in the procurement of project approvals, and the option of first securing a private PPA before beginning construction begins.

For 2018, auctions were planned to take place for RES installations on the Balearic and Canary islands. These island-specific auctions were pushed to 2019. In addition, there will likely be two further general (non-island specific) RES-E auctions in 2019. However, dates and volumes are unclear. The Ministry of Ecological Transition is currently defining new bidding rules.

In addition, Spain has a self-consumption scheme for RES-E installations. However, in 2015 Spain introduced new tax regulations (royal decree 900/2015) for existing and new self-consumption RES plants, both on capacity and generation levels making it less attractive for potential plant operators. Self-consumption installations of 10 kW and below and in non-peninsular locations are exempted from generation charges but will be subject to a fixed charge per kW[120]. However, royal decree 15/2018, validated by the national parliament in November 2018, modifies royal decree 900/2015 in that it establishes only two possible modalities of self-consumption: “With Surplus” (with feed-in to the grid) and “Without Surplus” (without feed-in to the grid). Self-consumption is defined as consumption by one or more consumers of electricity from installations in proximity of the consumption associated with it. The renewable self-consumed electricity will be exempt from all charges (both on capacity and generation levels) and tolls. Surpluses and deficits of generators associated with self-consumption will be treated in the same way as all other generators or consumers. Simplified compensation mechanisms between deficits and surpluses of self-consumers may be developed for installations below 100 kW.

- **Long-term security of support for RES-E: Low**
  The 2013 introduction of the new support scheme for RES-E based on the "reasonable return on investment" principle, which also applies to existing plants retroactively, followed a period of retroactive cuts in RES-E support and the absence of any support scheme for RES-E after January 2012. The retroactive changes have created a very high level of insecurity for RES-E investors in the MS.

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[119] 4th Spanish Progress Report, p. 35 and http://www.minetad.gob.es/en-US/GabinetePrensa/NotasPrensa/2018/Paginas/identificacion-proyectos-renovables20180423.aspx

[120] https://www.iea.org/policiesandmeasures/pams/spain/name-152980-en.php?s=dHlwZT1yZSZzdGF0dXM9T2s,&return=PG5hdiBpZD0iYnJlYWRjcnVtYiI-PGEgaHJlZj0iLyI-SG9tZTwvYT4gJnJhcXVvOyA8YSBocmVmPSIvcG9saWNpZXNhbmRtZWFzdXJlcy8iPlBvbGljaWVzIGFuZCBNZWFzdXJlczwvYT4gJnJhcXVvOyA8YSBocmVmPSIvcG9saWNpZXNhbmRtZWFzdXJlcy9yZW5ld2FibGVlbmVyZ3kvIj5SZW5ld2FibGUgRW5lcmd5PC9hPjwvbmF2Pg and https://www.boe.es/boe/dias/2015/10/10/pdfs/BOE-A-2015-10927.pdf

The reasonable return is revised every six years, which introduces uncertainty in the level of support renewable operators receive through the lifetime of their assets. For the regulatory period 2013-2019, the return was defined as the yield of a 10-year government bond plus a spread of 300 basis points, which resulted in an annual return of approximately 7.5%. From 2020, the regulator, CNMC, suggested a change in the calculation methodology to a WACC-based model, i.e. one taking into account the weighted average cost of capital, which would result in a return 7.1%. The change will likely favour investors since the yields on government debt have fallen significantly: from around a 4.5% rate in 2013 to around 1.6% in November 2018[121].

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially (but exceeding 2016 RES-H&C NREAP sectoral trajectory)**
  Spain has reached its 2016 RES-H&C NREAP sectoral trajectory. Currently, there is no support system for RES-H&C in Spain. However, it must be noted that in some cases RES-H&C is already competitive to conventional solutions in Spain. This is the case for example for biomass the industry and solar heating in the residential sector[122].

  New buildings or buildings undergoing major renovation with demand for warm sanitary water must satisfy some of this demand through solar thermal installations. The requirement varies between 30 and 70% of the total warm sanitary water demand of the building. The requirement can be lowered or bypassed if the supply of warm sanitary water is covered by other RES or CHP. In the past, a budget was available for the financial support for large RES thermal plants to supply warm water and air conditioning to buildings through separate programmes: BIOMCASA, SOLCASA, GEOTCASA. The programmes financed up to 80% of the project investment cost for projects with a maximum cap of €3 million per project. A total budget of €17 million was available and was exhausted in October 2017[123].

- **Long-term security of support for RES-H&C: Low**
  Spain does not have a support scheme for RES-H&C. RES technologies for H&C are already competitive in many cases in Spain. Still, Spain has a good chance of meeting its 2020 RES-H&C NREAP trajectory.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  As in many other MS, the main policy instrument for RES-T in Spain is a biofuel quota. With the target to fulfil the obligation under the RES Directive to supply 10% of road transport energy needs from RES by 2020, Spain obliges suppliers of fuels to ensure a 6% share of biofuels in their annual fuel sales in 2018. The biofuel share will rise to 8.5% in 2020. Changes to the quota system were implemented in 2015, ending the transitional period on biofuel sustainability.

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[121] S&P Gobal, 2018, Spain's energy regulator pushes for WACC-based model for renewables market, available from: https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/110218-spains-energy-regulator-pushes-for-wacc-based-model-for-renewables-market.

[122] http://www.iea.org/publications/freepublications/publication/IDR_Spain2015.pdf p. 131

[123] http://www.idae.es/en/ahorra-energia/renovables-de-uso-domestico/git-programme

Furthermore, Spain currently offers grants and tax reductions to support the uptake of electric vehicles. Grants under the Plan to Promote Sustainable Mobility with Alternative Energy Vehicles (Plan MOVEA) cover electric vehicles, plug-in hybrids or extended range and are worth between €1,100 and €15,000. According to the Government's estimates, the aid of the 2017 MOVEA Plan will encourage the acquisition of 1,800 electric cars and vans, and 230 electric motorcycles[124]. Regarding tax reductions, city councils (e.g. Madrid, Barcelona, Zaragoza, Valencia) are reducing the annual circulation tax (ownership tax) for electric and fuel-efficient vehicles by 75%.

- **Long-term security of support for RES-T: Moderate**
  The objectives for penetration of biofuels have been significantly reduced in 2013, but the annual biofuel quota is set until 2020.

France

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2016 RES-E NREAP sectoral trajectory)**
  France has fulfilled its earlier commitments regarding RES-E policy. However, France is off track regarding its NREAP RES-E trajectory. France’s main support measure in the past has been a feed-in tariff (tarif d´achat), whereby the level of support was either legally defined or determined through tendering procedures. To comply with EU State Aid Guidelines and progressively expose RES-E installations to market competition, the French Act on Energy Transition for Green Growth from 17 August 2015 introduced a thorough reshaping of the existing support scheme. While small RES-E installations[125] may still receive a feed-in tariff, larger installations have to successfully participate in a tendering process to receive support in the form of a premium tariff. The rates of the feed-in tariff range from 5 to 23 €ct/kWh, depending on technology as well as costs of investment and operation. The support is paid for 20 years (15 years for wind). The premium tenders are technology specific and so are their conditions. For most technologies, there are multiple tenders per year, e.g. for ground-mounted solar PV there are two calls per year and for rooftop solar PV there are three calls per year.

  In addition to the feed-in tariff and premium schemes, France grants deductions of the income tax to natural persons as well as reduced value-added tax for the purchase of RES-E technology for buildings. Eligible technologies are wind and solar energy as well as hydropower and biomass. The level of deduction is technology specific.

- **Long-term security of support for RES-E: High**

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[124] Spain National Action Framework for Alternative Energy in Transport

[125] Eligible technologies for the feed-in tariff are rooftop solar PV installations of up to 100 kW, biogas and hydro plants of up to 500 kW as well as wind power plants that fulfil specific requirements.

In its Law on the Energy Transition for Green Growth (Loi de transition énergétique pour la croissance verte), France has set out a target of 40% renewable energies in the total electricity production for 2030. This target and related measures assure the long-term security of support for RES-E in France. Planning security up to 2023 is ensured by technology-specific volumes which are defined in the framework of the Multiannual Energy Plan for the period between 2018 and 2023 (Programmation pluriannuelle de l'énergie). Until 2023, France plans to have the following capacities installed: 21.8 to 26 GW of onshore wind, 3 GW of offshore wind, 18.2 to 20.2 GW of solar PV, 0.79 to 1.04 GW of biomass and 25.8 to 26 GW of hydro power plants. These targets are currently under revision. By the end of 2018, new technology-specific RES targets for the periods 2018-2023 and 2024-2028 will be set out in the Multiannual Energy Plan, however this Plan will be implemented by mid-2019 after a series of public consultations.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes (but below 2016 RES-H&C NREAP sectoral trajectory**
  France has fulfilled earlier commitments and supports RES-H&C through a series of measures. The main support instruments are an Energy Transition Tax Credit, reduced VAT rates and a zero-rate eco-loan. With these three measures, the French government aims to have wood-fired heating installed in 9 million dwellings, heat pumps in 2 million dwellings and solar thermal equipment in 4 million dwellings by 2020. The income tax deduction is the same as for RES-E and amounts up to 30% of hardware costs. The reduced VAT of 5.5% (regular VAT is 20%) rate applies to biomass boilers, heat pumps, fireplace inserts and wood-burning stoves in individual housing units as well as in buildings. The zero-rate eco-loan (éco-prêt à taux zéro) applies to biomass heating and solar thermal energy. The loan amounts up to €30,000 and reimbursement within 15 years.

  In addition, France supports RES-H&C through the Heat Fund. The programme has been set up in 2008, runs from 2009-2020 and aims to trigger the production of up to 5.5 Mtoe of renewable heat. Eligible technologies are biomass, geothermal energy, heat pumps and solar thermal energy. The sectors concerned are collective housing, tertiary, agriculture and industry.

- **Long-term security of support for RES-H&C: Moderate**
  The long-term security of RES-H&C support in France is moderate. Support measures have been set in a transparent manner and well in advance. However, the annual reformulation of the Heat Fund – the support volume was cut in 2018 – poses insecurity to the long-term prospect of the program. The Fund should benefit from a budgetary increase in 2019 pending budget approval.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  As in many other MS, RES-T is supported through a biofuel quota in France. Fuel suppliers are obliged to ensure a 10% share of biofuels in gasoline and 8% in diesel. In France, the biofuel obligation is linked to a tax on polluting activities called TGAP (Taxe Générale sur les Activités Polluantes). Fuel suppliers are subject to increased tax rates in case they violate the biofuel obligations.

- **Long-term security of support for RES-T: Moderate**

The long-term security of RES-T support in France is high. The biofuel quota has been set up in 2015 and there are RES-T targets for 2030. In addition, the current Multiannual Energy Plan sets concrete targets for the incorporation of advanced biofuels by 2023: 3.4% for petrol, 2.3% for diesel.

Croatia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  In 2013, Croatia adopted its NREAP until 2020[126]. The NREAP confirms the target of 20% of RES in the final energy consumption by 2020 and defines the sectoral trajectory of 35% RES in the electricity sector. According to the Progress Report published in 2016, Croatia already surpassed the trajectory set for 2020 in the electricity sector in 2014 by reaching a RES-E share of 45.3% in 2014. In the Progress Reports published in 2016 and 2018, the Croatian government does not indicate any new measures planned for supporting the deployment of RES in the electricity sector. It only lists the existing support measures based primarily on the guaranteed feed-in tariff eligible for all renewable energy technologies.

  In 2015 the Croatian Parliament adopted the Law on Renewable Energy Sources and Highly-Efficient Cogeneration (RES Act)[127]. The law entered into force in January 2016 and introduced an auctioning mechanism combined with a feed-in premium or a fixed feed-in tariff. Originally, the RES Act envisaged that only installations smaller than 30 kW will receive a fixed feed-in tariff but the amendments to the RES Act adopted in December 2018[128] foresee that installations up to 500 kW may receive a guaranteed feed-in tariff, after being successful in the auction. The support is open to all renewable energy technologies. However, most of the by-laws necessary for enforcing the RES Act have not yet been adopted. Given that the previous feed-in tariff support scheme was officially abolished with the adoption of the RES Act and the new support scheme has not yet been made operational, renewable energy development in the electricity sector has been put on hold and no new projects can be initiated. In the Progress Report from 2018, it is stated that the by-laws are in the process of being adopted. In December 2018, with the amendments to the RES Act, the Croatian Government set itself a new legal deadline of six months for adopting all necessary by-laws for the implementation of the RES Act. At the end of December 2018, the Government adopted the first major by-law: the Decree on the Support for Electricity Production from Renewable Energy Sources and Highly-efficient Cogeneration[129].

- **Long-term security of support for RES-E: Moderate**
  As stated above, Croatia has been without the completed regulatory framework and support scheme for RES in the electricity sector since 2016. The adoption of most of the necessary by-laws based on the RES Act are still pending but some important progress was made at the end of 2018. The Decree on the Support for Electricity Production from Renewable Energy Sources and Highly-efficient Cogeneration which

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[126] http://www.mzoip.hr/doc/nacionalni_akcijski_plan_za_obnovljive_izvore_energije_do_2020_godine.pdf

[127] https://narodne-novine.nn.hr/clanci/sluzbeni/2015_09_100_1937.html

[128] https://narodne-novine.nn.hr/clanci/sluzbeni/2018_12_111_2151.html

[129] https://narodne-novine.nn.hr/clanci/sluzbeni/2018_12_116_2300.html

specifies the design and terms of the auctioning system was adopted in December 2018 but other by-laws are still pending such as the ones which shall define the targets for different renewable energy technologies and the technical conditions for renewable energy installations eligible for support. The changes in the regulatory framework with the RES Act have introduced some retroactive changes which can negatively affect the operation of renewable energy projects. This is particularly related to the grid balancing charges which have been imposed on all renewable energy projects larger than 50 kW (Article 46/7).

Heating and Cooling:

- **Fulfilment of earlier RES-H&C policy commitments: No (but already exceeding 2020 RES-H&C NREAP sectoral trajectory)**
  Croatia has still not introduced the regulatory framework and support scheme for promoting the deployment of RES in the heating and cooling sector. Although the Programme for Utilization of the Efficiency Potential in the Heating and Cooling Sector for the period 2016-2030 was published as planned by the Energy Institute Hrvoje Požar in November 2015[130], the government has not yet enacted a support scheme for facilitating the use of RES in the heating and cooling sector. Such measure was indicated as planned for 2016 in the previous two Progress Reports from 2016 and 2018.

  The entire use of RES in the heating and cooling sector in Croatia is related to the use of wooden biomass in households, with only minor contribution from geothermal energy, solar thermal, waste and heat pumps. There is considerable potential for promoting renewable energy sources in the district heating and at a smaller scale but the regulatory, market, infrastructure and policy conditions have not yet been altered to enable the utilisation of that potential.

- **Long-term security of support for RES-H&C: Low**
  The new Law on Renewable Energy Sources and Highly-Efficient Cogeneration does not address the heating and cooling sector. Heating is only indirectly supported through the financial support provided for electricity produced in cogeneration plants. There is no direct financial support for the heating part of cogeneration. This creates considerable uncertainty about the future prospect of RES-H&C in Croatia.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  In the period 2010-2014, the production of biofuels was financially supported through the premiums paid to producers of biodiesel and bioethanol for placing biofuels on the Croatian market. This scheme was abolished in 2014.

  The only existing regulatory framework for ensuring the fulfilment of the trajectory in the transport sector is the obligation for diesel fuel and gasoline distributers to place a share of biofuels on the market. The Action Plan for Biofuels Production and Consumption in Transportation for the period 2011-2020 defines the annual biofuel quota obligations for fuel distributors which should lead to achieving the market share target

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[130] https://ec.europa.eu/energy/sites/ener/files/documents/croatia_report_eed_art_141update_hr.pdf

of 10% biofuels in the transport sector by 2020[131]. This regulation has however proven to be difficult to enforce in practice.

In the NREAP from 2013, Croatia announced financial support for the purchase of electric vehicles. While this measure was introduced in 2014 through the Environmental Protection and Energy Efficiency Fund, the support was provided in a limited amount and on a year to year basis without necessary stability and long-term prospect. Furthermore, in 2016 and 2017, the financial support was fully absent. In 2018, the purchase incentive for electric and hybrid vehicles has been introduced again[132]. The total annual budget for natural persons is capped at 12 million Croatian Kuna (approx. €1.6 million). The maximum subsidy per car for electric vehicles is 80 000 Croatian Kuna (approx. €10,800).

- **Long-term security of support for RES-T: Moderate**
  There is considerable uncertainty about the long-term prospect of the support scheme for electric vehicles and the ability of the Croatian authorities to effectively enforce the Biofuels Obligation.

Italy

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  In Italy, electricity generated from RES has been promoted through a number of feed-in tariffs and premiums since 2013, as well as through a tendering system for installations above 5 MW, which then received a premium. However, this support scheme is not in place anymore since 01.01.2018. A new decree is being revised at the moment and should be issued shortly. Additionally, net metering and tax regulation mechanisms are available.

  Until 01.01.2018, depending on the source of electricity and the size of the installation, RES-E plant operators were obliged to opt for a certain system or choose between the available ones. For instance, all RES-E installations up to 0.5 MW, except solar PV, could make use of the feed-in tariff, whereas RES-E installations up to 5 MW could make use of the feed-in premium. Installations with an installed capacity higher than 5 MW had to compete in an auctioning process. Successful projects received a sliding feed-in premium for a period of 20 to 30 years.

  Solar PV installations can directly market their electricity through Italy's regulation for self-consumption, called the SEU framework. Installations up to 20 MW are eligible for this framework. In 2016, a ministerial decree was in place to also support solar thermal power through a separate feed-in premium scheme. There was only a minimum threshold of 1 kW, and lower support was given to installations in steps of 250 kW and 5000 kW. A budget of €5.8 billion is made available annually for the support of RES-E in Italy, of which 96% was spent in the year 2016. For the tender scheme, caps are installed on capacities (onshore wind: 800 MW; offshore wind: 30 MW; geothermal: 20 MW; biomass: 50 MW – for 2016).

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[131] http://www.mzoip.hr/doc/nacionalni_akcijski_plan_poticanja_proizvodnje_i_koristenja_biogoriva_u_prijevozu_za_razdoblje_2011-2020.pdf

[132] http://www.energetika-net.com/vijesti/elektromobilnost/krecu-poticaji-za-elektricna-vozila-26780

Operators of RES-E installations can also request the government to sell the generated electricity on the market, where the government then acts as a mediator between generators and end consumers. The maximum capacity threshold for this scheme is 1 MVA, beyond this, generators are required to market their electricity directly. Italy also grants a reduced VAT rate of 10% instead of 20% for investments in solar PV, wind power and the distribution grid.

Italy's green certificate scheme was abolished in 2016, along with the accompanying quota scheme due to the complete transition to the feed-in tariff and premium schemes. As of 2016, any installations still holding green certificates could exchange them with Italy's energy authority for a price of 78% of the difference between the price of a green certificate and the power price multiplied by a coefficient that is different to each technology[133].

- **Long-term security of support for RES-E: Moderate**
  The feed-in tariff and premium schemes in Italy provide support for a period of 15–30 years, depending on the source. However, there have been a number of retroactive changes in Italy's RES-E support policy aimed at increasing policy efficiency. Despite this, installation rates of renewable energy remained high, indicating that investor confidence has remained relatively stable. Funding volumes and installation caps for new installations are however uncertain for future years.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Since 2016, small RES-H sources such as heat pumps (aerothermal, geothermal, hydrothermal), biomass and solar thermal are eligible for financial support through the Conto Termico. Financial support is provided on an annual basis, or all at once when the level of eligible support does not exceed €5,000. Private individuals and public entities can make use of the scheme. A cap for support is set at €700 million for the former and €200 million for the latter or after a period of 3 years through a ministerial decree[134]. When this cap is reached, the incentive level will be adjusted and it is unclear whether more budget is planned.

  In addition, Italy maintains a scheme that allows for a 50-85% tax deduction for expenses related to energetic refurbishments of buildings and installation of RES-H&C technologies. The tax deduction of 65% cannot exceed €100,000, the tax deduction of 85% is limited to €136,000[135]. Aerothermal, geothermal and solar thermal installations are eligible. A separate €460 million loan fund for renewable heating technologies which had been available through the so-called "Kyoto fund" was available until 2017. The budget of the Kyoto fund has been topped up with €188 million to run until June 2018[136].

- **Long-term security of support for RES-H&C: Moderate**

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[133] https://www.gse.it/servizi-per-te/fonti-rinnovabili/impianti-a-fonti-rinnovabili-grin/modalità-di-calcolo

[134] http://www.res-legal.eu/search-by-country/italy/single/s/RES-H&C/t/promotion/aid/price-based-mechanisms-conto-termico/lastp/151/

[135] http://www.acs.enea.it

[136] https://www.cdp.it/progetti/tutti-i-progetti/fondo-kyoto-un-anno-in-piu-per-interventi-di-efficientamento-energetico-nelle-scuole.kl

Italy’s pricing scheme for RES-H&C grants incentives for a period varying between two and five years, depending on the capacity of the installation and what system the installation is substituted for. Solar systems receive two years of support when the surface is below 50 m^2. It is however unclear what the incentive level will be for new installations when the support cap is reached. This will be reviewed after three years, i.e. in 2019.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**
  The main instrument to increase the RES-T share in Italy is a quota system for biofuels. The goal set out is a share of 9% biofuels by 2020 in terms of energy consumption[137]. The scope of fuels is relatively broad, with biodiesel, bioethanol and derivatives, bio hydrogen and ETBE being eligible. Obligated parties (fuel suppliers) demonstrate compliance by providing a number of biofuel certificates (CICs) to the Ministry of Environment. One CIC represents 10 Gcal of fuel energy content or 5 Gcal of advanced biofuel which stems from specified raw materials. In 2018, a new biomethane decree was signed focusing on advanced biofuels and introducing a support system involving the withdrawal of certificates by GSE for ten years at a defined price. Therefore, Italy earmarked €4.7 billion for biofuel incentives until 2022[138].

  In 2017, Italy decided through a government decree that no longer all biofuels produced from wastes and residues are available for stimulation through the scheme, only those included in a specific list.

  As of 2015, Italy exempts owners of electric vehicles from ownership tax for a period of five years, whereby a reduced rate of 25% compared to that of petrol cars is paid. A focus is also put on fuel cell transport, with an aim of having 290,000 fuel cell vehicles by 2030, which will be stimulated by the construction of hydrogen fuelling stations starting in 2020. In 2014, incentives for the purchase of EVs were available (around €30 million) but were exhausted rapidly. No such plans are known for the upcoming years.

- **Long-term security of support for RES-T: Moderate**
  There are no indications of future changes to Italy’s RES-T policy. The biofuel quota scheme has targeted shares defined until 2020 but is expected to be maintained post-2020 as well. No public data is available about the price of biofuel certificates, but there seems to be a reasonable stability of prices at around €300/CIC. The biofuel certificates will be granted for a period of 20 years[139].

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[137] https://www.gse.it/documenti_site/Documenti%20GSE/Servizi%20per%20te/BIOCARBURANTI/Normativa/DM%2013%20dicembre%202017_obbligo%20biocarburanti%20dal%202018.pdf

[138] https://www.biogaschannel.com/en/news-and-events/firmati-decreti-su-uso-biometano-e-agevolazioni-im/186/

http://www.gazzettaufficiale.it/eli/id/2018/03/19/18A01821/SG

[139] https://www.mwe.com/en/thought-leadership/publications/2018/04/italy-biofuel-incentives-in-the-transport-sector

Cyprus

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  Cyprus has only partially fulfilled its commitments expressed in its NREAP and previous Progress Reports. In 2015, Cyprus decided to phase out its feed-in-tariff to integrate renewable plants into the competitive electricity market in the long-term. In the current transition period, a support scheme was introduced in October 2017. The scheme aims at facilitating the introduction of RES-E in the future competitive electricity market. The scheme covers photovoltaic, wind energy, biomass, concentrated solar power (CSP) and wave energy. The total installed capacity is capped at 212.5 MW. RES plants will be connected to the grid and receive a feed-in tariff that is defined by the Cyprus Energy Regulatory Authority (CERA)[140]. Under that scheme, RES plants will cease to receive the feed-in tariff 12 months after the official operation of the competitive electricity market which is expected to be fully operational by July 2019[141]. Afterwards, RES plants will only receive the electricity market price. Aim of the scheme is that all plants should be fully operational until 31 December 2019 the latest. The scheme closed in April 2018[142].

  In addition, Cyprus supports RES-E through a net metering scheme for solar PV systems up to 5 kW. The measure was initiated in 2013 and extended yearly until 2017. A capacity of 1.2 MW has been reserved for vulnerable consumers, who were the initial target group. Additionally, 8.8 MW are available to all consumers and 13 MW for installations in non-residential sites. Furthermore, Cyprus supported the installation of 40 MW of solar PV for self-consumption in commercial and industrial establishments as well as off-grid solar PV systems[143]. The scheme was partly terminated as another similar scheme was announced. In June 2018, a new net- metering/net-billing scheme was announced. Similar to the previous net metering scheme, PV systems up to 10 kW are eligible. 5 MW are reserved for residential consumers and 15 MW for non-residential consumers. Furthermore, 40 MW for PV systems and biomass in commercial, industrial and public administration sites are eligible for net-billing. Finally, off-grid solar PV systems are also eligible. It should also be noted that vulnerable consumers can continue to submit their application under the previous net metering scheme until the available budget is exhausted. The scheme ends in July 2018[144].

- **Long-term security of support for RES-E: Moderate**
  The long-term security of RES-E support in Cyprus is moderate. There seems to be a certain pattern concerning RES-E. Net metering schemes, as with the previous feed-in tariff and grant schemes before 2013, are announced yearly, having a budget and capacity cap.

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[140] The “RES price” is defined twice a year by CERA. For the period January- June 2018 the market price of RES electricity, which is based on the fuel price coefficients at €ct 7.393/ MWh for low voltage, 7.264€ct / MWh for medium voltage and 7.135€ct / MWh for high voltage. (see: https://www.cera.org.cy/el-gr/apofasis/details/apofasi-030-2018 and https://www.cera.org.cy/Templates/00001/data/hlektrismos/ape/methodologia-ipologismou.pdf)

[141] https://www.cera.org.cy/Templates/00001/data/nomothesia/ethniki/hlektrismos/rythmistikes_apofaseis/2017_05(1).pdf

[142] http://www.mcit.gov.cy/mcit/mcit.nsf/All/47B62BFD15CC5CC5C22581AE002FA04D?OpenDocument

[143] http://www.mcit.gov.cy/mcit/EnergySe.nsf/All/B3F78CDCA3517FF1C225811A0034C8EE?OpenDocument

[144] http://www.mcit.gov.cy/mcit/EnergySe.nsf/All/9BDC1EE5AA2223CAC22582B700274F54?OpenDocument

Future RES-E installations are expected to generate their revenues purely at the electricity market. In 2017, CERA issued a binding timeline concerning the operation of a competitive electricity market ("net pool" Day Ahead Market[145]), which is expected to be fully operational by July 2019[146]. However, its operation is estimated to be further postponed[147].

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Cyprus' support instruments for RES-H&C are basically two grant schemes. The first one offers an investment grant for solar water heaters for residential buildings as well as enterprises, which applies to new installations as well as the replacement of old installations. The grant scheme has been in place for several years now, while the budget is determined on a regular basis. In its latest round, which started in September 2017 and ended in January 2018, a total budget of €600,000 was available and more than 1,900 applications were submitted[148].

  The second grant scheme ("Energy Upgrading of Domestic Residences") focuses on the energy upgrading of domestic residences. Total budget amounts to €8 million and among others it provided grants for the purchase and installation of certain RES-H&C technologies (solar thermal, geothermal, hydrothermal and aerothermal heat pumps). The scheme was open from April 2018 to June 2018 and 931 applications were submitted[149].

- **Long-term security of support for RES-H&C: Moderate**
  As with other support measures in Cyprus, the RES-H&C support schemes ended in 2018. Furthermore, the second grant scheme stopped accepting new applications due to increased interest and as the applications already covered more than 80% of the foreseen budget in May 2018[150]. No reliable information on continuation of the two schemes in and beyond 2018 has been identified. However, despite the moderate long-term security of support, the solar thermal sector is very developed in Cyprus. Grant schemes were introduced only to give an extra push to a mature sector.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  Cyprus obliges fuel suppliers to replace conventional transport fuels with biofuels at a level of 2.4% per energy content of all transport fuels[151]. The biofuel quota can be seen as rather low. No additional

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[145] In this market, licensed participants can buy and sell energy to supplement the bilateral contracts they have entered to and the subsequent application of an integrated scheduling process (ISP). The ISP is regulated by the Transmission System Operator so as to schedule generating units and dispatchable load, while the Operator is responsible for the real-time Balancing Mechanism. It should also be noted that currently on the Electricity Authority of Cyprus (EAC) is the so-called "dominant participant" due to the fact that it holds 100% of the supply market in Cyprus while it covers 92.5% of the electricity produced in the MS.

[146] https://www.cera.org.cy/Templates/00001/data/nomothesia/ethniki/hlektrismos/rythmistikes_apofaseis/2017_05(1).pdf

[147] http://politis.com.cy/article/nea-kathisterisi-gia-tin-antagonistiki-agora-ilektrismou

[148] http://www.mcit.gov.cy/mcit/energyse.nsf/All/EF436A08BDC0BE34C2258209003F0EB4?OpenDocument

[149] http://www.mcit.gov.cy/mcit/sit/sit.nsf/f465c263fb66a34dc2258163002de955/4a13730ab22e88d6c225825500380f1b?OpenDocument

[150] http://www.mcit.gov.cy/mcit/sit/sit.nsf/All/918EC77AC914AD99C225829D003E781A?OpenDocument

[151] https://epure.org/media/1369/overview-of-the-biofuel-policies-and-markets-across-the-eu-28-final.pdf

measures are taken regarding RES-T. Given the current policy framework, Cyprus is likely to fall short of meeting its 2020 RES-T target (10%), as the RES-T share was 2.64% in 2016.

- **Long-term security of support for RES-T: Moderate**
  There have been no abrupt changes in RES-T policy of Cyprus. However, the tax exemption on biofuels was revoked in 2011. A support scheme concerning the deployment of electric vehicles was announced in June 2018 but no further details are known.

Latvia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  Latvia has partially fulfilled its commitments expressed in its NREAP and earlier Progress Reports in terms of policy support for RES-E. Electricity generation from RES is stimulated through a complex support system based on a feed-in tariff, which also includes elements of a quota system and tenders. The existing, technology-neutral support scheme is on hold since 2011 and closed for new installations (2012 in case of RES-based cogeneration plants) until 01.01.2020 due to lack of transparency in the way it was carried out since 2007 and high costs for the consumers[152].

  The state support mechanisms for energy production are being assessed and revised. Stringent supervision of subsidised electricity producers, stricter controls and a limited timeframe for the implementation of RES projects has been introduced in the past years. At the same time, a tax for subsidised electricity producers was in force from January 2014 until December 2017[153], and the tax was paid by companies that receive financial support for power generation from renewable energy sources or from Combined Heat and Power (CHP) plants under the existing feed-in tariff.

  On 3 January 2019 the Ministry of Economics has submitted to the Latvian Government a report on solutions for further support of renewable energy in Latvia. The Ministry proposes to implement a number of measures to abolish the existing support system by 1 January 2022.

  Since 1 January 2014 RES-E is promoted through net metering.

- **Long-term security of support for RES-E: Low**
  The transition towards the new main RES-E support scheme has not been successful, yet, and there have been retroactive changes in policy.

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[152] http://www.baltic-course.com/eng/energy/?doc=141999

[153] https://likumi.lv/doc.php?id=262304

Heading and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  Since 2017 the Latvian gas market is fully liberalised. Furthermore, in September 2016 the Cabinet of the Ministers approved new regulations on "Requirements for injection of biomethane and liquefied natural gas into the natural gas transmission system" ("Prasības biometāna un gāzveida stāvoklī pārvērstas sašķidrinātās dabasgāzes ievadīšanai un transportēšanai dabasgāzes pārvades un sadales sistēmā")[154]. These regulations provide the renewable energy industry with the opportunity to engage in gas supply and sale, using the existing Latvian natural gas pipeline infrastructure. However, it is associated with high costs for the RES producer, because currently there is no facility in Latvia that can produce biomethane.

  Nevertheless, Latvia supports renewable heat with different fiscal measures, such as investment support for installation of new renewable energy heat plants in district heating, investment support for replacement of fossil sources with renewable energy in state owned buildings, multi-apartment buildings and industry facilities. Moreover, a value-added tax reduction for suppliers of biomass and biogas is in place and excise taxes are reduced if biogas is used for heating.

- **Long-term security of support for RES-H&C: Moderate**
  The main focus of the Latvian government with regards to heating and cooling is rather on energy efficiency and investments in district heating than on RES. Therefore developments of recent years reveal a rather negative picture regarding the long-term security of support for RES-H&C in Latvia. Even though Latvia's gas market is liberalised and a legal framework for the introduction of biomethane into the gas network has been developed, there is still no clear vision of a future support scheme.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  The Latvian RES-T share was only 3.63% in 2016 while the sectoral trajectory was set at 8% for 2016.

  Biofuels are the most important renewable energy source used in the transport sector in Latvia, however both the "Biofuel Production and Use in Latvia (2003-2010)" program and the national support programme "Aid for Biofuel Production" ended in 2010. On 21 July 2017 the Latvian government approved the conceptual report "On the Use of Renewable Energy Resources in the Transport Sector"[155]. Since 25 April 2017 the „Development plan for alternative fuels"[156] is in force as well as the „Electromobility development plan". The mandatory blending quota of 4,5 – 7% biofuel in fossil fuel is the main instrument in force for RES-T support in Latvia[157]. In addition, excise taxes payable by companies processing, holding, receiving or dispatching energy products are reduced for fuels blended with biofuels.

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[154] https://likumi.lv/ta/id/285189-prasibas-biometana-un-gazveida-stavokli-parverstas-saskidrinatas-dabasgazes-ievadisanai-un-transportesanai-dabasgazes-parvades

[155] https://likumi.lv/ta/id/292398-par-konceptualo-zinojumu-par-atjaunojamo-energoresursu-izmantosanu-transporta-sektora

[156] https://likumi.lv/doc.php?id=290393

[157] https://likumi.lv/ta/id/296656

In addition to the support of biofuels, several measures regarding electric mobility have been adapted in recent years. These included grants for plug-in hybrids and electric cars[158], as well as subsidies for development of e-mobility charging infrastructure[159]. In 2014 grants for 174 electric cars with overall budget €4,7 million were approved. In 2018 the first 70 fast charging stations were built on Latvia's main roads. At the same time, control and monitoring system for electric vehicle charging infrastructure is being developed. The overall budget of the project is €8,3 million. Until 1 April 2018, 427 electric vehicles have been registered in Latvia.

- **Long-term security of support for RES-T: Moderate**
  Although some measures are underway to develop a charging infrastructure and subsidies for electric cars were available for short period of time, there is a lack of a clear medium to long-term support for both biofuel and electric cars. A certain security is provided by the mandatory blending quota of 4,5 - 7% biofuel.

Lithuania

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2016 RES-E NREAP sectoral trajectory)**
  Lithuania has fulfilled its policy commitments expressed in its NREAP and earlier Progress Reports.
  The main support instrument for RES-E in Lithuania is a sliding feed-in premium. Eligible technologies are wind and solar energy, biogas and biomass as well as hydro power. Within the premium scheme, installations up to 10 kW receive administratively set support payments, while installations above 10 kW have to successfully bid in a technology-specific tendering scheme to receive support payments.

  For the tendering scheme, technology-specific caps for the support volumes have been set by the law on Energy from Renewable Sources for the period until 2020. The support volumes are limited to 500 MW for wind power, 10 MW for solar PV (except small-scale solar PV up to 30 kW), 128 MW for hydro power plants and 105 MW for biogas and biomass power plants[160]. First tenders took place in 2013. Already in 2015/2016, all technology-specific volumes have been reached, thus currently no further tenders are taking place. It is, however, planned to introduce a new support scheme for renewable technologies: technology-neutral tenders in combination with a fixed feed-in premium. Under this new financial mechanism 3 TWh of electricity would be supported until 2020 (i.e. the difference between the currently generated amount of electricity and 3 TWh). Foreign companies would also be allowed to participate. First technology-neutral tenders are expected to be launched in the second half of 2019. The new scheme is currently undergoing the European Commission's approval under the state aid rules and is expected to come into force from May 2019.

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[158] http://varam.gov.lv/lat/darbibas_veidi/KPFI/?doc=17874

[159] http://www.e-transports.org/index.php/jaunumi/203-turpinas-elektrisko-transportlidzeklu-uzlades-tikla-izveidosana-3

[160] https://www.e-tar.lt/portal/lt/legalActEditions/TAR.FC7AB69BE291?faces-redirect=true

In addition, Lithuania offers reduced grid connection rates for RES-E installations. For RES-E installations up to 350 kW the cost is set to 20% of the regular fee, the rest of the fee is to be paid by the connecting operator. For RES-E installations above 350 kW, the rate is set at 40% of the regular fee.

Lithuania also promotes the uptake of RES production in the industry sector with its 'Renewable energy sources for industry LT+' programme which provides investment grants to industrial companies who successfully participated in a tender. The programme is financed through EU Structural Funds and started in 2016. So far, 94 agreements have been signed and €20 million of funding has been awarded[161].

Furthermore, solar, wind and biomass installations below 10 kW (operated by individuals) and 100 kW (operated by legal persons) respectively are eligible for net metering. In this scheme, the self-generating customers are relieved from paying a Public Service Obligation levy for the self-generated and consumed amount of electricity.

Recently Lithuania decided on a very ambitious renewable self-consumer programme. Lithuania plans to encourage renewable self-consumption and raise the number of prosumers to 34,000 by 2020 and 500,000 by 2030. The MS already developed a project proposal together with InnoEnergy and a private consultant for technical assistance and a communication campaign. Currently foreseen funds amount to about €1 million, provided by the state budget and EU structural support.

- **Long-term security of support for RES-E: High**
  In Lithuania, RES-E support measures are set in a transparent manner and administrative changes are communicated upfront. The New National Energy Independence Strategy was adopted in June 2018 and sets specific RES-E targets for 2030 as well as indicative trajectory for 2050. Lithuania's planned RES-E trajectory for 2020 is 30% and renewable electricity is expected to grow to 45% in 2030 by developing wind potentials and to 80% by 2050 in terms of final electricity consumption. The new strategy and planned corresponding support measures provide positive signals for the future of RES-E in Lithuania.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Lithuania has fulfilled earlier policy commitments. RES-H&C is supported through a series of support measures. Based on the Law on Renewable Energy (Lietuvos Respublikos atsinaujinančių išteklių energetikos įstatymas)[162] the production of biogas is supported through a feed-in tariff, which amounts to 2.6-7.2 €ct/kWh, depending on RES source and size of the plant[163].

  In addition, Lithuania promotes small-scale biofuel cogeneration with an investment grant[164]. The scheme applies to new biofuel-based high-efficiency cogeneration units (with an electrical power of up to 5 MW and

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[161] http://www.esinvesticijos.lt/lt/patvirtintos_priemones/atsinaujinantys-energijos-istekliai-pramonei-lt

[162] https://www.e-tar.lt/portal/lt/legalActEditions/TAR.FC7AB69BE291?faces-redirect=true

[163] https://www.e-tar.lt/portal/lt/legalAct/b52bef70b61611e6aae49c0b9525cbbb

[164] Measure No 04.1.1-LVPA-K-l 10 of the 2014-2020 EU Funds' investments in Lithuania

a rated thermal input not exceeding 20 MW) in district heating systems (except in Vilnius and Kaunas). Furthermore, there are exemptions from the Environmental Pollution Tax for biogas and biomass plants[165].

Lithuania also provides investment aid for the modernisation of fossil-fuelled boilers in houses and installing heat-generating installations using renewable energy sources.

Moreover, Lithuania supports the purchase of heat produced from RES. More specifically, heat suppliers must purchase all heat from RES produced by independent producers that is cheaper than the heat produced by that heat supplier and which meets environmental and quality requirements as well as standards for the security of supply.

- **Long-term security of support for RES-H&C: High**
  The long-term security of support for RES-H&C in Lithuania is high. Key support measures run until 2020 and beyond. The New National Energy Independence Strategy was adopted in June 2018 and sets RES targets for 2030 as well as indicative targets for 2050 for the RES share in total final energy consumption – 45% and 80% of final energy consumption respectively.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  As in most EU MS, Lithuania obliges fuel suppliers to fulfil a biofuel quota. Petrol must contain at least 5% biofuels while for diesel the share is set to at least 7% of biofuels. Moreover, RES-T is promoted by a subsidy on raw materials for biofuel production accompanied by exemptions from excise tax and environmental pollution tax.

- **Long-term security of support for RES-T: High**
  No end dates are reported on the support measures for RES-T in Lithuania and there are no indications of changes in the future.

Luxembourg

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  The main RES-E support instruments in Luxembourg are feed-in-tariffs and sliding feed-in premiums on top of the market price with the aim to achieve a RES share of 8,5% in the electricity sector by 2020. Eligible technologies are wind and solar energy, biogas, biomass as well as hydro power. Geothermal energy is not supported. Paid tariffs range from 9.11 €ct/kWh for wind energy plants to 18 €ct/kWh for small hydro power plants (≤ 300 kW). The total available budget for RES-E support in 2016-2020 is approximately €150 million.

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[165] https://www.e-tar.lt/portal/lt/legalAct/TAR.FFF9AE9162EE/DSziflUHij

To comply with EU State Aid Guidelines, Luxembourg amended its support for RES-E installations larger 500 kW (3 MW for wind power plants) in June 2016. These installations are granted a premium on top of the wholesale market price instead of a feed-in-tariff. Moreover, Luxembourg launched a tender scheme for solar PV exceeding 500 kW in 2018.

In addition to the feed-in-tariff, Luxembourg supports RES-E installations through four different types of investment grants. The grants apply to different applicants. The first grant (Régime d'aides pour la promotion de l'utilisation rationnelle de l'énergie et la mise en valeur des énergies renouvelables) supports solar PV installations of up to 30 kWp with up to 20% of investment costs and a maximum of 500 €/kWp for natural persons, non-profit associations, and private and public real estate developers other than the state. The second grant (Régime d'aide à la protection de l'environnement et à l'utilisation rationnelle des ressources naturelles) is directed at natural persons and companies and supports all RES-E technologies with up to 45% of the additional investment costs of renewable energy as compared to non-renewable sources.The third grant (Régime d'aide en faveur des classes moyennes) is especially directed at companies and covers up to 40% of investment costs of RES installations.The fourth grant (Fonds pour la protection de l´environnement) especially supports municipalities in their investment of solar PV installations with up to 50% of investments costs.
Furthermore, in 2017, Luxembourg signed agreements for statistical transfer with Lithuania and Estonia. The agreements stipulate that Luxembourg will be provided statistic transfers for the period 2018 - 2020 in order to meet its 2020 RED target.

- **Long-term security of support for RES-E: High**
  The long-term security of support for RES-E in Luxembourg is high. Despite several amendments of the feed-in-tariff, RES-E support in Luxembourg is stable.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  In Luxembourg, RES-H&C is supported by different types of investment grants. Eligible technologies are heat pumps, geothermal energy, biomass and solar thermal energy. The granted support ranges from 25% to 50% of investment costs.

- **Long-term security of support for RES-H&C: High**
  The long-term security of support for RES-H&C in Luxembourg is high. New support conditions have been introduced in 2013 and are scheduled to be in place until 2020.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  Luxembourg has partially fulfilled its earlier RES-T policy commitments. As many other MS, Luxembourg supports RES-T by means of a biofuel quota system. From 2015 to 2020, Biofuels must make up at least 5.4% of the annual sale of petrol and diesel fuel companies. If the quota is missed, a pollution tax must be paid.

Moreover, the establishment of a charging infrastructure is mentioned in the NREAP and the latest Progress Report states that by 2017 the first 100 public charging stations had been installed. 800 public charging stations are to be built until 2020.

- **Long-term security of support for RES-T: Moderate**
  The biofuel quota is in place and no end date has been reported.

Hungary

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  In the past, the main support instrument for RES-E in Hungary were a feed-in-tariff (KÁT). Eligible technologies were biogas, biomass, hydro power, solar and geothermal energy. Feed-in-tariffs ranged from 4.2 to 11.52 €ct/kWh and were divided into three tariff rates, which varied depending on the time of day: peak, mid-peak and off-peak period. An exception was solar PV, for which the same rate of around 10.3 €ct/kWh applied throughout the day. The support was paid for 13 years for solar PV installations and 25 years for biogas and biomass plants. Under the feed-in-tariff, a total of 2,356 GWh electricity was produced in 2016, which led to support payments of €162.24 million.

  Since January 2017, only installations from 50 to 500 kW are eligible for the feed-in tariff due to the adoption of the new support scheme for renewable electricity, METÁR, through which a more differentiated tariff system has been introduced. Larger installations may receive a premium on top of the wholesale market price. Installations of 0.5 to 1 MW may apply directly for the premium. Installations larger than 1 MW have to successfully participate in a tender to receive the support. Although the European Commission has accepted the adoption of the new scheme in July 2017, no tenders have been opened yet. Sample tenders were announced for late 2016, which have not been realised.

  Since, 2017, wind power is no longer eligible for the feed-in-tariff but may receive a premium in theory. However, the Hungarian government has unexpectedly impeded further expansion of wind energy per government decree.

  Hungary introduced a net metering scheme in 2007 which applies to RES-E installations below 50 kW.

- **Long-term security of support for RES-E: Moderate**
  Hungary planned to replace its feed-in-tariff system (KÁT) with a new scheme (Megújuló Energia Támogatási Rendszer - METÁR) in 2011. The change of the support scheme has been postponed several times and was finally adopted in 2017[166]. Past postponements created a perception of high regulatory uncertainty. Although the scheme is considered more reliable than the preceding KÁT-system, it has been criticised that the planned all-encompassing renewable electricity law has not been enacted. The METÁR is not an overarching law but rather consists of individual elements specified e.g. in the law on Electricity and several governmental, ministerial and energy regulatory authority decrees, amongst others. This

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[166] http://www.mekh.hu/megujulo-tamogatasi-rendszer-metar

fragmentation in various types of legal instruments also characterised the previous regulatory framework before METÁR more specifically, since it provided an easy mechanism to reverse policy direction. A case in point and is the impediment of wind power's expansion per governmental decree in 2016. The complexity and fragmentation of the regulatory framework results in a lack of transparency and leaves the system exposed to the risk of sudden changes.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  In Hungary, RES-H&C is supported through the Environment and Energy Efficiency Operational Programme (EEEOP)[167]. The support of RES-H&C is closely connected to building modernisation measures and mainly non-profits, church institutions, companies and public institutions can take advantage of the associated schemes. The support is granted through calls for tenders which are published continuously between 2014 and 2020. Between 2015 and 2017, €1.05 billion were to be allocated for the enhancement of energy efficiency and the application of RES.

- **Long-term security of support for RES-H&C: Moderate**
  RES-H&C's long-term security of support in Hungary is moderate. The EEEOP scheme runs from 2014 to 2020 and provides tenders for RES-H&C. However, the scheme is not considered stable by investors and experts - for instance, the tendering procedures are incomprehensible and not transparent - and a clear strategy for the diversification of resource use is missing.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**
  As in many other MS, the main support measure for RES-T in Hungary is a biofuel obligation. The quota is set for a period of three to four years. For the period of 2014 to 2018, Hungary obliges fuel suppliers to mix a biofuel share of 4.9% into their fuels. In 2019 and 2020, the quota will rise to 6.4%.

  Hungary has not adopted any additional measures to support renewables in this sector. However, despite the quota share being low, Hungary is on track to meet its 2020 RES-T target due to the applicable methodology which allows for double accounting of certain biofuels.

- **Long-term security of support for RES-T: Moderate**
  Hungary has not made significant changes in RES-T policy since its NREAP. The mandatory biofuel quotas are set in advance for a period of three to four years.

Malta

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**

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[167] http://www.kormany.hu/en/ministry-of-national-development/news/eu-funding-of-huf-2-000-billion-for-transport-environmental-and-energy-efficiency-developments

Malta has made limited progress in adopting RES-E policy measures. Maltese RES-E support policy is specifically focused on solar energy by now. Since 2016, other RES-E technologies are not supported any longer. In late 2016 Malta updated its NREAP and presented a shift in RES technology focus. While in the original NREAP Malta planned to produce 254.49 GWh (4.1% of the 10% RES 2020 target) from wind energy, the updated plan intends to rely solely on solar PV for RES-E. Wind energy, geothermal, wave, tidal and hydro power as well as biomass are no longer considered "because the available resource intensity is not yet known or sufficient to make them cost-effective or indeed possible at the current level of development of the technology, or because they are as yet immature, or because they have a negative collateral impact on the environment and on other indispensable activities"[168].

The main support measure is a feed-in-tariff for solar PV. 15.5 €ct/kWh are granted to installations with a capacity of 1-40 kWp and 15 €ct/kWh to installations with a capacity of 40 kWp to 1 MWp, over a period of 20 years. In addition, a grant scheme for PV installation in the domestic sector and other measures support the specific development of solar PV. PV installations that received an investment grant may also apply for a feed-in-tariff of 16.5 €ct/kWh for six years[169]. Furthermore, Malta aims to support solar PV installation larger than 1 MWp from 2018. Projects may bid for support in a competitive process[170].

- **Long-term security of support for RES-E: High**
  The level of feed-in tariffs for PV installations has undergone several adjustments since September 2012. Feed-in tariffs are available only until the annual target capacity of 4.2 MWp is reached for installations of 1 kWp to 40 kWp and 8 MWp for installations of 40 kWp to 1 MWp[171].

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  Malta has made some progress in adopting new RES-H&C measures. The government continues to support the deployment of solar water heaters (SWHs) with an investment grant scheme. In addition, a similar grant scheme for heat pumps was introduced in 2017[172]. Yet, Malta has still not adopted measures for the promotion of CHP that it committed to in the NREAP.

- **Long-term security of support for RES-H&C: Moderate**
  Lon-term planning security is limited, as support schemes are extended on a yearly basis. As a result, it is unclear for investors whether there will be support in the mid-term future.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

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[168] Malta, revised NREAP 2016/2017, p. 114
https://www.timesofmalta.com/articles/view/20161103/local/wind-power-ditched-in-favour-of-solar-as-government-revisits-renewable.629952

[169] https://www.rews.org.mt/#/en/fa/32

[170] https://energy.gov.mt/en/tenders/Documents/Invitation%20to%20Bid%20(ITB)%20for%20Financial%20Suppor.pdf

[171] http://justiceservices.gov.mt/DownloadDocument.aspx?app=lp&itemid=28611&l=1

[172] https://www.rews.org.mt/#/en/a/151-heat-pump-water-heater-scheme

In the past, a biofuel quota has been Malta's main policy measure regarding RES-T. Introduced in 2011, the biofuel content level is set to gradually increase from 1.5% in 2011 to 10% in 2020.

Introduced in January 2017, a new grant scheme is set to incentivise the purchase of Battery Electric Vehicles (BEV), Range Extender Electric Vehicles and Plug-in Hybrid Electric Vehicles, Battery Electric Quadricycles, Electric Motor Scooters and Cycles as well as Pedelecs (Electric Assisted bicycles)[173]. The scheme has varying conditions. E.g., for private individuals registering a new or used[174] electric vehicle the grant amounts to €5,000. For registering a new electric vehicle and de-registering a vehicle with internal combustion engine which is at least ten years old, €8,000 are granted. The scheme will be reviewed from time to time to respond to changing conditions. First adjustments already took place in July 2017[175]. Alongside the promotion of electric vehicles, Malta aims to increase the number of public charging points as necessary.

- **Long-term security of support for RES-T: Moderate**
  The biofuel quota, introduced in 2011, set out predefined required biofuel levels up to 2020.
  The conditions of the investment grant for electric vehicles, on the other side, are subject to continuous change, which might affect the effectiveness of the scheme.

Netherlands

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2016 RES-E NREAP sectoral trajectory)**
  The Netherlands has strengthened its commitments expressed in the NREAP in terms of policy support for RES-E, predominantly by increasing the available budget for RES support. Nevertheless, it has not fulfilled its commitments on RES-E production. The projected share for RES-E in 2016 in the Netherlands NREAP was 24.4% but turned out to be 12.5%.[176]

  The most important policy for RES promotion is the SDE+ (Stimulation of Sustainable Energy Production) under which producers receive a feed-in premium. The SDE+ promotes renewable energy sources used for electricity, renewable gas and heating purposes (CHP). Support is paid for a period of 8-15 year depending on the technology.[177] In the year 2015, a total budget of €3.5 billion was available for the SDE+. In 2016,

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[173] http://www.transport.gov.mt/land-transport/grant-scheme-on-the-purchase-of-electric-vehicles
http://www.transport.gov.mt/admin/uploads/media-library/files/Government%20Gazette%20-%2017th%20January.pdf_20170118142519.pdf

[174] For used electric vehicles, the grant is only applicable for Battery Electric Vehicles of not more than 24 months old from date of first registration and not more than 12,000 km on the odometer.

[175] http://www.transport.gov.mt/news/press-release-25-july-2017-grant-schemes-on-electric-environment-friendly-vehic

[176] Please note that in this assessment we have focused on current policies, not taking into account the details of the recently published National Climate Agreement, which presents a range of measures and ambitions for 2030/2050. Most of the activities mentioned in this Agreement will be effective later than 2020, but it does show a momentum within the Netherlands to close the gap towards RES ambitions is set. Additionally recent tenders for offshore wind will make sure additional capacity will come online, but also these will be effective after 2020.

[177] The only projects receiving less than 15 years of support are biomass co-firing and anaerobic digestion/biogas projects.

two auction rounds were held with a total budget of €9 billion, representing a sharp increase compared to previous years. Only the budgets for offshore wind were not fully utilised due to rapidly falling costs of production. Also, in 2017, two auctions were held with a total budget of €12 billion. In 2018, the budget for SDE+ remained at €12 billion[178]. However due to saving measures, the SDE+ budget for 2019 will fall to €10 billion. As a consequence, the total projected year-to-year payments are set to increase sharply under SDE and SDE+ from an average of €690 million in 2010 - 2015 to around €3.4 billion in 2023.

Solar PV dominated the 2017 auctions regarding the number of projects as well as allocated budget. Overall, 4.54 GW of solar-PV was awarded in 2017[179]. In 2015, co-firing of solid biomass in coal-fired power plants became eligible for SDE+ subsidy up to a maximum of 25 PJ renewable energy per year. As of 2018 a total of €3.6 billion has been awarded for this.

Additional efforts have been made concerning offshore wind energy, including the adoption of the Offshore Wind Energy Act (Wet windenergie op zee) in 2015, which enables permits to be granted for offshore sites for wind energy by means of tendering procedures, which has led to record low bids. However, many permits for offshore wind that were issued when the NREAP was published were retracted to develop a more coordinated national approach for offshore wind. This caused the actual growth of offshore wind to be significantly lower than expected in 2016. Recent auctions for offshore wind will result in additional capacity to come online, but most of these new offshore wind parks will come online after 2020.

Furthermore, fiscal support measures are implemented. The EIA (investment subsidy) scheme's deductible percentage increased to 58% in 2016 and the available budgets increased to €106 and €161 million in 2015 and 2016, respectively. In 2016, the budget was not fully utilised. The EIA deductible percentage dropped in 2017 to 55% and in 2018 to 54,5%. Other fiscal support measures such as VAMIL, MIA and Green Investments remain in place.

- **Long-term security of support for RES-E: High**
  The SDE+ is expected to remain in place until 2020, therefore providing mid-term security. As of 2020, the SDE+ regulation will be transformed to a new regulation, named SDE++. The regulation will no longer only focus on the production of sustainable energy, but also on the reduction of CO² emissions. There is no end date known for the EIA, but it is scheduled to increase by 0.5% per year as of 2021.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes (but below RES-H&C 2016 NREAP sectoral trajectory)**
  The Netherlands has strengthened the existing elements of RES-H&C policy support but is expected to not fulfil commitments in terms of RES-H&C production. The main support scheme, the SDE+, covers renewable heat (biomass, geothermal, solar) since 2012. The SDE+ was opened for steam production with sustainable biomass (wood pellets) using boilers with a capacity exceeding 10 MW thermal capacity in

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[178] https://www.pv-magazine.com/2017/12/07/netherlands-sets-budget-of-e12-billion-for-2018-sde-program/

[179] https://www.pv-magazine.com/2017/04/06/netherlands-pre-selects-pv-projects-totaling-2-64-gw-in-first-round-of-2017-sde-program/
https://www.pv-magazine.com/2018/05/09/netherlands-awards-1-9-gw-of-pv-in-sde-2017-autumn-round/

2015[180]. This new category provides the opportunity for industrial players to ensure the sustainability of their heat demand. Other fiscal measures such as the EIA and green loans remain in place, aimed at companies, and stimulate a long list of technologies, varying from wind, solar, biomass and CHP to investments for efficiency improvement[181]. From 1st of January 2016, a new subsidy scheme exists for small installations to produce renewable energy (ISDE). Through the ISDE, the Dutch government aims to promote the heating of homes and offices by means of sustainable heat and reduce gas consumption. Private individuals and business users can therefore obtain a subsidy via the ISDE on the purchase of solar boilers, heat pumps, biomass boilers and pellet stoves. The budget for the scheme amounted to €70 million in 2016.

- **Long-term security of support for RES-H&C: High**
  The SDE+ is expected to remain in place until at least 2020 and gives support for a period of 8-15 year depending on the technology. The only projects receiving less than 15 years of support are biomass co-firing or anaerobic digestion/biogas projects. Total budgets have increased over the past years, but in 2019 the budget will decline again to €10 billion. As of 2020, the SDE+ regulation will be transformed to a new regulation, named SDE++. The regulation will no longer only focus on the production of sustainable energy, but also on the reduction of CO² emissions. The ISDE was opened on 1 January 2016 and will run until 31 December 2020.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  Some measures for RES-T continue to exist. The biofuel quota was 6.25% in 2016 and 7.75% in 2017. The actual deployment in 2016 was only 4.6%, which means that the quota has only been partially successful. The quota continuous to increase, to 16.4% in 2020, so that the end-point could be higher than the initial trajectory. Furthermore, there are tax credits for biofuel and hydrogen related RES-T investments. Existing CO_2 differentiated taxation has been complemented with a specific taxation for company car use in 2011 (in Dutch: “bijtelling”). However, this tax was increased from 0% to 4% for zero-emission vehicles in 2014 and will increase to the standard 22% rate in 2019 for zero-emission vehicles with a catalogue value exceeding €50.000, except for hydrogen-powered vehicles. Other programmes that ran for a fixed period, such as the Action Plan for Electric Driving and the Sustainable mobility testbed subsidy programmes, were terminated.

- **Long-term security of support for RES-T: Moderate**
  There have been no abrupt changes in RES-T policy since the First Progress Report. As the NREAP announced in 2010, the quota is increasing more steeply in the 2015-2020 period. There are no indications of future changes besides the changes in tax for zero-emission vehicles in 2019.

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[180] In the recently published National Climate Agreement the SDE+ program will be broadened to include industrial technologies for RES-H&C. This should start from 2020 onwards, so will have an effect after 2020, but shows momentum focused on the H&C sector.

[181] https://www.rvo.nl/sites/default/files/bijlagen/SEN040%20DOW%20A4%20Greenfunds_tcm24-119449.pdf; https://www.rvo.nl/subsidies-regelingen/energie-investeringsaftrek-eia

Austria

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  Austria’s most important law for RES-E support continues to be the Green Electricity Act (*Ökostromgesetz 2012*, ÖSG 2012). It has been amended several times and provides technology-specific feed-in-tariffs for solar PV, biomass, wind and hydro power. In its latest version from 2012, Austria’s Green Electricity Act set’s out the RES-E expansion targets up until 2020[182].

  A so-called *small amendment of the Green Electricity Act* from 2017 expands the Austrian RES-E support by providing investment grants for rooftop solar PV systems and home storage[183]. Grants are provided in 2018 and 2019 and may cover up to 65% of investment costs[184].

  The lack of measures for RES-E in the building sector was addressed in 2013 with the implementation of amendments to the building law as well as to the *Provincial Electricity Act*. These amendments aimed at administrative simplification for private individuals and undertakings.

- **Long-term security of support for RES-E: High**
  With a steady continuation of the feed-in-tariff Austria ensures long-term security of its RES-E support. The level of support can be updated (for new installations) on a yearly basis and the annual budget for new installations is €50 million[185].

  In addition, Austria’s energy and climate strategy for 2030 “mission2030” confirms its support for RES-E and foresees additional support, e.g. for rooftop solar PV in the “100,000 rooftop PV and storage program”.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  After limited progress in adopting RES-H&C measures in the past, Austria made significant efforts to increase policy support for RES-H&C in recent years. The *environmental support scheme* (*Umweltförderungen*) provides investment grants to, e.g., district heating based on renewables, solar thermal energy, heat pumps and building renovations. The support is applicable to companies, municipalities as well as households[186]. An integral part of the environmental support scheme is, e.g., a building renovation offensive that provides support for thermal renovation measures and installation of renewable energies as heating systems for private and commercial building owners.

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[182] https://www.e-control.at/documents/20903/-/-/c2e5bd0f-588e-4cd9-826e-d16111dfc571

[183] https://www.oem-ag.at/fileadmin/user_upload/Dokumente/gesetze/Novelle_Oekostromgesetz_2012.pdf

[184] https://www.oem-ag.at/fileadmin/user_upload/Dokumente/gesetze/180216_Foerderrichtlinien_2018_PV_und_Stromspeicher.pdf

[185] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20007386

[186] https://www.umweltfoerderung.at/alle-foerderungen.html

In addition, *klimaaktiv*, a climate protection initiative by the Austrian Ministry for Agriculture, Forestry, Environment and Water Management that started in 2004, provides information, consultation, trainings and offers standards with regard to renewable heating and cooling[187].

Other measures regarding RES-H&C are mostly implemented through provincial measures by the federal states. This, for example, applies to the EU Directive on the energy performance of buildings (2010/31), which has, to a large extent, been implemented on state level [188, 189]. Provincial measures include subsidies for biomass heating of residential buildings, for thermal solar panels, for heat pumps and for biomass district heating systems.

- **Long-term security of support for RES-H&C: High**
  The *environmental support scheme* (*Umweltförderungen*) provides significant and reliable support for RES-H&C of around €100 million per year[190]. Regional support schemes constitute the second main pillar of RES-H&C. The system is mature and is assumed to be stable.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**
  Austria has maintained its existing policies and implemented planned policies with regard to RES-T. The main policy measure is a biofuel quota introduced in 2009. It is part of the national fuel regulation (Kraftstoffverordnung 2012) and obliges companies introducing fuel to the market to annually substitute 5.75% of fossil fuels with biofuels[191]. An amendment of national regulation is currently planned to transpose the ILUC Directive, which sets a 10% biofuel share for 2020, into national law.

  In addition, several measures to support the uptake of electric mobility have been implemented. The environmental support scheme (Umweltförderungen) offers financial support also in the RES-T sector, by providing investment grants to undertakings, associations and municipalities for purchasing electric vehicles, electric motor cycles and scooters and electric bicycles and charging infrastructure. Requirement for the support is that the used electricity is based on renewable energy sources.

  As part of the previously mentioned climate protection initiative, *klimaaktiv mobil* provides information and financial support for mobility management and the conversion of vehicle fleets to companies, provinces, municipalities, etc.

- **Long-term security of support for RES-T: Moderate**
  There have been no unexpected changes in the main elements of RES-T policy and additionally implemented measures draw a positive picture for the security of Austria's RES-T support.

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[187] https://www.klimaaktiv.at/ueber-uns.html

[188] https://www.bmnt.gv.at/energie-bergbau/energie/energieeffizienz/Energieeffizienz-bei-Gebaeuden.html

[189] http://eur-lex.europa.eu/legal-content/DE/NIM/?uri=CELEX:32010L0031

[190] https://www.ots.at/presseaussendung/OTS_20151120_OTS0186/rupprechter-2016-hat-oesterreich-mehr-geld-fuer-umweltfoerderungen

[191] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20008075

Poland

Electricity

Fulfilment of earlier RES-E policy commitments: Partially
Poland has a series of support instruments for RES-E in place. The latest Progress Report indicates ten additional measures have been implemented since 2013. These include the recent adoption of policies regarding small installations: RES Act licence exemptions, the obligation for purchasing electricity and a scheme for a surplus-deficit exchange at 70-80% of electricity fed into the grid for prosumers (in each case up to 40 kW). The reform improves the viability of prosumers solutions although no assessment is available.

2016 also saw the introduction of a new support scheme based on tenders (auctions which has become the main mechanism in pursuit of the 2020 trajectory.

- Pay-as-bid tenders are the main support scheme. Tenders are open for all technologies and are conducted for five different groups of RES, separately for installations up to 1 MW and above 1 MW. However, before November 2018 only two test tenders were held, delivering only 0.2-0.3 TWh annually, whereas at least 12 TWh of annual generation would be required for the target achievement[192]. While a number of tenders for different technology baskets was conducted in November 2018, much of the budget remained unassigned and a few tenders closed unresolved due to too few bidders. The tenders that took place on 5-20 November 2018 were dominated by wind onshore (76% purchased electricity) and PV 14% purchased electricity and brought ca. 3,6 TWh[193], while ca. 12 TWh/a growth is needed to meet the target.

The maximum amount of public support that is paid is equal to the difference between the reference price multiplied by the amount of generated electricity and the revenues from the same amount of electricity sold on a competitive market at an average price. At the same time, the old quota support scheme is being phased out, although it is still available for installations that were connected before the second half of 2016. In August 2017 the old quota scheme was amended to set the substitution fee for surrendering green certificates (often a benchmark in certificate purchase agreements) at 125% of the average certificate price from the year before (but no more than 300.03 zł/MWh, approx. 70 EUR/MWh). The cap is the previous level of the fee. Given low certificate prices at the time, the amendment is highly disadvantageous for RES installation operators and benefits state-owned utilities[194]. Certificate prices stayed at low to very low level for a long time[195], even if they have increased more recently[196], due to the following system design fall-backs: 1) allowing existing large-scale hydropower plants and cofiring of biomass in existing coal power plants, and 2) unlimited banking of certificates. Despite a lengthy public debate on improving the certificate scheme, no measures have been implemented.

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[192] https://wysokienapiecie.pl/7435-system-aukcyjny-po-notyfikacji-cel-oze/

[193] Interestingly, average bids for wind onshore were at the level of average monthly power price in December at the Polish Energy Exchange (50,8 EUR/MWh; source: TGE Day-Ahead Monthly Market Report, December 2018, https://tge.pl/fm/upload/Raporty-Miesiczne/2018/RAPORT_grudzie_2018.pdf)

[194] http://energetyka.wnp.pl/jakie-oplaty-zastepcze-po-wejsciu-w-zycie-nowelizacji-ustawy-oze,304725_1_0_0.html

[195] https://wysokienapiecie.pl/1534-cena-zielonych-certyfikatow-tge-2016/

[196] http://gramwzielone.pl/trendy/30701/ceny-zielonych-certyfikatow-w-gore

- **Long-term security of support for RES-E: Low**
  The transition towards the new main RES-E support scheme (tenders) has been fraught with difficulties and uncertainty, also given the long duration of the notification with the EC. Moreover, mid- to long- term no timetable with targeted volumes, dates or technologies is available, which leaves investors with uncertainty regarding the availability of support. Since 2016, a minimum distance requirement of ten times the turbine height between new onshore wind parks and settlements as well as regulation increasing real estate taxes for onshore wind installations effectively froze the development of this sector. This led to a substantial decline in onshore wind deployment in recent years, despite many well-developed and fully permitted wind projects. However, small changes to these rules, i.e. extending the validity of building permits issued before the 10h law until 2021 and more favourable taxation of onshore wind installations, were put in place in June 2018. The distance requirement for new installations, however, remains in place and is the major barrier against renewable energy development in Poland.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: N/A**
  Neither the NREAP nor the Progress Reports mention concrete policy commitments in RES-H&C. However, some investment support programmes (subsidies and loans) exist in Poland. The main subsidy & loan programme, *Prosumer* (EUR 200 m for 2014-2022), supports heat installations for biomass, heat pumps and solar thermal collectors up to 300 kWt[197]. The funding is also available to RES-E installations. Another loan programme, *RES Stork*, targets an annual renewable heat generation of 990 000 GJ and earmarks PLN 570 m (EUR 142.5 m), to be divided among RES-E and RES-H&C installations in the years 2015-2023. The targeted technologies are biomass and solar collectors of 300 kWt – 20 MWt[198].

  The latest RES-H&C policy, introduced in 2017, is the obligation of purchasing heat generated from renewable energy sources for heat-trading entities or district heating utilities, provided it is offered at a price no higher than the average price of heat from other sources supplying the network. In general, all technologies are eligible for support[199]. No specific target has been set and an impact assessment of the measure is not available.

- **Long-term security of support for RES-H&C: Moderate**
  In the light of a missing strategy for RES-H&C, it is uncertain how and in what form support will be maintained in the coming years. The obligation of purchasing renewably generated heat is a new policy and an assessment of its stability cannot be made at this point. Since the bulk of support for RES-H&C is investment aid, potential modifications do not pose a risk to existing installations.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**

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[197] https://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe/prosument-dofinansowanie-mikroinstalacji-oze/informacje-o-programie/

[198] https://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe/bocian-rozproszone-odnawialne-zrodla-energii/

[199] http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20170001084

The main instrument for reaching the RES-T in Poland is a quota system for biofuels, introduced in 2008 (the only substantial commitment in NREAP). It foresees an increasing amount of fossil fuel to be substituted with biofuels; currently at 7.10%, the share is set to rise to 8.50% by 2020[200]. The Progress Report for 2015-2016 also mentions subsidies for the implementation of activities related to the production of biocomponents, liquid biofuels or other renewable fuels for transport, which exists since 2013.

- **Long-term security of support for RES-T: Moderate**
  Although the quota system is an established policy instrument, it has not led to the envisage RES-T shares. Also, the quota saw a downward adjustment (at time of implementation of the ILUC Directive in Polish regulation) of requirements for entities under the National Indicative Target for 2017 (to 7.10%, down from 7.80%)[201]. Lower demand may potentially affect the supply side of the policy aimed at reaching the RES-T target.

Portugal

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  In 2012, the existing feed-in system was revoked and feed-in tariffs for new installations no longer apply. More specifically, Decree-Law 215-B/2012 set a moratorium for all large RES-E projects introduced by Decree-Law 25/2012. Existing RES plants that were registered until November 2012 continue to be supported through the "old" feed-in tariff scheme for the duration of their support periods. For non-hydro plants, Decree-Law no. 35/2013 of 28 February foresees that these plants continue to receive a guaranteed tariff for an additional period of five years after the end of the initial 15-year period. For wind plants more specifically, Decree-Law 35/2013 provided for the additional option to accede to an alternative remuneration regime for an additional period of five or seven years after the end of the period of guaranteed remuneration contingent on the commitment to contribute to the sustainability of the National Electric System (SEN) via the payment of a compensation (Art. 1 DL 35/2013).

  Under the current system, RES-E generators can be remunerated under two schemes: the general scheme and the guaranteed remuneration scheme. Under the general scheme generators sell electricity produced on organised markets or through bilateral contract conclusion with end consumers or electricity suppliers. Support schemes can be envisaged under the guaranteed remuneration scheme, where produced electricity is delivered to the supplier of last resort, in exchange for the payment of a feed-in tariff. This guaranteed remuneration system is contingent on the capacity allocated through public tenders. However, an ordinance defining the details of these tenders is still to be published.

  In 2015, Portugal introduced a new regime for the stimulation of RES-E through Small Production Units (UPPs), which can have an installed capacity of up to 250 kW, and Self-Consumption Units (UPACs), which can have an installed capacity of up to 1 MW. As opposed to the former feed-in tariff scheme, these UPPs and UPACs now receive a feed-in tariff through a reversed auctioning scheme that was capped at a reference tariff of 9.5 eurocents/kWh in 2015. Electricity producers bid by proposing discounts to this

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[200] http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20160001986

[201] http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20160001986

reference tariff. Depending on the source, bidding starts a fixed percentage of this reference tariff. For instance, solar PV at 100% of the reference and wind power 70%. UPACs can sell the surplus electricity to grid at the previous month average market price with a 10% discount.

The Government has stated that in 2019, new frameworks for Solar PV auctions and Wind Repowering will be created, favouring new investments that are on hold in the last few years. Also, from the 1000 MW of solar PV that were licenced in the last two years, the remuneration mechanism will be revised (they were licenced with electricity sold in market conditions) and a new mechanism (e.g. floor and cap auctions) will be created in order to foster the investment.

- **Long-term security of support for RES-E: Moderate**
  The decision by the Portuguese government in 2012 to revoke the feed-in tariff scheme for new installations created insecurity for investors. However, the 2015 scheme for UPPs and UPACs provides some stability for small installations. An annual cap of 20 MW for small-scale units per year provides an outlook for investors.

  In October 2018, Portugal's government approved the budget proposal for 2019 (it was approved in parliament at the end of November 2018). The proposal envisages that the Energy Sector Extraordinary contribution shall apply to renewable energy operators under the guaranteed remuneration scheme as of 2019. RES-E generators have so far been exempted from this levy. This might have adverse effects on investment conditions in the renewables sector and thus overall deployment. In addition, the launch of certificates of origin to add value to the production of renewable energy companies is foreseen. On the positive side, the Government has stated that in 2019 new frameworks for Solar PV auctions and Wind Repowering will be created (see above), which could improve investment conditions significantly. In November 2018, the preliminary results of Portuguese National Carbon Roadmap for 2050 (RNC2050) were launched, including targets from to 2030 to 2050, which underline the government ambition to reach carbon neutrally in 2050. The targets are supported by trajectories for the different economy sectors. It is expected that the National Energy and Climate Plan will be in line with these targets.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: No**
  No direct support schemes for RES-H&C are currently in place. The Energy Efficiency Fund (FEE) provided a subsidy to investments in solar thermal installations for heating water and a round for calls ran for half a year in 2016. No additional calls for 2017 or 2018 had been put forward. Financial support amounts to up to €3,000 for a new solar thermal heating installation and a total budget was available of €1.1 million in 2016. Portugal has also phased out a reduced VAT and options for tax deduction for renewable heating equipment in 2012, meaning that as of that year there are no fiscal measures in place for RES-H&C equipment.

- **Long-term security of support for RES-H&C: Low**
  Future calls for the FEE are unknown, making the outlook for RES-H&C uncertain. With regard to heating and cooling, the focus is rather on improving energy efficiency than on RES. The Environmental Fund, that receives budget from the CO2 emissions licences, due to the increase in the price of ton of CO2, has now a

budget of around 400M€ per year, comparing with values under 100M€ per year. These funds are going to be distributed in measures to support energy efficiency in future funding calls.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partially**
  In Portugal, there are two support schemes for the use of renewable energy sources in the transport sector: a tax exemption to small producers of biofuels (PPDs) and a biofuel quota for companies supplying fuels for consumption. The biofuel quota for 2019 and 2020 is 7% in terms of energy content, which is below the 2020 10% target. PPDs are exempt from the Petrol Product Tax up to a volume of 40,000 t/year. In 2016 Portugal also established sustainability criteria for the production and use of biofuels and bioliquids.

  Furthermore, the Electrical Mobility Programme (Mobi-E) was revitalised in 2015 with the aim of improving the countries' charging infrastructure. Late 2017, 100 old charging stations were replaced and 202 new charging stations were planned to be installed – one for every municipality where there is none yet[202].New investments in public transport are occurring with support of European funding or funding from the Environmental Funding (Fundo Ambiental), namely on acquiring 300 electric buses for the two biggest metropolitan areas in Lisbon and Porto and the expansion of the Lisbon Subway. Also investments on railways are being performed.

- **Long-term security of support for RES-T: Moderate**
  Portugal's biofuel quota is established until 2020, but the value for 2019/2020 is set at 7%, which is lower than the 2020 10% target. The Electrical Mobility Programme is also expected to run until 2020. The targets for 2030 in the National Energy and Climate Plan account for 30% of the transport sector energy consumption being from RES.

Romania

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but projected to miss 2020 RES-E NREAP sectoral trajectory)**
  Romania has fulfilled its commitments expressed in its NREAP and earlier Progress Reports in terms of policy support for RES-E and completed the process of transposing the RES Directive in 2012. Romania's main RES-E support scheme is a green certificate quota system that covers onshore wind, solar PV, geothermal, biogas, biomass and hydropower projects, the latter only up to 10 MW[203]. Both electricity suppliers and producers are required to meet the quotas[204]. The GC schemes was revised in 2017 to improve the trade of green certificates, which was welcomed by the private sector. The main changes to the scheme include an extension of the validity period of green certificates, from only 12 months until the

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[202] https://pushevs.com/2017/07/11/portugal-will-soon-fully-covered-electric-car-charging-stations/

[203] https://www.ceer.eu/documents/104400/-/-/41df1bfe-d740-1835-9630-4e4cccaf8173

[204] http://www.res-legal.eu/search-by-country/romania/single/s/res-e/t/promotion/aid/quota-system-4/lastp/183/

end of the scheme period, 2032. This extension of the green certificate's validity is expected to allow the sale of surplus green certificates, and to ensure a better sale price for electricity producers to market participants[205].

The Romanian Government also recently approved a scheme to encourage investment in high-efficiency cogeneration (Government Decision 215/2017) and energy production based on biomass, biogas and geothermal resources (Government Decision 216/2017). The support scheme for high-efficiency cogeneration has a total allocated budget of €81 million and it is estimated that around 50 MWe of high cogeneration capacity will be installed und the programme. The "New Support Scheme" (energy production from biomass, biogas and geothermal), as it is called, is applicable until 2020 and has a total allocated budget of €100 million[206]. The aim is to increase the electricity and thermal energy production from these sources with the additional installation of 60 MW until 2023[207]. These regulations set up subsidy programs to cover up to 45 percent of the project values for building or upgrading production capacities for RES-E production based on biomass and biogas[208].

- **Long-term security of support for RES-E: Moderate**
  Romania's quota support system for RES-E was reformed late 2017 and in 2018. It now provides more long-term certainty to investors by extending the validity of green certificates until 2032 as well as adjusted minimum and maximum prices for green certificates of €29.4 and €35, respectively[209]. This corresponds to a support level of 22,05 €/MWh – 26,25 €/MWh for new wind installations in 2018 and 88,5 €/MWh – 105 €/MWh for new solar installations. The Romanian Government - under pressure of rising electricity bills – reduced the issuance of green certificates per RES production for some technologies and also postponed the issue of part of the green certificates from 2013 to 2017. This development unsettled investors. In general, recent developments in Romania's legislation have had a positive effect on the long-term support outlook.

  Although the recent developments in Romania's legislation have had a positive effect on the long-term, the support scheme is still detrimental for small producers that cannot sell their green certificates in an oversaturated market. To address this issue, several new amendments to the Emergency Ordinance 24/2017 have been approved in recent months. The most important amendments include a faster recovery of the postponed GC for solar energy, allowance of PPA contracts for small producers and the introduction of the feed-in premiums as an alternative to the existing GC scheme. However, the provision regarding the feed-in premium would not apply right away as it has to be notified to the European Commission first.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  The main measure supporting RES-H&C in Romania is the Green Home Programme (applying to both physical and juridical persons). Under this programme, financed from the Environmental Fund, physical

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[205] https://www.pv-magazine.com/2017/04/03/romania-removes-12-month-expiry-date-for-green-certificates/

[206] https://www.lexology.com/library/detail.aspx?g=5a105fba-5c99-46cc-8679-fe5a44679ae6

[207] https://www.romania-insider.com/almost-3800-applications-romanias-green-house-programme/

[208] https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Romania%20Biofuels%20Market%20Overview_Bucharest_Romania_6-14-2017.pdf

[209] http://www.res-legal.eu/search-by-country/romania/single/s/res-e/t/promotion/aid/quota-system-4/lastp/183/

persons can receive up to €1,280 for the installation of solar boilers and up to €1,715 for heat pumps. Juridical persons can receive up to €430,000 for new energy systems comprising both solar boilers and heat pumps installed in public buildings. Due to a lack of funds, a halt in calls for applications was introduced in 2011. A new call for applications was opened again from October to November 2016, which received 12,028 applications from physical and 194 from juridical persons. Currently, the Commission is still in the process of revising the applications. The total budget for the programme is around €20 million, of which €17 million is for physical persons and the rest for juridical persons.

In 2016, the Environment Administration Fund launched a new programme, namely Green Home Plus. The new programme will finance insulation measures with grants up to €8,600 for physical persons and €107,000 for juridical persons.

The “New Support Scheme”, introduced in 2017, is also applicable to RES-H&C, since it focuses on the development of new capacities and refurbishment of existing capacities for production of electricity and/or thermal energy from biomass, biogas or geothermal energy[210].

- **Long-term security of support for RES-H&C: Moderate**
  After a halt of the Green Home Programme in 2011, a new call for applications was opened again in October 2016 (receiving applications only for several weeks). A new call for the Green Home Plus programme is expected to open soon. The programmes, however, are not launched systematically, and it is not known if they will continue in the following years. The new support scheme under Government Decision no. 216/2017 sets a target until 2023 and is also expected to run at least until this year.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  In terms of policy commitments for RES-T, Romania has increased its blending quota for biodiesel in 2016 from 5 to 6.5% and has therefore fulfilled its earlier RES-T policy commitments. As of 1 January 2019, the blending quota for bioethanol is increased from 4.5% to 8% (Emergency Ordinance 80/2018). In addition to the biofuel quota, the National Car Fleet Renewal Incentive Programme provides financial support for the purchase of electric or hybrid vehicles. Rabla Plus, the new phase of the Car Fleet Renewal programme, saw the Romanian Ministry of Environment increasing the premium for the purchase of electric cars, which increased to €5,000 in 2016 and €10,000 in 2017[211].

- **Long-term security of support for RES-T: Moderate**
  The long-term prospect of support for RES-T in Romania is stable and remains in place until at least 2020, for which blending quotas are already specified. A minor change to the legislation stipulates that mandatory values for biofuels set forth for gas and diesel sold at gas stations can be reduced by half if biofuels obtained from waste are used. Although the support system is stable in the sense that it has been in place for a long time, stakeholders report that the level of support remains insufficient to ensure the development of the sector.

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[210] https://www.lexology.com/library/detail.aspx?g=5a105fba-5c99-46cc-8679-fe5a44679ae6

[211] https://electriccarsreport.com/2017/04/10000-euro-incentive-electric-cars-romania/

Slovenia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  In 2014, Slovenia amended its Energy Act and introduced a tendering scheme as the main RES-E support measure which replaced the former feed-in tariff/premium scheme for installations above 500 kW. RES-E installations of up to 500 kW are still free to choose between a feed-in tariff and premium, while plants larger than 500 kW may receive a premium after successfully participating in the annual tender. Eligible technologies for both schemes are wind, solar and geothermal energy as well as hydro power and biomass and biogas plants.

  The support scheme, amended in 2014, only came into effect in October 2016. In the period of March 2014 to October 2016 no tender has been held. In 2017, a budget of € 10 million was provided for the tendering scheme. Based on this budget, 41 projects with a total nominal electrical power of 129.4 MW were selected, 124.6 MW of RES and 4.8 MW from CHP. Among the selected RES projects, wind power plants predominate - 13 projects with a nominal power of 108.7 MW. For 2018, further €10 million were available for the tendering scheme, for which the interested parties may apply until mid-February 2019.

  In addition to the feed-in tariff and premium scheme, Slovenia's Environmental Fund (Eko sklad) provides low interest loans and grants to renewable energy projects in another tendering scheme. The granted loan is installation-specific and depends on several factors, like the amount of eligible costs, type of investment, evaluation of environmental criteria, etc. Loans are provided for up to 15 years. In the beginning of July 2018, the Slovenian government revised the budget of Eko Sklad for 2018: The Fund provided up to € 15 million in subsidies for the purchase of wood biomass boilers and heat pumps in 2018. Additional € 50 million in lending was secured to finance environmental protection projects of individuals, companies, and local communities in 2018.

  Furthermore, Slovenia offers annual net metering for RES-E installations up to 11 kW. In total, a volume of 20 MW is available for the net metering scheme. In 2016, 135 self-supply units with o total capacity of 1.1 MW joined the scheme. The bulk of these were solar PV plants with 97% of the total loan, while the rest were hydroelectric plants. The average size of solar PV plants was 8.16 kiW, while that of hydroelectric plants was 6.4 kW.

- **Long-term security of support for RES-E: Moderate**
  The interruption of support from 2014 to 2016 had a significant influence on RES-E development, leaving Slovenia behind target trajectory. After the approval by the European Commission, the new scheme has run well, leading to a positive outlook for RES-E support.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  The Eco Fund, Slovenia's public Environmental Fund, also provides support to RES-H&C in the form of low-interest loans as well as investment grants. Two public tenders were published in 2015 and one in

2016. In those tenders, support was allocated for the installation of solar heating systems, wood biomass combustion installations (WBCI) and heat pumps, both for central heating, and for the connection of a buildings to district heating using RES. The available budget in 2016 was €16.8 million.

In addition, the RES-E premium scheme is also available to (biomass) CHP units and thus also provides support to renewable heating.

- **Long-term security of support for RES-H&C: High**
  The Environmental Fund continues to operate and provides long-term security for RES-H&C investments. In July 2018, the Slovenian government revised the budget of Eko Sklad for 2018. Hence, the public Environmental Fund managed by the Ministry of the Environment and Spatial Planning increased and Eko Fund can now provide up to €15 million (€5 million more than before) in subsidies for the purchase of wood biomass boilers and heat pumps in 2018. The Environmental Fund will also continue to provide further support in the form of loans: Additional €50 million in lending has been secured to finance environmental protection projects of individuals, companies, and local communities in 2018.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  Slovenia's main support measure for RES-T is a biofuel quota. Fuel suppliers are obliged to incorporate a certain percentage of biofuels in their total fuel sales. For 2018, the biofuel share is set to 7.4%. It shall increase to 8.4% in 2019 and reach 10% in 2020. In addition, biofuels are exempt from the excise duty tax.

  Furthermore, the Environmental Fund Eko Sklad also applies to RES-T, providing low-interest rates as well as investment grants for RES-T projects, such as investments in environment-friendly vehicles for road transport and electric vehicle charging stations located in protected natural areas and Natura 2000 areas.

- **Long-term security of support for RES-T: Moderate**
  The long-term security for RES-T in Slovenia is high. Biofuel rates are set well in advance and additional support schemes are ongoing and transparent.

Slovakia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**
  Slovakia's has slowed down the implementation of the RES-E support measures that were specified in the NREAP. The main support scheme, a feed-in tariff scheme introduced in 2010, is still in place, whereas the transition to a planned tender scheme for solar and wind plants has been postponed. Based on the law applicable before 1 January 2019, the feed-in tariff scheme supports wind (≤15 MW), solar (restricted to installations <30 kW since 2013), hydropower, biomass, biogas and geothermal energy (last four up to and including 5 MW). The scheme was reviewed in July 2013, resulting in lower feed-in tariffs for newly constructed plants. Under the scheme, tariffs may be reduced after three years of generation and is influenced by factors like the total installed capacity and whether there are grid issues but will never be

lower than 70% of the initial tariff[212]. As of 1 January 2019, the feed-in tariff will apply only to RES-E installations, i.e. hydropower, geothermal, biogas, landfill gas or gas from sewage treatment plant gas (except for solar or wind plants), with an installed capacity up to 500 kW included, and high-efficiency CHP up to and including 1 MW. The FIT will also apply to reconstructed or modernised CHP facilities, if their installed capacity before the reconstruction or modernisation was lower than 125 MW.

In addition, since December 2013, DSOs have announced a connection moratorium (so-called 'Freeze Status') and as a result of it any new RES supported by feed-in tariff cannot be connected to the grid. However, this persistent barrier, which also caused the decrease of RES in the Slovak final energy consumption in 2016, should be overcome by the upcoming major reform of RES Act (No. 309/2018 Coll.)[213].

Given that Slovakia has exceeded its capacity targets specified in NREAP for solar power, a tender system for the construction of solar and wind plants has been postponed from the originally planned period of implementation (2013-2014). The introduction of feed-in premium support (premium level to be defined in the tender scheme) for RES-E installations exceeding 500 kW of capacity became a part of the reform, which main parts enter into force on 1 January 2019. Furthermore, as of 1 January 2019, the so-called Local Energy Source (up to and including the capacity of 500 kW) promoting self-consumption is being introduced.

As a result of the aforementioned legislative changes, the long-prevailing connection moratorium should be overcome. The operators of small-scale RES installations up to 10 kW are eligible for a simplified authorisation procedure.

In addition, plant operators may receive RES-E subsidies from the European Regional Development Fund (ERDF) and electricity generated from renewable energy sources is exempt from excise tax in Slovakia.

- **Long-term security of support for RES-E: Moderate**
  In July 2013, the feed-in tariff for solar PV was restricted to installations below 30 kW. The connection moratorium prevents the installation of new RES-E plants and has resulted in a negative investment environment for RES-E. However, the so-called 'Freeze Status' is believed to be overcome in 2019 when the major reform of RES Act (No. 309/2018 Coll.), which is considered as the largest legislative change in the Slovak energy sector over the last decade, is coming into force.

  Based on the current legislation in 2018, feed-in tariffs are guaranteed for 15 years, whereas installations smaller than 1 MW are supported during the entire lifetime of the plant, so long-term support remains guaranteed for existing plants. However, after three years of support, price levels may be decreased, but not below 70% of the initial tariff. Starting from 1 January 2019, large-scale wind or PV plants (over 500 kW) will not be supported by the feed-in tariff anymore. RES installations exceeding 500 kW of installed capacity will be supported solely by a feed-in premium defined in the auctions.

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[212] Enerdata

[213] https://venergetike.sk/sapi-podiel-oze-na-spotrebe-klesol/

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes (but below 2016 RES-H&C NREAP sectoral trajectory)**
  Slovakia has fulfilled its commitments for RES-H&C expressed in the NREAP and previous Progress Reports. Scheduled to start in 2014, the measure 'Promotion of RES use in the business sector' was introduced in 2016. Support for heating technologies that can be used for self-consumption is prioritised in the first period of the programme (up to 2020). This includes heat pumps, biomethane production, and producing and using biogas in CHP installations.

  In addition, in 2016, the scheduled measure 'Support for the upgrading of heat distribution systems' was introduced, to maintain and increase the share of heat from renewable sources and high-efficiency cogeneration. By providing grants to renovation projects, the Slovak Republic aims to stabilise the price of heat distribution. Finally, also in 2016, a measure was introduced on 'Promotion of RES for heating and cooling in public buildings', aimed at stimulating energy efficiency, mainly by improving the thermal characteristics of structures or upgrading heating and air-conditioning systems.
- **Long-term security of support for RES-H&C: Moderate**
  In 2015, no funds were available to support RES-H&C since no programmes were active as of that year. The budget increased to €5.5 million in 2016. Currently, RES-H&C installations may be supported by subsidies from the Operational Programme Quality of Environment funded by the European Regional Development Fund (ERDF).

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**
  Slovakia’s main support instrument for RES-T remains in place, the 'Compulsory blending of bio-components into motor fuels'. According to the amendment of the RES Act (No. 181/2017 Coll.) that came into force in August 2017, the biofuel reference values and the minimum biofuel content by volume are defined from 2017 up to 2030. The biofuel quota in terms of energy content was 5.8% in 2017 and is set to increase to 7.6% in 2020. Furthermore, any legal and natural person will be obliged to place on the market motor fuels with at least 8.2% biofuel content in the period of 2022-2030. It should already be kept in mind that the total contribution of conventional biofuels to the RES target would be limited to a maximum of 7% post 2020, hence advanced biofuels and renewables-based e-mobility should play an increasing role. In 2016, Slovakia reached a RES-T share of 7.5% and thus surpassed its NREAP interim RES-T trajectory of 6.3% for this year. The 2020 RES-T target is set at 10%.

  Since 2011, petrol and diesel with legally defined minimum contents of biogenic material are subject to reduced excise duties. Moreover, mineral oil from biogenic material only is exempt from mineral oil tax. In addition, Slovakia is supporting the production of biofuels from energy crops since 2014 through a rural development programme that supports the acquisition of technologies for the extraction and processing of woody biomass fuel.

- **Long-term security of support for RES-T: Moderate**

Slovakia’s rural development programme regarding the support of technologies for woody biomass fuel runs until 2020. Biofuel quotas have been laid down into law until 2030. The Draft of the Action Plan on Electromobility Development was developed by the Ministry of Economy (MH SR), and sixteen measures promoting further development of electromobility were introduced with a short-term focus on the period of 2018-2020. Since 7 December 2018, an inter-ministerial commentary procedure has been evaluating by the MH SR.

Finland

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  Finland maintains a feed-in premium scheme under its Production Aid Act, which pays out a variable premium on top of the wholesale market price for a period of twelve years. Caps on the total support volume vary per technology, and are 2,500 MW for wind power, 19 MW for biogas and 150 MW for energy from wood fuel. No other RES-E technologies are included in the scheme and the total budgets allocated to the years 2015 and 2016 were €142 and €172 million, respectively. In 2015, the Finish government amended the feed-in premium scheme for wind power as a result of plummeting power prices leading to higher subsidies which generated public pressure. This amendment excluded wind power from the scheme, unless approved by a case-by-case government quota decision. Capacities for wind power have been approved in excess of the 2,500 MW cap but will likely end up being lower due to projects not being implemented[214].

  However, the most significant change to RES-E policy in Finland comes from a forthcoming new scheme for RES-E based on a competitive auction process, which will include support for wind, solar, wave, biogas and wood fuel power. The draft proposal, which was put forward in September 2017, outlines that auction rounds will be held in (December) 2018 and 2019. The scheme will be a combination of a sliding and fixed premium, depending on whether the market price is below €30/MWh or not. The annual amount of electricity to be tendered will be 2 TWh, and the auctioning is technology neutral, meaning that no capacities have been allocated per technology.

  Capital investment subsidies for RES also continued to be provided to biomass in electricity and heat generation. About 20% of total investment subsidies in 2015 and 2016 (€46 and €36 million, respectively) was allocated to biomass electricity production units, and the rest for other RES-E. These subsidies can make up to 30% of the project cost and can even increase to 40% depending on the innovativeness of the technology.

  Finally, there is a scheduled increase in property tax for RES projects, from 3.1% to 3.5% which is met with quite some opposition from the RES industry since this impacts returns on investment for investors[215].

- **Long-term security of support for RES-E: Moderate**

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[214] https://tem.fi/en/article/-/asset_publisher/syottotariffijarjestelma-sulkeutumassa-tuulivoimaloiden-osalta

[215] https://www.globallegalinsights.com/practice-areas/energy-laws-and-regulations/finland

Since 2015, wind power is no longer eligible for direct support through the feed-in premium scheme, unless a project successfully applies for a government quota decision. This meant that by the end of 2015, about 1,000 MW of capacity was approved, quota decisions were made for around 900 MW and for another 1,400 MW the decision was pending. However, it is expected that eventually fewer than 2,500 MW will be constructed due to project delays and cancellations. While these changes were made, investors were assured that a more cost-effective scheme was underway. However, the separate scheduled increase in property tax for renewable energy projects may harm investor confidence and was met with opposition. The new RES auction scheme that is underway provides a clear remuneration scheme, although the budgets available for every year need to be approved consistently by the parliament.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Finland generated around 7 TWh for heating and cooling in 2016, which is more than projected in the NREAP. Around 90% of this is generated in CHPs, meaning that support for electricity indirectly also supports heating and cooling in Finland. To complement this, Finland maintains a “heat bonus” for CHP plants operating on biogas and wood fuel. A pre-condition for receiving this bonus is a minimum efficiency of 50%, or even 75% if the capacity exceeds 1 MW. Moreover, investment support exists for the construction of production facilities using renewable energies through the so-called “energy aid”.

  Another important element of Finland’s RES-H&C policy is fuel taxation on heating fuels. Finland applies a tax to the fuel based on the energy and carbon content. The tax rate for heating fuels was increased for the first time in 2012, and subsequently in 2014, 2015 and 2016. The two latest increases stemmed from the carbon tax, which increased the competitiveness of renewable heating fuels.

  Total annual estimated support in the RES-H&C sector in Finland amounted to €10 and €5.6 million in 2015 and 2016, respectively. These amounts were predominantly spent on investment subsidies.

- **Long-term security of support for RES-H&C: Moderate**
  No significant changes are expected in Finland’s RES-H&C policy, although there is quite some uncertainty around the available funds for schemes like the heat bonus since these are directly funded from the state budget and are not projected for the coming years.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  In Finland, the main support scheme for RES-T is a quota system. This system obliges fuel suppliers to blend in a certain percentage of biofuels in the company’s total fuel sales. In 2020, the required percentage needs to be 20%. However, when biofuel is produced from waste, residues or inedible cellulose or lignocelluloses, its energy content is double-counted when determining the final amount of biofuels in the total fuel sales. Biofuels are also indirectly supported through tax incentives based on energy content and carbon dioxide emissions.

Although Finland's electric vehicle market is not very developed currently, the government has expressed the intention to have 250,000 EVs on the road in 2030 with no policies in place yet to support the achievement of this goal[216].

- **Long-term security of support for RES-T: Moderate**
  There are no significant changes expected to Finland's RES-T policy, apart from an EV support scheme that may be developed. The biofuel quota scheme has set targets until 2020 and is expected to remain in place post-2020 as well.

Sweden

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**
  The Electricity Certificate System continues to be the main policy to support RES-E in Sweden. It consists of quota obligations for electricity suppliers in combination with a common electricity certificate market with Norway.

  Electricity suppliers as well as energy-intensive industries and consumers using self-consumption or electricity imports from Norway are obliged to purchase certificates for the electricity they sell/consume. The annual amount of certificates needed is set by the quota and is set at 27% of the sold/consumed electricity for 2018. For 2019 the quota will rise to 30.5% and decrease in 2020 to 28.8%. The certificate price is at SEK 152 (~15€) per MWh (June 2018). It has seen a decline since 2010, where the certificate price was above SEK 300 (~30€)[217]. The certificates are handed out to producers of renewable energy by the Swedish state for a maximum of 15 years and are tradeable[218]. Eligible technologies are biofuels, geothermal energy, solar energy, hydropower, wind power and wave energy. Since 2012 Sweden has a common electricity certificate market with Norway. The aim of the joint system is to increase RES-E production from new installations by 28.4 TWh from 2012 to 2020, of which Sweden agreed to finance 15.2 TWh[219,] 220. Reaching this goal is ensured by the annually set quota.

  In addition to the certificate system, Sweden grants tax reductions to wind energy and micro-scale RES producers of solar and geothermal energy as well as hydro power and biomass plants. Sweden also provides investment grants for solar PV of up to 30% of investment costs[221]. The limit of the investment grant is set to SEK 1.2 (~€116,000) million per installation and a total budget of SEK 1423 million (~€139 million) is available for the 2017-2019 period[222].

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[216] https://electrek.co/2016/11/25/finland-electric-vehicles/

[217] https://cesar.energimyndigheten.se/WebPartPages/AveragePricePage.aspx

[218] http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-20111200-om-elcertifikat_sfs-2011-1200

[219] http://www.energimyndigheten.se/en/sustainability/the-electricity-certificate-system/

[220] https://energimyndigheten.a-w2m.se/Home.mvc?ResourceId=5676

[221] http://www.energimyndigheten.se/fornybart/solenergi/solceller/stod-till-solceller/investeringsstod/

[222] https://www.lagboken.se/Lagboken/lagar-och-forordningar/lagar-och-forordningar/naringsliv/Statligt-stod/d_432161-forordning-2009_689-om-statligt-stod-till-solceller

- **Long-term security of support for RES-E: High**
  The security of support for RES-E in Sweden is high when looking at the durability of the support scheme. Policies in place are stable from a regulatory perspective and have long planning periods. Investment grants for solar PV are in place since 2009 and planned until 2020. The Electricity Certificate System as the main instrument was introduced in 2003 and is expected to run at least until 2030. However, the set quota obligation will decrease significantly over the coming years[223], which impairs the medium-term investment perspective.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**
  Support to renewable energies in the H&C sector in Sweden is provided by tax exemptions for renewable heating solutions and investment grants for biogas. Heat pumps, solar thermal energy as well as biogas and biomass receive exemptions from the energy, carbon and the nitrous oxide tax. In addition, income tax reductions for RES-H&C works on households are granted. Furthermore, Sweden provides investment grants to biogas projects.

- **Long-term security of support for RES-H&C: High**
  The long-term security of support for RES-H&C in Sweden is high. Tax exemptions have been in place since 2009 and 2010 respectively and have no end date. The investment grants for biogas are provided until 2020. However, it is to be noted that the decrease of the price of electricity certificates has an impact on the viability of combined heat and power plants in Sweden. Decreasing revenues from the sale of electricity impair the potential to produce heat at a competitive price, as explained in Annex C.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**
  Sweden has fulfilled its policy commitments regarding RES-T. In fact, Sweden has already overachieved compared to the level of its 2020 RES-T target, reaching a RES-T share of 30,3 % in 2016 against the background of a 2020 RES-T target of 13.8%. The main instrument regarding RES-T in Sweden continues to be tax exemptions for biofuels. Sweden raises energy and carbon dioxide taxes on fossil fuels. Biofuels receive deductions for these taxes, ranging from 63% to 100% for the energy tax, depending on the type of biofuel, and 100% of the carbon dioxide tax[224].

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[223] http://www.res-legal.eu/search-by-country/sweden/single/s/res-e/t/promotion/aid/quota-system-1/lastp/199/

[224] http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-2010598-om-hallbarhetskriterier-for_sfs-2010-598

Additionally, Sweden promotes electric vehicles. In 2012 the *super green car premium* was introduced. The scheme provides investment grants for passenger cars with very low greenhouse gas emissions (<50 gCO_2/km), covering up to 35% of the additional costs of such a car, which are estimated at 100,000 to 150,000 SEK[225]. Furthermore, there is a similar premium granted for electric buses since 2016, ranging from 200,000 to 700,000 SEK per bus, depending on the transport capacity of the bus[226].

In addition to existing measures, Sweden has introduced a reduction obligation for fuel suppliers in April 2018[227], which obliges the companies to reduce greenhouse gas emissions from gasoline and diesel by 40% in 2030. Sweden has introduced a bonus-malus system for new light vehicles (passenger cars, light trucks and light buses) in July 2018, which replaces the super green car premium for any new passenger car. Depending on the level of a vehicle's emissions, the vehicle tax will be decreased or increased[228].

- **Long-term security of support for RES-T: High**
  The security of support for RES-T in Sweden is very good. The main support measure for RES-T, a tax exemption on the energy and carbon tax, has no reported end date. Additional programmes have transparent end dates. Despite the reliability of existing support for RES-T, stakeholders point-out that additional measures should be taken to foster the use of biofuels in sectors such as shipping and aviation, which are excluded from the current support scheme, as explained in Annex C.

United Kingdom

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2016 RES-E NREAP sectoral trajectory)**
  The UK has fulfilled its commitments expressed in its NREAP and earlier Progress Reports in terms of policy support for RES-E. The Contract for Difference (CfD)[229] scheme that was launched in 2014, replaces the Renewables Obligation (RO) scheme and is the main RES-E support scheme in the UK now.

  Two CfD allocation rounds have been successfully completed, in March 2015 and September 2017, delivering around 5.4 GW of new generating capacity. The first allocation round included two separate auction "pots".

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[225] https://www.transportstyrelsen.se/sv/vagtrafik/Miljo/Klimat/Miljobilar1/supermiljobilspremie1/#13999 and http://ec.europa.eu/growth/tools-databases/tris/en/index.cfm/search/?trisaction=search.detail&year=2017&num=597&dLang=EN

[226] http://www.energimyndigheten.se/klimat--miljo/fossilfria-transporter/elbusspremie/ and http://ec.europa.eu/growth/tools-databases/tris/lv/index.cfm/search/?trisaction=search.detail&year=2016&num=311&dLang=EN

[227] http://www.energimyndigheten.se/fornybart/hallbarhetskriterier/reduktionsplikt/ and https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/forordning-2018195-om-reduktion-av_sfs-2018-195

[228] https://www.regeringen.se/artiklar/2017/09/bonus-malus-och-branslebytet/ and https://www.government.se/press-releases/2017/05/bonusmalus-system-for-new-vehicles/

[229] https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference

The first auction "pot" included established technologies: onshore wind, solar PV, waste energy, hydro power and landfill and sewage gas; while the second auction "pot" was allocated between less established technologies: offshore wind, wave and tidal energy, advanced conversion technologies, anaerobic digestion, geothermal and dedicated biomass with CHP. The second allocation round in September 2017 was reserved for less established technologies of the second "pot". A third auction round is planned for spring (May) 2019[230]. The available support budget determines the volume of the allocation/auction rounds. The annual budget for the first allocation round is £ 325 million (2012 prices)[231], while the annual budget for the second round is £ 295 million (2012 prices)[232]. The second allocation round has already shown effect in driving support costs down, e.g. offshore wind costs have decreased by 50% compared to the first auction in 2015.
To hedge against investment uncertainty in the transition period from the RO- to the CfD-scheme, the Final Investment Decision (FID) regime has been put in place, which offered investment contracts ahead of the CfD implementation[233].

Alongside the CfD, a feed-in tariff (FIT) is provided to support households, communities and small businesses investing in projects up to 5 MW, covering the following technologies: solar PV, wind, CHP, hydro, anaerobic digestion[234]. However, the FIT will be closed to new application in April 2019[235].

Other supporting measures committed in the First Progress Report such as the National Planning Policy Framework - which sets out the approach for local authorities in plan-making and decision-taking on RES applications regarding economic, social and environmental aspects - have been implemented as planned.

- **Long-term security of support for RES-E: Moderate**
  The transition towards the new main RES-E support scheme (CfD) has been successful, without abrupt or retroactive changes in policy. The CfD budget is determined per allocation round and made public upfront for the next allocation round. However, the available budget for and dates of further future rounds are unknown, which leaves investors with uncertainty regarding the availability of support in the medium to long term. Former support schemes will continue for established support contracts and the Final Investment Decision (FID) regime is in place to ease the transition period between RO and CfD by offering investment contracts ahead of the CfD implementation. Furthermore, there is uncertainty as there is no support scheme planned for small RES-E after the closure of the FIT scheme in 2019.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partially**
  The United Kingdom has maintained and adapted the main element of its RES-H&C policy support, the Renewable Heat Incentive (RHI). It is a support scheme that provides premium payments per kWh_{th} of produced renewable heat. The Renewable Heat Incentive was first implemented in 2011 for the non-domestic sector. It was expanded to the domestic sector in 2014. The Non-Domestic RHI in Northern

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[230] https://www.gov.uk/government/publications/contracts-for-difference-cfd-draft-budget-notice-for-the-third-allocation-round

[231] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/398665/150127_Budget_Revision_Notice_for_CfD_Round_One.pdf

[232] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598824/Budget_Notice.pdf

[233] https://www.gov.uk/government/publications/increasing-certainty-for-investors-in-renewable-electricity-final-investment-decision-enabling-for-renewables

[234] https://www.ofgem.gov.uk/environmental-programmes/ FIT/applicants

[235] https://www.cibse.org/getmedia/4dc06683-9be1-44bb-b00c-7621fe7e4745/ FITs_Review_Government_response.pdf.aspx

Ireland stopped receiving any new applications since the beginning of 2016. Eligible technologies covered under the RHI schemes are biomass boilers and stoves, biomass CHP, biogas and biomethane injection, heat pumps (air, ground and water source), deep geothermal. In addition, a District Heating Loan Fund exists in Scotland. However, planned regulation requirements for zero carbon buildings were not implemented, see below.

Furthermore, the Industrial Heat Recovery Support (IHRS) Programme was launched in 2018. It is a competitive grant funding programme providing funding for feasibility studies and implementation activities. The IHRS programme's total funding is £18 million.[236]

- **Long-term security of support for RES-H&C: Moderate**
  Developments of recent years draw a mixed picture regarding the long-term security of support for RES-H&C in the UK. The RHI as the main instrument for RES-H&C policy support has been maintained and expanded. The domestic part of the RHI replaced the Renewable Heat Premium Payment, a government grant scheme available for installing domestic renewable heating systems. The uptake of the RHI has been slower than expected. The UK government originally forecast 513,000 new heating systems to be deployed by 2020, however based on current rates of uptake only 111,000 new installations are likely to be deployed [237].

  The Zero Carbon Homes regulation, which aimed at obliging all new homes in England to be zero carbon from 2016 and thereby stimulate greater uptake of on-site renewables, however, was not implemented. In 2015, nine years after the ambitious pledge, the UK government decided not to proceed with it. This move came as a surprise to the industry and thus had a negative impact on long-term security of RES-H&C support[238][239].

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2016 RES-T NREAP sectoral trajectory)**
  The Renewable Transport Fuel Obligations Order (RTFO), establishing an obligation system for biofuels, is the main instrument for RES-T support in the United Kingdom[240]. The RFTO has been established in 2008 and most recently amended by the Renewable Transport Fuels and Greenhouse Gas Emissions Regulations in 2018[241]. Under the RTFO, fuel suppliers supplying above 450,000 liters/year of transport and non-road mobile machinery fuel in the UK must be able to show that a percentage of the fuel they supply comes from renewable and sustainable sources. The recent changes to the RTFO more than doubled the biofuels obligation level from 4.75% in 2017-18 to 9.75% in 2020, and furthermore introduced annual targets up to 2032. The increase in the obligation level followed a period of several years where it

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[236] https://www.gov.uk/government/publications/industrial-heat-recovery-support-programme-guidance-and-application-forms

[237] https://publications.parliament.uk/pa/cm201719/cmselect/cmpubacc/696/696.pdf

[238] https://www.thenbs.com/knowledge/will-we-ever-achieve-zero-carbon-homes

[239] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf

[240] https://www.gov.uk/guidance/renewable-transport-fuels-obligation

[241] https://www.legislation.gov.uk/ukdsi/2018/9780111164242

had been frozen at 4.75%[242]. A separate target for so called “development fuels” (advanced waste or residue based sustainable fuels and renewable fuels of non-biological origin) and a cap for crop based biofuels are also set. In addition, renewable aviation fuels are also eligible in the RTFO from April 2018[243]. In addition to the support of biofuels through RTFO, several measures regarding electric mobility have been introduced in recent years, aiming at behavioural change of end consumers. These include grants for plug-in hybrids, e-mobility charging schemes and alternative fuel programmes. However, in October 2018, the Department for Transport announced plans to reduce the grant level for electric vehicles from £4.5k to £1k and scrap grants for hybrid vehicles.[244]

- **Long-term security of support for RES-T: High**
  The Renewable Transport Fuel Obligation (RTFO) is a well-established policy instrument and secures long-term incentives to increase RES-T shares, as the obligation is set until 2032. The outlook of the support for electric mobility is mixed, given that the Department for Transport recently announced plans to reduce grants for electric vehicles and scrap grants for hybrid vehicles.

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[242] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/572971/rtfo-consultation-document-2016.pdf, p. 38

[243] https://www.gov.uk/government/news/new-regulations-to-double-the-use-of-sustainable-renewable-fuels-by-2020

[244] https://www.theguardian.com/environment/2018/oct/12/scrapping-uk-grants-for-hybrid-cars-astounding-says-industry

Appendix C Analysis of non-economic barriers

Review on Barriers and Incentives

Historic overview of the barriers at European level

The input on barriers used for the present study stems from the REveal database, which is shortly presented in the box below. For more detailed information on the methodology, please refer to last section of this Annex.

Box 1. Short description of the REveal Database

The REveal database was created in 2016 by eclareon, with the aim to provide a comprehensive overview of existing barriers hindering the development of renewable energies (RES) in the 28 EU MS. It builds upon the results from earlier barrier researches conducted by eclareon, such as RES Integration and Keep-on-track! Therefore, some barriers can be traced back until 2011. The content of the database has been updated at least once a year since 2013.

The content of the database is based on desktop investigation and qualitative research interviews carried out by the eclareon research team for all 28 EU MS. The interviews are conducted informally, without predefined questions. This open approach allows the interviewer to remain flexible so as to better respond to the interviewee’s priorities and concerns during the exchange. The advantage of this approach is the broad spectrum of barriers potentially reported by stakeholders. Nevertheless, such an approach also implies that certain issues may be eclipsed by the overwhelming significance of some barriers. In addition, the inherent subjective nature of the information on barriers should be kept in mind when assessing the progress of the MS.

Currently, the REveal database contains profiles on over 1200 barriers in the electricity (RES-E), the heating and cooling (RES-H&C) and the transport (RES-T) sectors, also identifying the affected RES technologies. Each barrier is rated on spread and severity values, respectively indicating the gravity of the barrier’s impact on RES projects as well as the amount of installations from a specific RES technology affected by the barrier. The barriers are classified in 5 main categories and 38 sub-categories, thus allowing to aggregate, compare and analyse the data at national and European level.

The content of the REveal database is the property of eclareon GmbH and is freely accessible online at: https://www.re-frame.eu

The features of the REveal database allow to analyse the barriers from different angles, depending on which aspect the analysis should focus on. In the present study, the RES progress of MS has been analysed on the basis of five main topics highlighted in the tender specifications and in the RES Directive. For each of these five topics, matching barrier categories from the REveal database were identified, as shown in the table below:

Table 28. Topics and matching categories from the REveal database

Topic		Sub-category
I	**Administrative issues**	Complexity of administrative procedure
		Duration of administrative procedure
		Cost of administrative procedure
II	**Building and planning issues**	Integration of RES in spatial and environmental planning
		Lack of infrastructure and infrastructure development
		District heating networks
III	**Information issues**	Information exchange/communication between stakeholders
		Training
		Certification
IV	**Grid issues**	Predictability / transparency of connection procedure
		Transparent and foreseeable grid development
		Cost of RES grid access
		Duration of RES grid access
		Treatment of RES dispatch (curtailment)
V	**Support scheme issues**	Remuneration level for RES
		Revenue risk under given support scheme
		Existence of general RES strategy
		Reliability of general RES strategy
		Existence of RES support scheme
		Reliability of RES support scheme

The research and analysis have shown that for some sectors certain barrier categories are not relevant for technical or other reasons and were thus not included in this barrier analysis. The table below shows which of the five topics were considered as relevant in the sectors and were thus included in this barrier assessment.

Table 29. Topics analysed per RES sector

		RES-E	RES-H&C	RES-T
I	**Administrative issues**	✓	✓	✗
II	**Building and planning issues**	✓	✓	✓
III	**Information issues**	✓	✓	✓
IV	**Grid issues**	✓	✗	✗
V	**Support scheme issues**	✓	✓	✓

The figures below visualise the evolution of the distribution of barriers reported for the five topics per RES sector between 2014 and 2018 in the 28 MS. The first barriers were already gathered in 2013 in the Reveal database, however only for 13 MS in total. The comprehensive reporting of barriers among all 28 MS started in 2014, which is why this year was chosen as the starting year for the historic overview of the barriers at European level.

At first glance, the distribution of barriers per topic is very similar for all three sectors between 2014 and 2018. This means that stakeholders have reported the same kind of issues over the years. In all three sectors, the largest share of reported barriers for the three sectors deal with support scheme issues. However, the underlying causes of the barriers differ among the sectors. In the electricity sector, the matters of concern are related to insufficient remuneration levels, to revenue risks under given support schemes and to a lesser extent to the reliability of existing support schemes. In the heating and cooling sector as well in the transport sector, it is the mere existence of support schemes which represents the main barrier for stakeholders. In fact, the lack of support policies largely hinders the development of renewable energy projects in both sectors. As far as the remaining topics are concerned, the distribution of barriers differs depending on the sector.

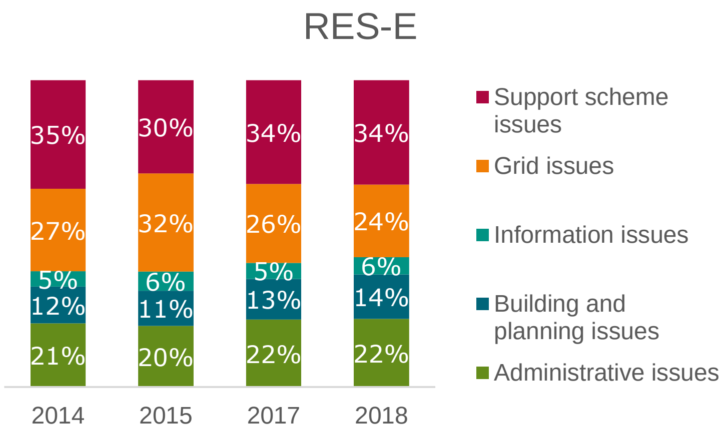


Chart 1. Distribution of barriers per topic in the RES-E sector at European level

In the RES-E sector, barriers related to administrative issues and grid issues hold a comparatively equal share between 2014 and 2018, amounting to approximately one fourth of the total barriers. The main administrative issues reported are caused by the complexity and the duration of procedures. As far as the electricity grid is concerned, the main barriers deal with the transparency of the grid connection procedure as well as with the costs for grid access for RE plants.

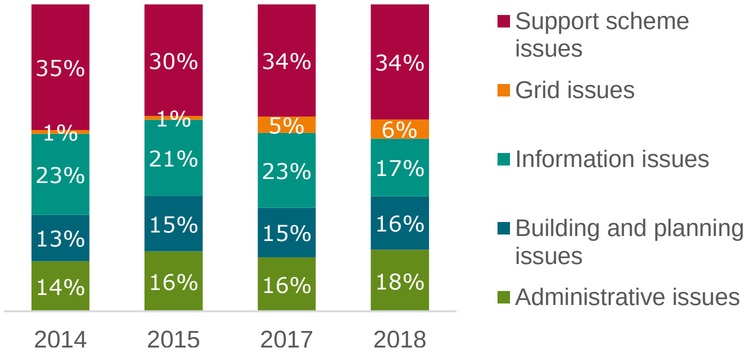


Chart 2. Distribution of barriers per topic in the RES-H&C sector at European level

In the RES-H&C sector, the share of barriers falling in the topics of information issues, building & planning issues and administrative issues is relatively comparable between 2014 and 2018. The decrease in the share of barriers related to information issues indicates a noticeable improvement over time in the fields of training and certification for RES. As far as administrative issues are concerned, stakeholders have reported an increasing number of barriers resulting from the complexity of administrative procedures. This does not necessarily mean existing procedures have become more complicated. A more plausible explanation could be that the amount of administrative procedures has increased, thus increasing the feedback of stakeholders. This interpretation would be consistent with the higher amount of training and certification measures implied above.

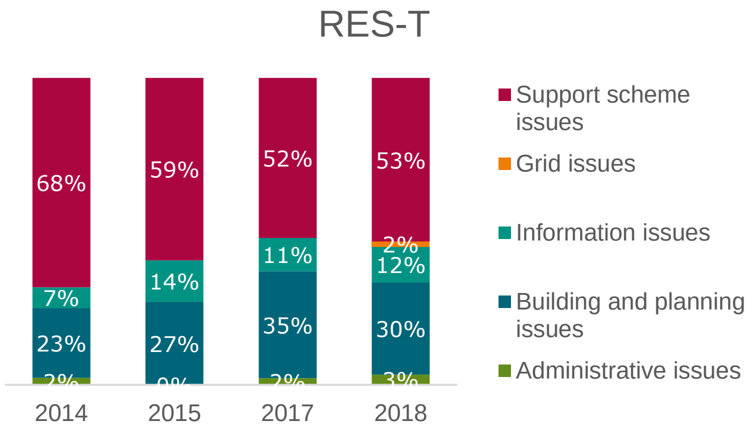
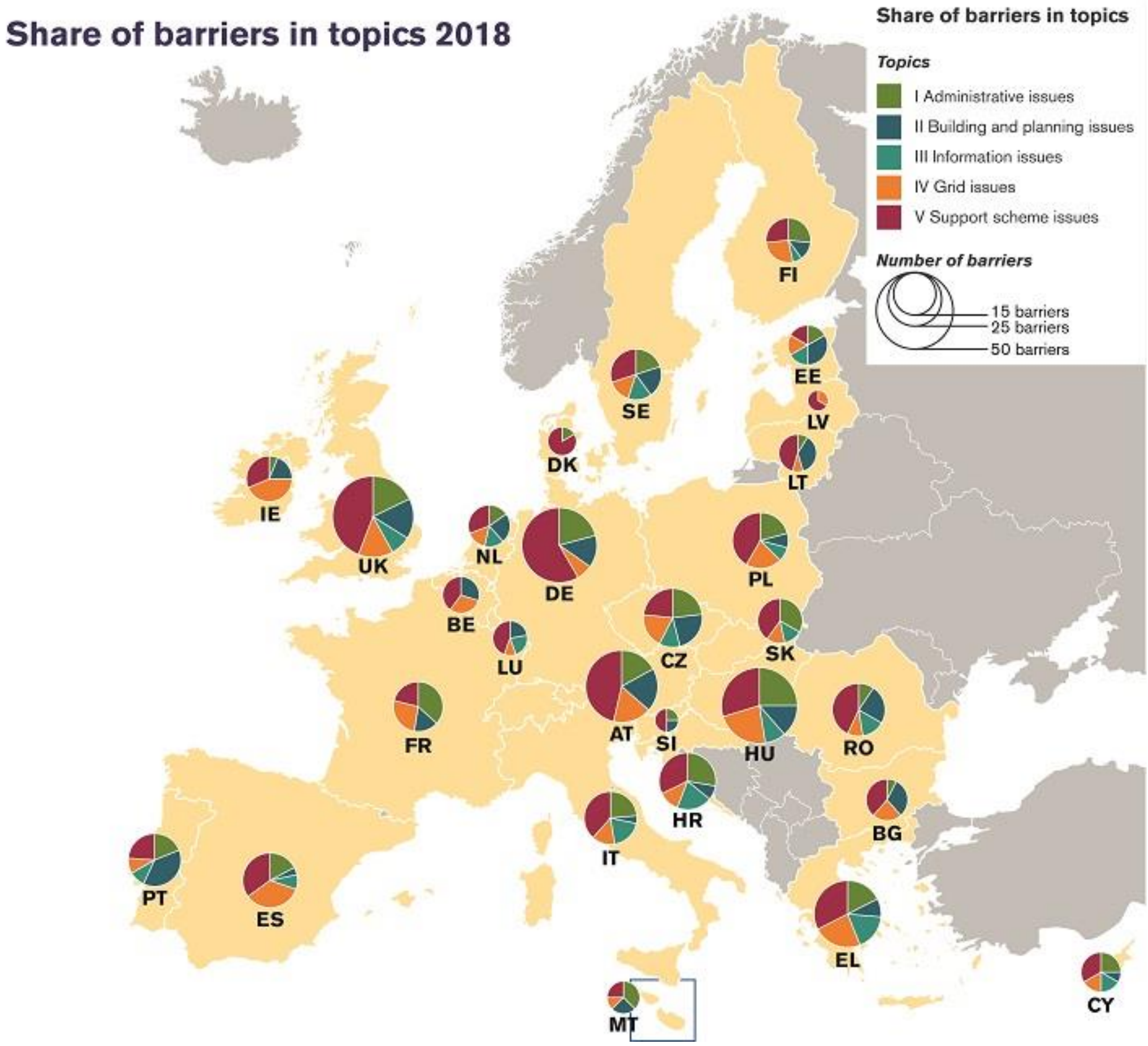


Chart 3. Distribution of barriers per topic in the RES-T sector at European level

Unlike the RES-E and RES-H&C sectors, the RES-T sector is characterised by the almost complete absence of barriers related to administrative issues. This correlates with the lack of existing support schemes mentioned earlier. In fact, the few existing measures promoting the use of RE in the transport sector are often quota systems and tax incentives for the use of biofuels or premiums for the purchase of electric cars. Both cases do not involve complicated administrative procedures.

The map below illustrates the distribution of barriers among all sector and the five topics for all EU MS in 2018. The size of the circular charts indicates the number of barriers reported for each MS, which should be interpreted only as an indicative figure. In addition, the identification of a high number of barriers in a specific MS does not necessarily correlate with the degree of severity of the overall renewable situation. The identification of a high number of barriers could be the result of high barrier awareness in certain MS, favoured by high transparency or a high level of information availability. Moreover, the number of barriers might also depend on the development stage of a certain technology; a high number of barriers would therefore be the outcome of technology maturity.

The map shows the predominance of barriers caused by support scheme issues in the majority of the 28 MS. Depending on the MS, the topics of grid issues, administrative issue and building and planning issues are also highly represented.



Map 1. Share of barriers per MS and per topic in 2018

The following section provides a more detailed analysis of the progress of barriers per MS and per sector since 2013/2014.

Progress Assessment of Specific Issues

The present Section gives for each MS an assessment of the progress observed in five different topics between 2013 and 2018 on the basis of the barriers from the REveal database. The progress is analysed by means of a barrier index calculated for each barrier and presented in the box below. For more detailed information on the methodology, please refer to the end of this Appendix.

Box 2. Short description of the barrier index methodology

The barrier index indicates how strongly a technology/sector/MS is affected by barriers. To this end, the expertise of national stakeholders on barriers is set in relation with official RES deployment figures. The combination of these two aspects ensures on the one hand that various expert assessments are included in the barrier analysis. On the other hand, the barriers are put into perspective with the significance of the respective RES technologies in the sectoral renewable energy mix by 2020 as set out in the NREAPs. The index is composed of values between 0 (good) and 1 (bad). It is calculated taking into account the arithmetic mean of three indicators, which can be clustered in two parts:

- Technology-specific share in the planned RES deployment per sector 2010-2020 (based on NREAP)
    - **INDICATOR I:** Technology-specific contribution to the planned RES deployment per sector in the period between 2010 and 2020, as given in the NREAPs.
- Barriers hindering the development of RES (based on the REveal database from eclareon)
    - **INDICATOR II:** Average severity of barriers on a scale from 1 to 5 assessing the gravity of the barriers' impact on RES projects.
    - **INDICATOR III:** Average spread of barriers on a scale from 1 to 5 estimating the amount of installations from a specific RES technology which are affected by a specific barrier in a specific MS.

The results of the barrier analysis are presented by RES sector for each MS. The sectors are identifiable by a colour code, where RES-E is blue, RES-H&C is red and RES-T is green. Each sector is composed of two tables visualising the barrier indices, focusing on the topics and the affected technologies:

- ○ The first chart is a heat map presenting an overview of the barrier index per topic and per year, accompanied by a pie chart displaying significance of the respective RES technologies in the sectoral renewable energy mix by 2020 as set out in the NREAP. The colour legend allows to identify at first sight to which extent the topic is affected by barriers, weighing the average spread and severity of the barriers with the share of the respective RES technologies in the planned RES deployment between 2010 and 2020. The darker the colour, the strongest the impact of barriers. Blank cells indicate that no barriers were gathered. In this regard, it should be underlined that the non-identification of a barrier in a certain topic does not necessarily stand for its non-existence. In fact, other national barriers may have been perceived as more important or more urgent and were therefore prioritised by stakeholders.
- ○ The second chart sets the average severity and spread of the barriers in relation for each topic in the respective RES sectors for the latest data gathered in 2018.

Belgium

Table 30. Progress of Belgium on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Aeronautical constraints for wind energy installations
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Lack of political unity regarding energy policy
	Online application for permit?	☐		Significant delays and higher realisation costs for renewable installations due to legal procedures
	Maximum time limit for procedures?	☐		Lack of decision maker support in Flanders
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Difficult grid connection for on-shore wind installations due to spatial planning
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	New buildings and extensively refurbished buildings must meet legal requirements for RES in Flanders.	
	Obligation to use RES in public buildings? (Art. 13 (5))	☑	There is an obligation to use a certain amount of RES in public buildings in Flanders.	
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑		**Barriers due to information issues**
				Insufficient information on grid connection
Grid issues	Grid usage fee?	☑	In Flanders and Wallonia, but not in the Brussels Capital Region	**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Injection tariffs for the connection to the distribution grid affects the profitability of RES plants
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Grid access is sometimes slow and expensive
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Insufficient and not adapted network for district heating
	Priority of RES connection to the grid? (Art. 16 (1))	☑		Insufficient information on grid connection
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐	Pricing is a reg. competence and costs are shared differently between the actors in the 3 regions.	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	⌛	Meshed offshore grid to be developed for the Belgian wind parks in the North Sea, possible connection with UK and NL	
	Shallow cost structure? (Art. 16 (5) and (6))	☑	The cost structure is published on the site of the CREG	
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑	This is a regional competence	
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Uncertain and inefficient support system for RES-HC
				Uncertainty of the support mechanism for RES-E

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

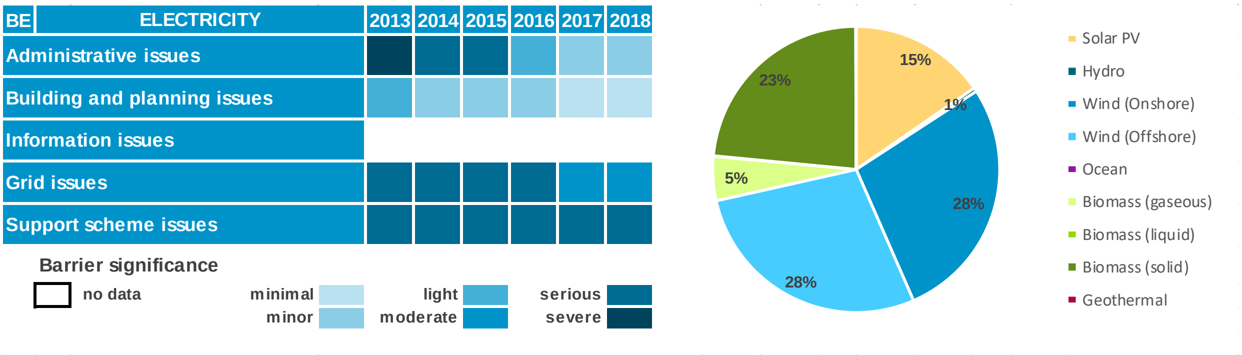


Chart 4. Heat map of the barrier indices per topic in the RES-E sector in Belgium 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Belgium is mainly hindered by moderate to serious barriers related to support and grid issues. According to the NREAP, onshore and offshore wind, along with solar PV and solid biomass are the most significant RES technologies for the achievement of the planned 2020 trajectory in the Belgian electricity sector. The dominant issues related to the support scheme in Belgium for RES-E involve the lack of political unity and the consequent slow stimulation of the RES-E sector. The distribution of competencies between the federal level and the regions is particularly an issue regarding the security of supply; with an exclusive competency of the federal level, mainly rooted in the fact that 65% of the electricity is supplied from nuclear plants, which are also under federal competency. Yet RES, under the competency of the regions, are a growing factor and nuclear shall be phased out over the upcoming years. Therefore, the regions demand for a stronger influence and stakeholders called for a higher political unity of both levels to advance RES. With the Energy Pact signed in 2017, regions and the federal level have agreed on a stronger unity in this matter. The effects of this pact remain yet to be seen. Regarding grid issues, the existing injection tariffs at DSO level are considered as a central barrier affecting the profitability of RES plants. Moreover, DSO injection tariffs undermine the level playing field between RES and conventional plants. In fact, the latter are mostly connected to the transmission grid, which does not involve injection tariffs.

The heat map gives a mixed picture of the development of the barrier indices. The decrease of administrative issues is mainly rooted in the fact that the curtailment regime, which affected mostly wind installations, has less heavily impacted on installations than in previous years. In addition, the permit procedure has been simplified in Flanders (with the environment and construction permits bundled into a single permit). In Wallonia, a one-stop-shop is implemented and makes the process much simpler. Nevertheless, current rules for wind energy plants are not clear and objective enough, which has led several advisory administrations to decide on their own rules, making the decision process unpredictable and on a case-by-case basis for developers (e.g. for environment criteria).
The scatter plot provides a snapshot of the severity and extent of Belgian stakeholders' issues with RES-E in 2018. Support scheme issues affect a predominant share of RES installations, significantly impeding their development through higher cost and longer lead times. Grid issues are affecting the majority of installations; yet with less severity.

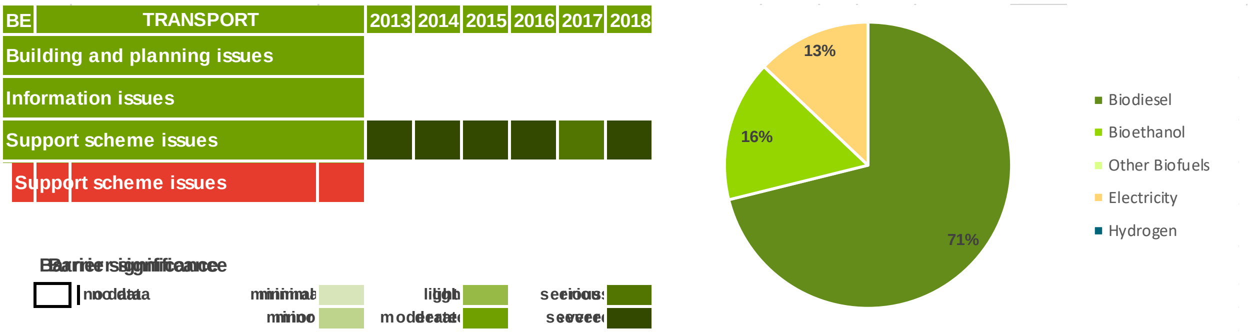


Chart 5. Heat map of the barrier indices per topic in the RES-T sector in Belgium 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Belgium is characterised by moderate to serious barriers related to support schemes and building and planning issues. As visualised by the pie chart above, solid biomass is by far the single most dominant RES technology for the achievement of the planned 2020 trajectory in the Belgian H&C sector, followed by shallow geothermal and solar thermal.

Central RES-H&C barriers related to the Belgian support scheme during the six years analysed involve particularly the Walloon moratorium on almost all energy subsidies for private individuals, introduced in 2015 and still dominantly affecting the RES-H&C development. The Walloon government proclaimed the moratorium primarily out of a fear regarding the uncontrolled explosion of support costs and a resulting market bubble. Yet, since 2015 no alternative support framework has been adopted. Generally, stakeholders also underlined the low political attention for the H&C sector as a major roadblock. As far as the building and planning issues are concerned, the insufficient, non-adapted and in poor condition existing district heating network is of central concern, substantially limiting the production potential for biomass and CHP. Also, the district heating network is not part of the local spatial planning, aggravating the situation.

The heat map indicates a diverse picture regarding the development of barrier indices for the two topics. While the index for support schemes shows an overall stagnation at high level; the one for building and planning issues decreased in the last years. This development is rooted in a stronger political focus of the political level throughout the last years.

The scatter plot provides a snapshot of the severity and extent of Belgian stakeholders' issues with RES-H&C in 2018. The support scheme issue remains the central challenge, affecting a very dominant share of installations and heavily impeding their development, causing higher realisation costs and substantially longer lead times.

In the Belgian RES-T sector, development is limited by important issues related to the support schemes. As visualised by the pie chart above, biodiesel is by far the single most important RES-T technology for the achievement of the planned 2020 trajectories in the Belgian transport sector, followed by bioethanol and e-mobility.

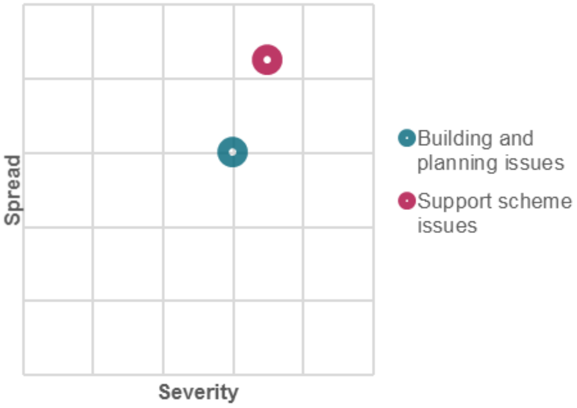


Chart 6. Average severity and spread per topic in the RES-H&C sector for 2018

The main challenges for RES-T in Belgium over the last six years was the instable support framework as well as the discussions at EU-level on future blending targets. Regarding the first, stakeholders highlighted the constant change of the focus of the biomass sector and specific for the RES-T sector the change of the biofuel focus, resulting in an insecurity of developers. Between 2005 and 2008, the production capacity of biofuels was constructed, but afterwards the market has been locked due to the quota that has been put into force by the Federal Government. In this regard, the support of biofuels long suffered from political and budgetary difficulties of the Belgian Federal State, being the competent authority for biofuels. A further issue that has had a negative impact on the biofuel sector is the EU discussions on blending. The uncertainty around the position of the European Commission, combined with the fact that biomass faces numerous competing applications, has led to a standstill of the Belgian biofuel sector in Belgium. The heat map visualises an overall stagnation at a very high level in the barrier indices regarding support scheme issues, reflecting the ongoing insecurity of the sector as described above.

The scatter plot provides a snapshot of the severity and extent of Belgian stakeholders' issues with RES-T in 2018. The support scheme remains the sole, central issue, seriously limiting the growth potential of the sector and affecting the very dominant share of RES-T installations. Realisations of installations is heavily impaired, resulting in substantial extra costs for the project development and longer lead times.

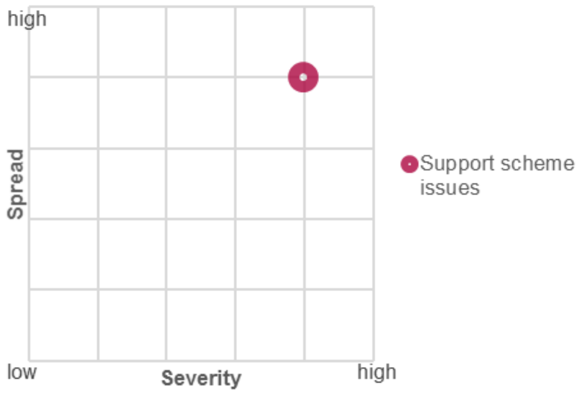


Chart 7. Average severity and spread per topic in the RES-T sector for 2018

Bulgaria

Table 31. Progress of Bulgaria on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☐		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		Ecological and agricultural restraints
	"One Stop Shop" ? (Art. 22(3)a)) ?	☑		Difficult access to public information during the site selection process
	Online application for permit?	☑		Non-harmonized and non-standardized administrative procedures
	Maximum time limit for procedures?	☑		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Ecological and agricultural restraints
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Outdated district heating system
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Difficult access to public information during the site selection process
				Negative attitude of the media towards renewable energy sources
				Lack of transparency and public discussion during decision-making process
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Discrimination of RES producers
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Disadvantageous curtailment measures for renewables
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		Grid access fee for wind and PV plants affects projects' profitability
	Priority of RES connection to the grid? (Art. 16 (1))	☑		Outdated district heating system
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☒		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Uncertainties related to the EWRC's methodology for determing premiums
				Electricity Trading Rules ignore specifics of renewable energy generation
				Lack of investor confidence due to a former cap on the quantity of electricity purchased at FiT
				Lack of incentives for RES-T

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

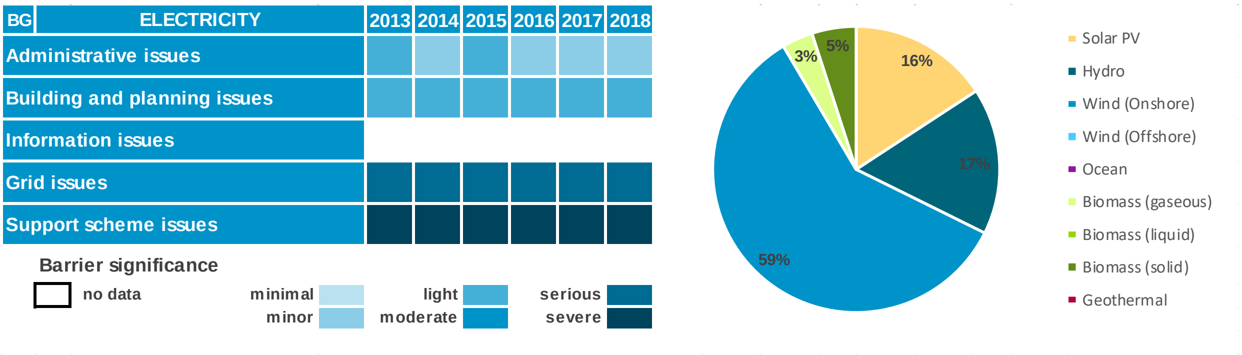


Chart 8. Heat map of the barrier indices per topic in the RES-E sector in Bulgaria 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Bulgaria is mainly hindered by significant barriers related to support issues, serious barriers related to grid issues and minor to minimal barriers related to building and planning as well as administrative issues. As visualised by the pie chart above, onshore wind is the most important RES technology for the achievement of the planned 2020 trajectory in the Bulgarian electricity sector, followed by hydro and PV power.

Some of the main issues related to support schemes are connected to the many and partially retroactive changes, which the Bulgarian government has introduced since 2010. A particular and still ongoing issue is the high frequency of changes (as often as every six months), most of them without a clear and transparent process. Although later measures such as a tax on solar and wind incomes in 2014 were refuted by the courts, there is a lack of investor confidence which is reflected in insufficient access to financing. Similar barriers were identified during the grid connection process or when RES-E installations had to be curtailed. In both cases, RES operators suffered from intransparent decisions, which discriminated RES installations against fossil plants and unexpected fees that made planning impossible. Projects also suffer from insufficient integration of RES-E in spatial and environmental planning due to ecological restraints as well as non-harmonised administrative procedures.

The heat map indicates an overall stagnation in the barrier indices, including barriers for support scheme at a severe and for grid issues at a serious level. This is because after the legal actions by the Bulgarian government, there have been no legal steps to amend the overall situation for RES-E in Bulgaria.

The scatter plot provides a snapshot of the severity and extent of Bulgarian stakeholders' issues with RES-E in 2018. The above-described support scheme issues affect almost all RES-E installations, and that to a major extent. Grid issues have a slightly better effect but are still at a very problematic level. Building and planning issues and administrative issues affect fewer installations and that to a lesser extent.

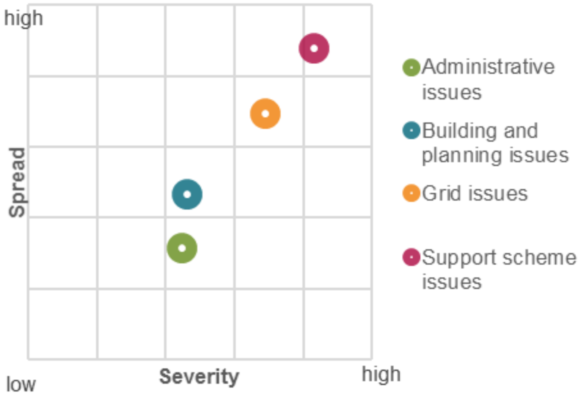


Chart 9. Average severity and spread per topic in the RES-E sector for 2018.

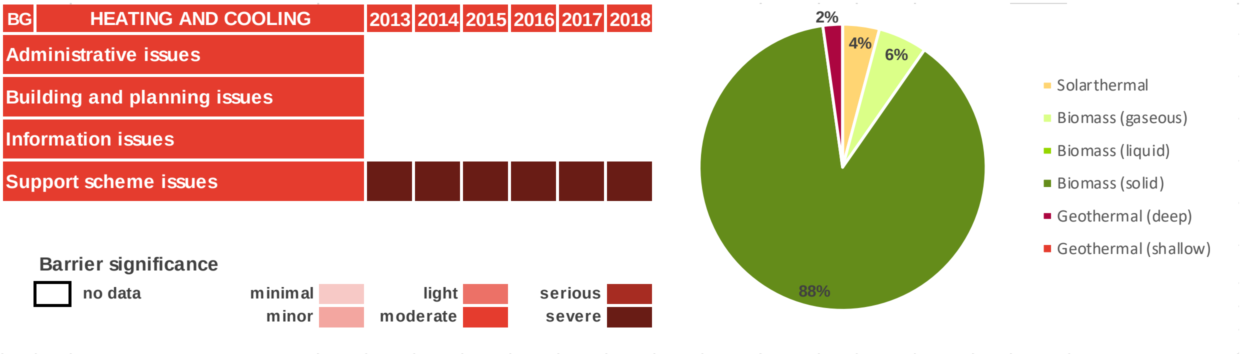


Chart 10. Heat map of the barrier indices per topic in the RES-H&C sector in Bulgaria 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Bulgaria is characterised by important barriers related to support scheme issues. As visualised by the pie chart above, solid biomass is by far the most dominant RES-H&C technology for the achievement of the planned 2020 trajectory in the Bulgarian H&C sector, followed by gaseous biomass, solar thermal and geothermal.

Central RES-H&C barriers related to the Bulgarian support schemes during the six years analysed involve the insufficient support schemes for biomass installations. The remuneration level for gaseous biomass is so low that it is not attractive for farmers to change to energy crops. In addition, legal provisions of the “Rulebook for Grid operation” by the Energy and Water Regulatory Commission make the use of CHP almost impossible.

The heat map indicates a continuation of barriers related to support schemes at a very negative level. One of the reasons why these conditions have not changed in recent years is that the Bulgarian government already reported in 2012 that Bulgaria had reached its binding national RES target of 16% in the final energy consumption. Stakeholders from the RES sector, however, doubted that these figures were actually accurate.

The scatter plot provides a snapshot of the severity and extent of Bulgarian stakeholders’ issues in RES-H&C in 2018. The above outlined support scheme issues are dominant obstacles for a majority share of RES-H&C installations and largely impede their development.

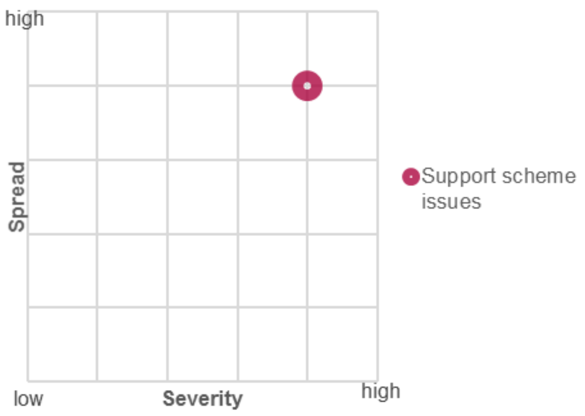
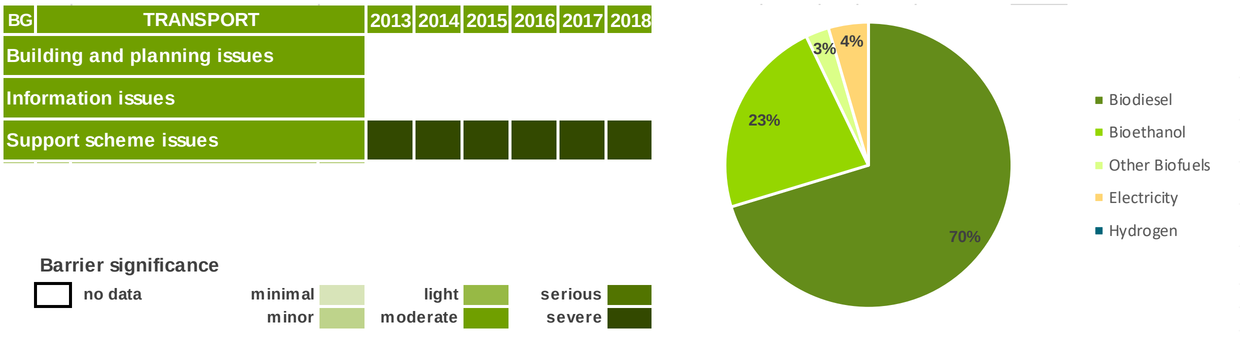


Chart 11. Average severity and spread per topic in the RES-H&C sector for 2018



BG	TRANSPORT	2013	2014	2015	2016	2017	2018
Building and planning issues							
Information issues							
Support scheme issues		■	■	■	■	■	■

Chart 12. Heat map of the barrier indices per topic in the RES-T sector in Bulgaria 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Bulgarian RES-T sector, progress is limited by issues related to the support schemes. As visualised by the pie chart above, biodiesel as well as bioethanol are the two dominant RES-T technologies for the achievement of the planned 2020 trajecotry in the Bulgarian transport sector. Other biofuels and electricity in the transport sector play an insignificant role.

The main challenges for RES-T in Bulgaria over the last six years with regard to support schemes involve the lack of incentives: The taxation of vehicles is based on the power of engine instead of emissions. As a result, the annual tax on a 20-year-old diesel car is ten times lower than the tax on a new car with a small gasoline engine or a hybrid vehicle. As of this moment, there are no tax reliefs or subventions to support electric vehicles in Bulgaria. Furthermore, electric vehicles are being treated the same as combustion engine vehicles, which means that electric vehicles are obliged to pay vignette tax.

The heat map visualises stagnation in the barrier indices regarding support scheme issues. This is because there have been no changes and it seems limited interest in stimulating RES-T in the past years.

The scatter plot provides a snapshot of the severity and extent of Bulgarian stakeholders' issues within RES-T in 2018. The support scheme remains the sole, central issue, seriously limiting the growth potential of the sector and affecting the very dominant share of RES-T applications.

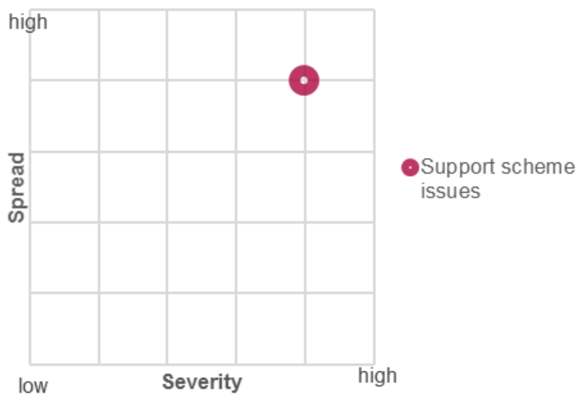


Chart 13. Average severity and spread per topic in the RES-T sector for 2018

Czech Republic

Table 32. Progress of Czech Republic on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		Owners of PV installations exceeding 10 kW are obliged to be registered as entrepreneurs
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Non-unified administrative procedures causing delays
	Online application for permit?	☐		Burden of bureaucracy in license obtainment
	Maximum time limit for procedures?	☐		Cuts of production due to reactive power compensation for installations above 100 kW
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		Energy Regulatory Office's delays not penalised
	Increased cooperation between institutions/streamlining of permit procedures?	⌛	Major amendment to the Building Act (prepared in 2015-2016)	
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Diverse interpretations of the building code and related regulations
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		Too strict PV prohibitions in historical and landscape areas
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		Unintegration of hydropower plants in spatial planning
				Too restrictive planning documents of Regions on the construction of new RES plants
				Arbitrary decision-making of officials in case of wind power projects
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Insufficient profesional capacity and lack of communication
				Unsatisfactory explanation for connection rejection
				Unpredictability of DSO's decision
				Negative image of RES (especially PV)
				Nontransparent and unclear support mechanism for historic RES
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Limited transparency of DSO's Decision
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Ossified electricity tariff regime of the regulator
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		Slow development of electric vehicle infrastructure
	Priority of RES connection to the grid? (Art. 16 (1))	☑		Poor quality of electric vehicle charging infrastructure
	Clear legal obligation for the system operator to reinforce the grid?	☑		No transparency in the DSO's grid access decision
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		Difficulties to connect decentralised RES to the grid, due to feared grif instability of the grid operator
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☒		
	Shallow cost structure? (Art. 16 (5) and (6))	☒		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Support for renewable energy abolished since 2014
				Risk of the return of investment control (so-called Revision Mechanism)
				Frequent restrictive measures increase financing costs in RE Sector
				Slow return on investment of hydropower plants
				Too dominant position of the DSO on the market

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

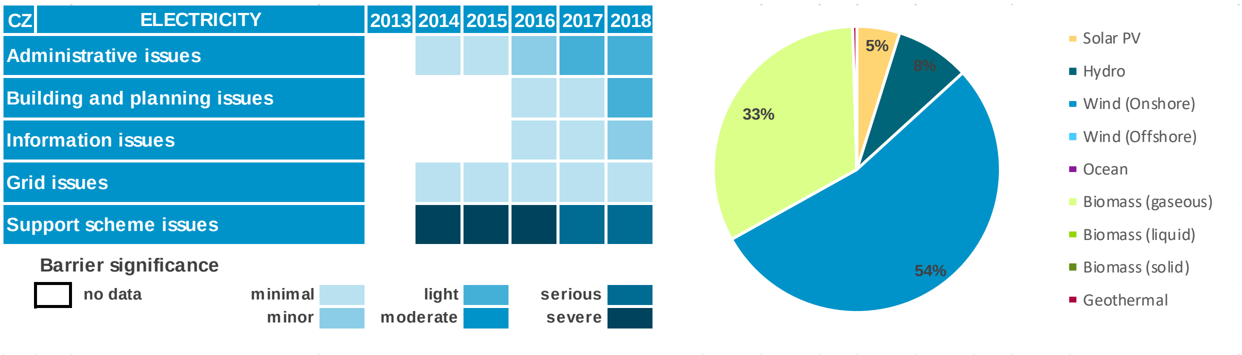


Chart 14. Heat map of the barrier indices per topic in the RES-E sector in the Czech Republic 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in the Czech Republic is mainly hindered by light to serious barriers dealing with support scheme and administrative issues. As visualised by the pie chart above, onshore wind and gaseous biomass are by far the most significant RES technologies used to achieve the 2020 trajectory planned in the electricity sector.

The dominant issue in the Czech Republic's support scheme for RES-E over the analysed five years include the abolishment of the support scheme for new RES installations in 2014, as well as the restrictive solar tax, in place since 2011.

The heat map indicates a decrease in the barrier indices, which applies to support scheme issues. This reflects the slight encouragement felt by stakeholders regarding the capacity auctions which are expected for RES plants larger than 1 MW, and 6 MW in case of wind plants. However, according to the current version of the amendment, large-scale PV plants will not be supported by auctions. Yet, the reform of the RES Act on which the new support mechanism is based, might only be enacted as of 2021.

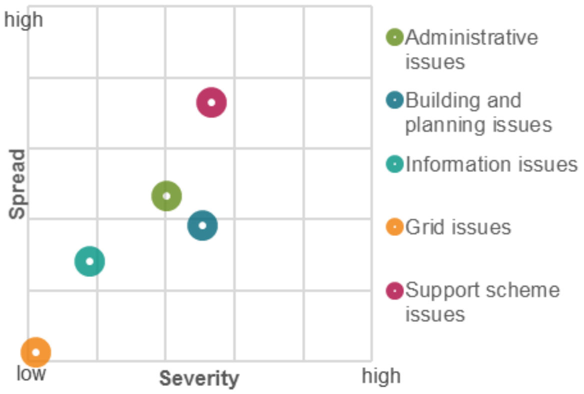


Chart 15. Average severity and spread per topic in the RES-E sector for 2018

Regarding administrative issues, the heat map shows an increase in the index values since 2017. This is explained by the increased bureaucratic burden due to the multiple authorities involved in issuing licenses. The procedure does not affect installations with a capacity less than 10 kW.

The scatter plot provides a snapshot of the severity and extent of Czech stakeholders' issues with RES-E in 2018.The support scheme issues remain the central challenge, impacting on a very high scale all RES-E installations and seriously affecting their development, i.e. resulting in substantial extra realisation costs and strong delays in realisation. Building and planning issues affect less installations, yet with an equal severity. Issues related to the administrative framework affect more installations than the building and planning obstacles, however with a lower severity value, meaning delays and extra costs for the project realisation are generally lower.

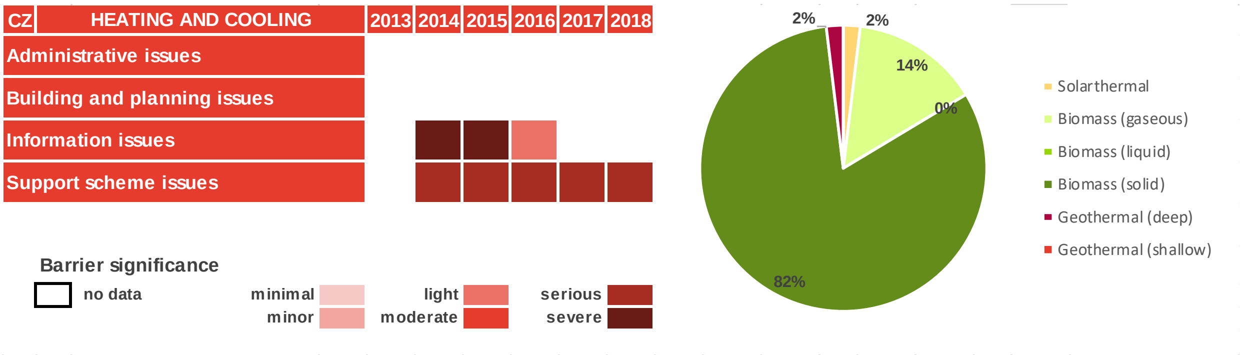


Chart 16. Heat map of the barrier indices per topic in the RES-H&C sector in the Czech Republic 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in the Czech Republic is characterised by serious barriers related to information and support schemes issues. As visualised by the pie chart above, solid and gaseous biomass are the dominant RES technologies for the achievement of the planned 2020 trajectory for the H&C sector in the Czech Republic.

Czech Republic's central RES-H&C barrier over the analysed five years includes the lacking reliability of the general RES-H&C strategy and the support framework. The sector experienced frequent restrictive measures over the past years, leading to the financing institutions' substantial financial straits, ultimately impacting the installations' cash flows. The instable framework raises the financial costs for the development of RES-H&C installations in the MS and undermines investors' confidence in RES technologies. Support scheme challenges persist at a high level since they were first reported in 2014 and are strongly limiting a further sectoral growth.

In parallel, the heat map also indicates the presence of barriers dealing with information issues until 2016. The main barrier was the strict certification system of installers, who had to obtain an authorisation granted from the competent Ministry. The process decisively lengthened installation construction and posed a further financial burden on developers. Since July 2015, the reform of the certification scheme for RES installers through Act No. 103/2015 Coll. has changed the certification requirements. In fact, the legal definition of a person authorised to install RES devices has been modified, thus allowing physical and legal subjects holding a relevant business license to install RES plants. As a result, the certification of RES installers no longer presents a barrier.

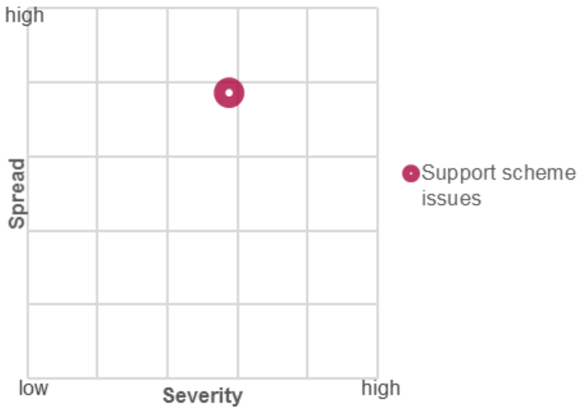


Chart 17. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severity and extent of Czech stakeholders' issues with RES-H&C in 2018. The above outlined support scheme issues are the central obstacle for the majority of installations and significantly impede their development.

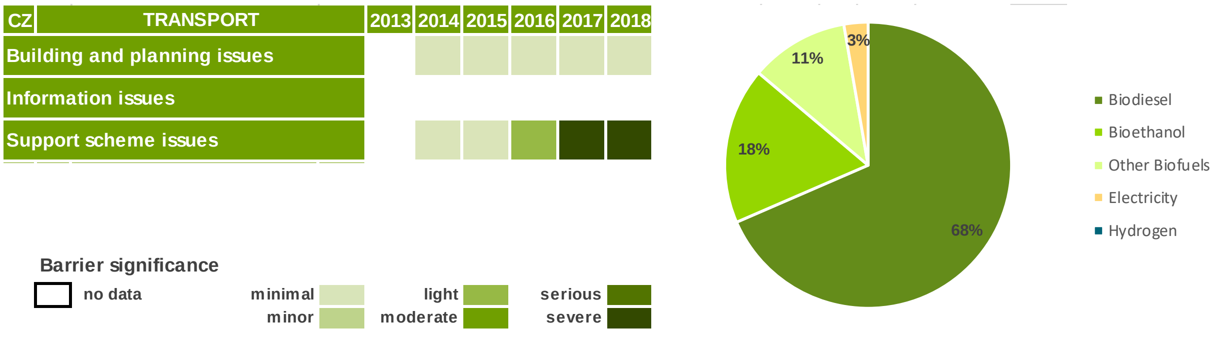


Chart 18. Heat map of the barrier indices per topic in the RES-T sector in the Czech Republic 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Czech Republic's RES-T sector, development is predominantly hindered by support scheme issues. As visualised by the pie chart above, biodiesel, bioethanol and other biofuels are the dominant RES technologies for the achievement of the planned 2020 trajectory for the transport sector in the Czech Republic.

The main challenge for RES-T in the Czech Republic over the last five years concerns the very slow and unsatisfactory implementation of the National Action Plan for Clean Mobility, adopted in 2015. Stakeholders increasingly perceived the pertinence of barriers, given the narrowing timeframe to meet targets. Commitments such as the labelling of vehicles, the introduction of required infrastructure or the introduction of priority lanes or parking spaces for clean vehicles have not been implemented yet.

The heat map visualises an increase in the barrier indices of support scheme issues. As mentioned above, the increase is rooted in the stronger and more urgent perception of the RES-T sector's shortcomings. Stakeholders identify existing challenges in greater detail and flag issues with a higher urgency.

As far as building and planning issues are concerned, stakeholders have been pointing out the constant lack of infrastructure and charging stations for electric vehicles as well as the poor quality of the existing ones.

The scatter plot provides a snapshot of the severity and extent of Czech stakeholders' issues with RES-T in 2018. The support scheme remains the central issue, seriously limiting the growth potential of the sector and affecting all RES-T installations.

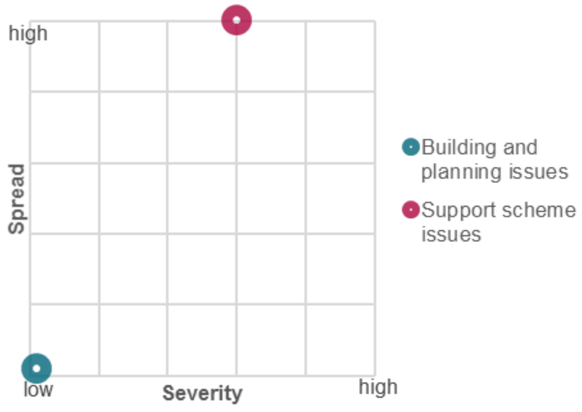


Chart 19. Average severity and spread per topic in the RES-T sector for 2018

Denmark

Table 33. Progress of Denmark on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		
	“One Stop Shop” ? (Art. 22(3)a)) ?	☑	There is a one-stop-shop procedure for offshore wind turbines	
	Online application for permit?	☐		
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	Since 2013, a ban on the installation of boilers fired by oil or natural gas in new buildings was introduced. The report provides no information on other legal requirements for RES in new buildings.	
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Lacking grid development in Germany causing lock-in of wind in the northern part of Europe.
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		The high amount of fluctuating wind power jeopardizes grid stability
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑	Danish legislation implements Article 16 of the RE Directive concerning access to and operation of the grids.	Too low European standards for biofuels hinder the entering of advanced biofuels into the market
	Priority of RES connection to the grid? (Art. 16 (1))	☑		
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑	Danish legislation implements Art. 16 of the RED concerning grid access and operation.	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☑	Danish legislation implements Article 16 of the RE Directive concerning access to and operation of the grids.	
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

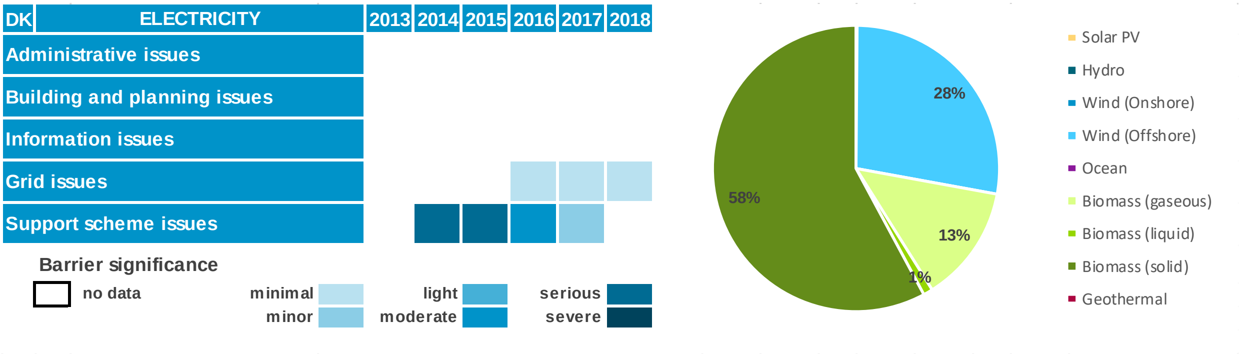


Chart 21. Heat map of the barrier indices per topic in the RES-E sector in Denmark 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Denmark is facing only few and relatively light barriers related to grid issues. As visualised by the pie chart above, solid biomass and wind offshore are the most significant RES technologies for the achievement of the planned 2020 trajectory for the Danish electricity sector.

The dominant issues related to the support scheme in Denmark for RES-E have been solved in June of 2018 with the political decision on the main questions regarding support issues and the future funding of RES-E deployment. The existing barriers related to grid issues concern the challenges due to the high amount of fluctuating wind power which can jeopardize grid stability in the future. This issue is further aggravated by the lack of grid development in Germany, which causes lock-in of wind in the northern part of Europe. However, up to now, these risks have not materialized.

The heat map indicates a strong improvement in the barrier index regarding support schemes. This is due to the lifted insecurity of project developers regarding the implementation of the new state aid rules from the European Commission. The guidelines have been accepted and the new technology-neutral tender schemes incorporated into the state aid guideline logic. Moreover, the question on the future funding of RES-E in Denmark seems to be resolved. As far as grid issues are concerned, the increased amount of fluctuating wind power in the grids in Denmark but also in Germany during the past three years, put a strain on Danish grid and increases costs in the energy system.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today's issues for RES-E as reported by stakeholders in Denmark. Grid issues are the only issues that were identified, and they are not grave in terms of spread and severity. This is also due to the fact that particularly the impact on solid biomass and offshore wind power (and not onshore wind power) was considered since these were the technologies the Danish NREAP focused upon.

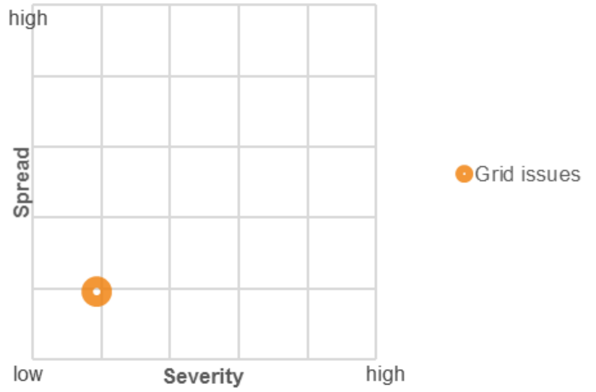


Chart 20. Average severity and spread per topic in the RES-E sector for 2018

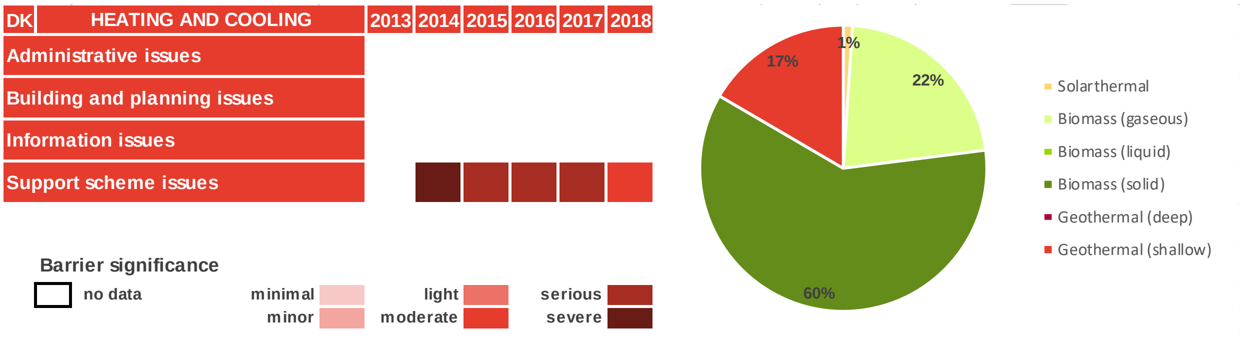


Chart 22. Heat map of the barrier indices per topic in the RES-H&C sector in Denmark 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Denmark is characterised by moderate barriers related to support scheme issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory for the H&C sector in Denmark, followed by gaseous biomass and solar thermal.

The central barriers related to the support scheme in Denmark for RES-H&C over the analysed six years have improved. There are ambitious targets. However, the implementation of the policies and the coordination with other laws, for example the tax regulation were considered insufficient. The electricity heating tax causes insecurities for investors and reduce future incentives. This barrier was further aggravated by solar thermal systems because they suffered from high prices of land in many regions in Denmark. This problem was addressed by the Energy Agreement in June 2018. It remains to be seen whether the implementation of the Energy Agreement will overcome these issues.

The heat map indicates an improvement for support schemes issues. The improvement of support schemes can be explained by the efforts from the Danish Government to create a more consistent and reliable policy particularly with the Energy Agreement in June 2018.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today's issues for RES-H&C as reported by stakeholders in Denmark. The above outlined support scheme issues are the dominant obstacle for a large share of installations and affect their development moderately. They have an impact on a substantial amount of installations yet not all of them and that impact is relevant but not too severe.

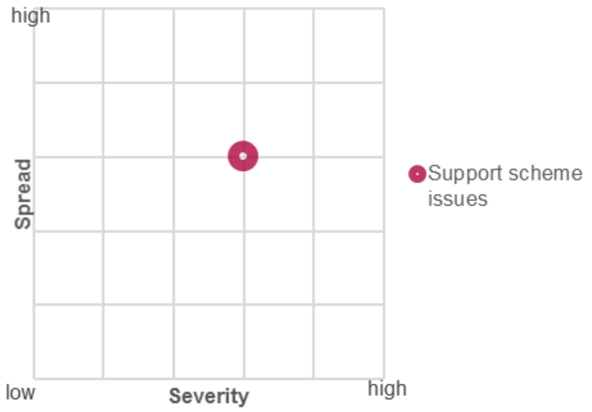


Chart 23. Average severity and spread per topic in the RES-H&C sector for 2018

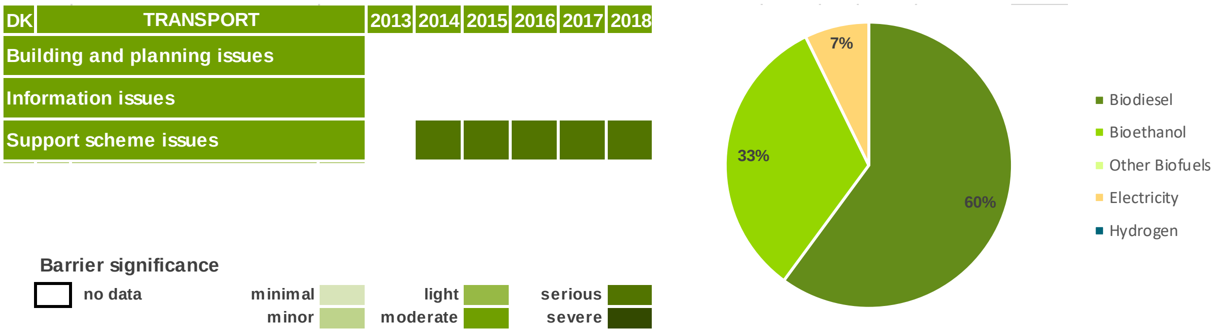


Chart 24. Heat map of the barrier indices per topic in the RES-T sector in Denmark 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the RES-T sector in Denmark, the development is limited by issues related to support schemes. As visualised by the pie chart above, biodiesel as well as bioethanol are the two dominant RES technologies for the achievement of the planned 2020 trajectory for the transport sector. In addition, there is a minor share that shall be covered through the use of electricity.

The main challenges for RES-T in Denmark over the last six years involve the lack of a sufficient support scheme for biofuels, particularly when it comes to the development of new advanced biofuels. Conflicts between RES-T policy on one side and tax policy on the other increase insecurity for future RE developments in the RES-T sector, too. A broader use of green technologies and reduced use of fossil technologies will result in lower tax revenues from taxes on fossil resources. This pattern creates concerns that the financing of RES-T has to be changed sooner or later – to the disadvantage of RES-T applications. The heat map visualises that he barrier index regarding support scheme issues remains fairly stable at a high level. There has been only a slight improvement. This is rooted in the fact that barriers on biofuels regulation at European level have been resolved.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today’s issues for RES-T as reported by stakeholders in Denmark. The support scheme remains the sole, central issue, moderately limiting the growth potential of the sector; yet, not affecting the totality of the RES-T plants.

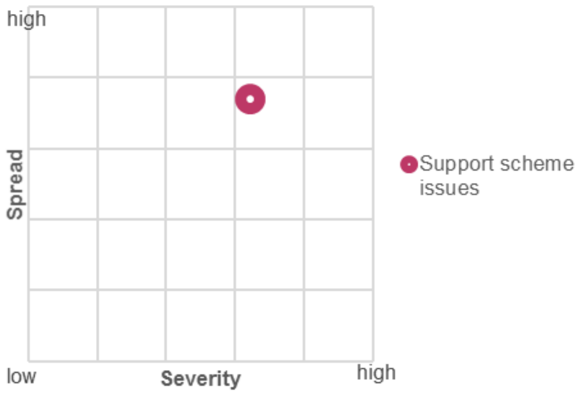


Chart 25. Average severity and spread per topic in the RES-T sector for 2018

Germany

Table 34. Progress of Germany on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑	Administrative procedures are only evaluated indirectly.	Considerable up-front costs related to the tendering system
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Complex administrative procedures for offshore wind
	Online application for permit?	☑	"Marktstammdatenregister", which will be online from 8.12.2018. All RES installations have to be reported and there.	Formal irregularities have led to disqualification of many project applications in tenders
	Maximum time limit for procedures?	☐		Complex safety procedures for biogas
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		Lack of consistent administrative procedures for geothermal projects
	Increased cooperation between institutions/streamlining of permit procedures?	☒	The Marktstammdatenregister is designed to facilitate different registry procedures.	
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☑		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Complex and not fully aligned regulatory framework for energy efficient buildings
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		Lack of uniform height and distance restriction rules for onshore wind
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		Arable land restrictions for free standing solar PV installations
				Long and complex adoption of wind priority areas in regional land-use plans
				Restriction to build wind turbines in the proximity of radar areas
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				No atlas on deep geothermal datasets available
				Anti-wind movement working more efficiently
				Public resistance towards the use of energy crops
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Volume caps for wind energy due to the lack of grid capacity in North Germany
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Lack of infrastructure and infrastructure development
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		Lengthy grid expansion and authorisation processes
	Priority of RES connection to the grid? (Art. 16 (1))	☐		
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Too low tendered capacities
				EEG surcharge on self-consumption affects projects' profitability
				Tenant electricity surcharge not well designed
				Tendered capacity volumes are calculated based on gross expansion corridors instead of net expansion
				Missing connection between climate policy and energy policy

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

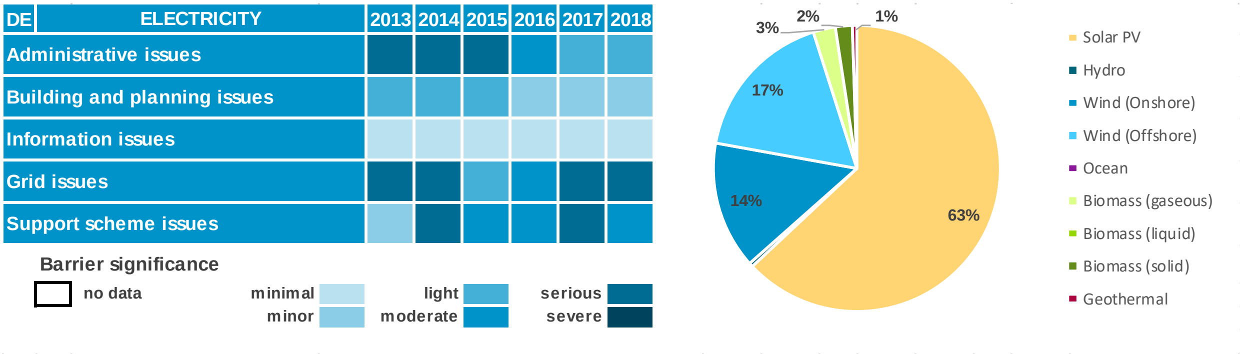


Chart 26. Heat map of the barrier indices per topic in the RES-E sector in Germany 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Germany is mainly hindered by serious barriers related to grid issues and moderate barriers related to support scheme issues. The pie chart above shows that PV is the most significant RES technology for the achievement of the planned 2020 trajectory in the RES-E sector, followed by wind offshore and wind onshore.

The dominant issue related to grid issues for RES-E is the delayed expansion of the German transmission grid, which is a result from many complex factors. The consequence of that delay is that negative prices occur more often, which cause additional insecurity and wind power installations in very suitable areas are curtailed. Most of the support scheme issues revolve around the auctioning scheme that has been introduced for most installations and RES-E technologies over the past years. The transition from a classic premium scheme seems to work for PV. For wind power, the situation is not clear yet and particularly the attempt to privilege RES cooperatives has created unintended and peculiar consequences. RES cooperatives were advantaged over other competitors: They did not have to present a building immission protection permit at the time of the submission of their bids, they will receive the highest price that was accepted during that bidding process and they have more time for the construction of the wind parks (4,5 years instead of 2,5). As a consequence, it is not clear whether all the authorities will permit all projects that were awarded in the tendering procedure. This increases the uncertainty for all market players. It remains to be seen whether this issue has been addressed by the introduction of additional 4 GW of tendered capacity for PV and onshore wind until 2021 in December 2018.

The heat map indicates an overall alleviation in most barrier indices. Only the grid issues are deteriorating because the RES sector developed faster than the transmission grids in the past years. Administrative issues as well as building and planning issues have improved over the past years thanks to more experience in processes and routines.

The scatter plot provides a snapshot of the severity and extent of Germany stakeholders' issues with RES-E in 2018. Grid issues affect almost half of all installations and that with the highest degree of severity. Support scheme issues show similar results as they are a bit more widespread but perceived as less severe. Administrative issues and particularly building and planning issues are perceived considerably lighter in terms of spread and especially severity.

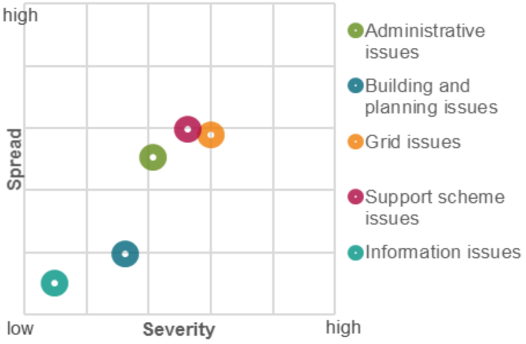


Chart 27. Average severity and spread per topic in the RES-E sector for 2018

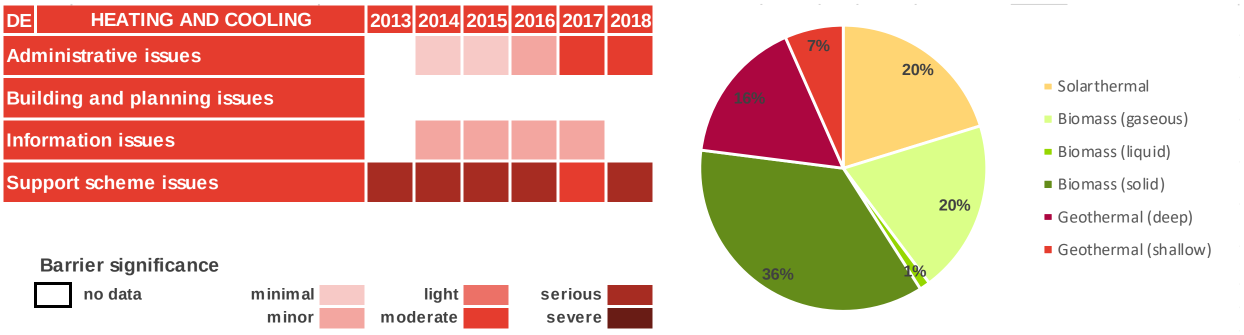


Chart 28. Heat map of the barrier indices per topic in the RES-H&C sector in Germany 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Germany is characterised by serious barriers related to support scheme issues and moderate barriers dealing with administrative issues. As visualised by the pie chart above, biomass (solid and gaseous) is the most dominant RES technology for the achievement of the planned 2020 trajectory in the German H&C sector, followed by solar thermal and geothermal energy.

Central RES-H&C barriers related to the German support schemes during the six years analysed involve the insufficient stimulation to increase the amount of RES-H&C in the building sector. Most notably, the obligation for increasing the use of RES applies only for new buildings but not existing ones. With regards to other heating applications, there is no support for renewable industrial process heat. Administrative issues arise from the complex and not fully aligned regulatory framework for energy efficient buildings, which increases complexity and hinders effective policy implementation. In addition, specific barriers to the development of geothermal power, related among others to the unharmonized procedures for the obtaining of drilling permits from local water and mining authorities, hamper the projects' implementation and thus pose risks for investors.

The heat map indicates a stagnation for support schemes issues and a slight increase for administrative issues. A positive development, on the other hand is that of information issues, which were sizeable until 2017 and are not considered an issue anymore. The improvement of the reputation of RES-H&C among the general public was achieved on the one hand through campaigns by local and regional energy agencies that addressed local consumers and on the other hand through a change of context when the discourse on sector coupling and power-to-heat helped re-framing power as a source of heat.

The scatter plot provides a snapshot of the severity and extent of German stakeholders' issues with RES-H&C in 2018. The above outlined support scheme issues are dominant obstacles for a large share of installations and impede their development. Administrative issues have a similar negative impact both in terms of spread and severity.

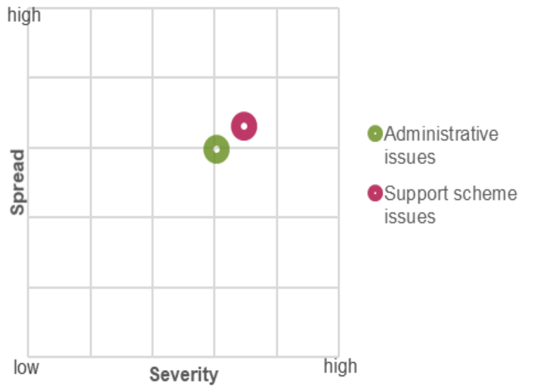


Chart 29. Average severity and spread per topic in the RES-H&C sector for 2018

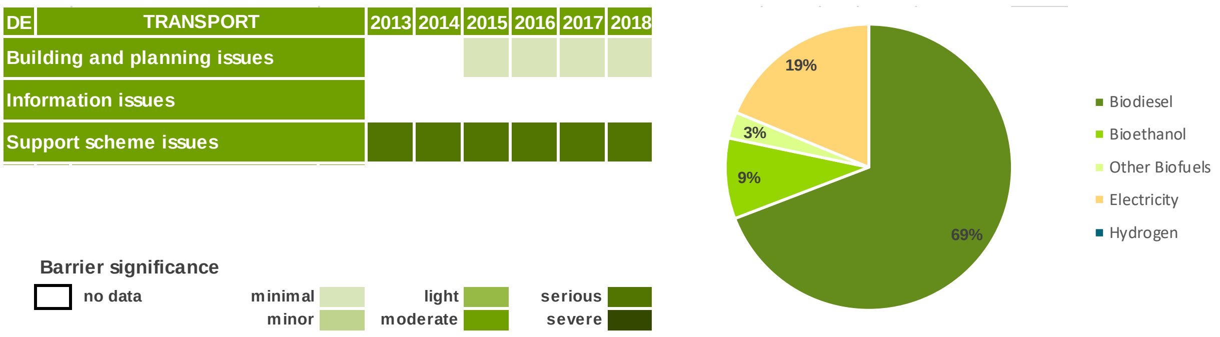


Chart 30. Heat map of the barrier indices per topic in the RES-T sector in Germany 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the German RES-T sector, progress is mostly hampered by issues related to the support scheme. As visualised by the pie chart above, biodiesel is the dominant RES technology for the achievement of the planned 2020 trajectory in the German transport sector. Electricity and bioethanol are also supposed to play a significant role.

The main challenges for RES-T in Germany over the last six years involve the insufficient support of fuels from RES. Tax reliefs were abandoned in 2015 and this is still considered one of the most significant barriers. In addition, the existing targets for the expansion of biofuels are considered insufficient, partly also since it is not clear what will be actually needed to meet the required levels of GHG reduction. With regards to electric mobility, the main barriers concern the price bonuses which do not sufficiently create an incentive for a transition from combustion cars. Current programmes to support the electrification of public transport are too limited to make a substantial difference. Regarding planning and building issues, the lack of a widespread charging network is another important barrier, especially concerning rural regions and Eastern Germany.

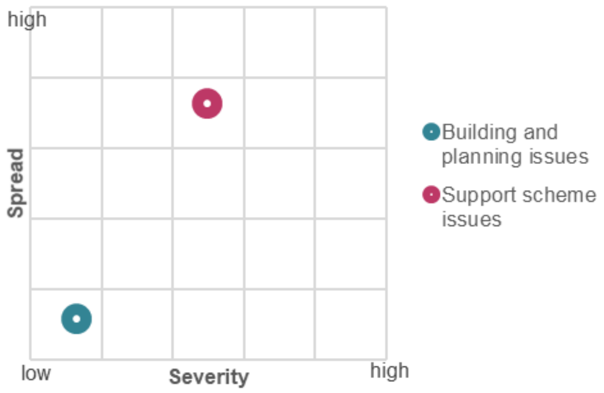


Chart 31. Average severity and spread per topic in the RES-T sector for 2018

The heat map shows that there has been no improvement of support scheme issues in the past six years. They still stay at a serious level. Building and planning issues have come about over the past four years but are still at a relatively low level. The scatter plot provides a snapshot of the severity and extent of German stakeholders’ issues with RES-T in 2018. The support scheme remains the central issue. It affects most RES-T technologies. Yet, it does not seriously limit the growth potential of the sector.

Estonia

Table 35. Progress of Estonia on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		The administrative processes take too long and are too complex
	“One Stop Shop” ? (Art. 22(3)a)) ?	☐		Veto by Estonian air force due to security of radar systems
	Online application for permit?	☐		Difficult planning procedures for wind projects due to strong position of environmental office
	Maximum time limit for procedures?	☐		Too high requirements for wind power developers for obtaining a grid connection permit
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Integration of biofuel production in spatial planning is non-existent
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Lack of technical training and expertise
				Lack of cooperation between governmental agencies regarding biomethane's exemption from excise duty
Grid issues	Grid usage fee?	☑	"The grounds for the calculation of network charges have been laid down in the Electricity Market Act. Network charges on the basis of the principle of equal treatment. "	**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Too expensive costs for injection points (Injection of biogas into natural gas grid)
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		Grid development plans are not transparent and reliable and impede the development of RES projects
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Lack of heating infrastructure development
	Priority of RES connection to the grid? (Art. 16 (1))	☒		Biogas infrastructure needs improvement
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑	"Renewable energy charge is calculated by the TSO in compliance with approved methodology and Section 59 of the Electricity Market Act."	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑	The cost of electricity is broken down in accordance with the Electricity Market Act, with a specific component for grid charges.	
	RES-priority in dispatch? (Art. 16 (1))	☒		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Legislative change of support scheme – unclarity about post-2020 development
				Lack of political will for RES development
				Lack of framework for energy cooperatives
				Smaller companies do not have access to finance
				Uncertainty about future support schemes

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

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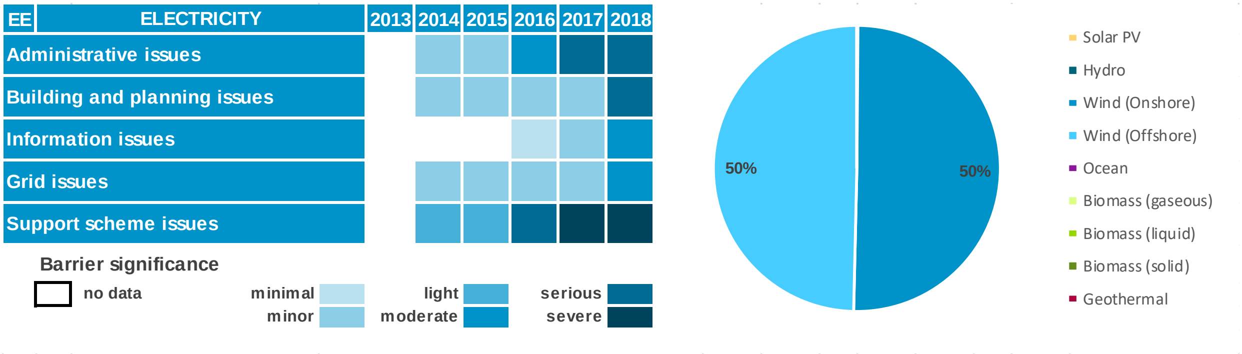


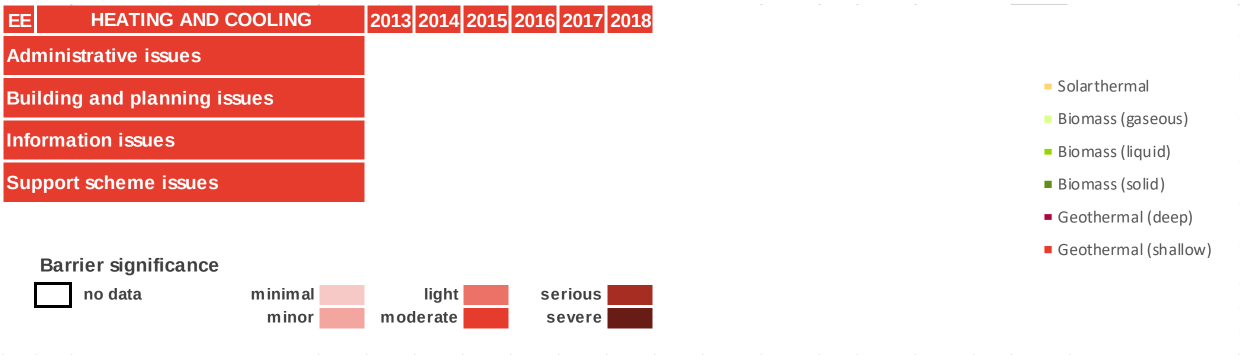
Chart 32. Heat map of the barrier indices per topic in the RES-E sector in Estonia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Estonia is mainly hindered by barriers dealing with support schemes and building and planning issues, alongside serious issues concerning the administrative framework. As visualised by the pie chart above, onshore and offshore wind are the two RES technologies for the achievement of the planned 2020 targets for the electricity sector in Estonia.

The dominant issues related to Estonia's support scheme in Estonia for RES-E over the analysed five years involved the lack of clarity on the new support framework for onshore wind and the political commitment for strong RES development. Since 2015, a new support scheme (auction/sliding premium) was under ongoing discussion and preparation, which created great uncertainty for developers. Missing political will was flagged as a central challenge. In summer of 2018, the legal rules for the new auctioning scheme were finally introduced. A first tendering round shall take place in 2019. The required by-laws are yet to be published. While this development is certainly a step in the right direction, it is yet too early for a final assessment. Stakeholders also highlighted the government's strong commitment to oil shale as a central barrier for RES development. As far as administrative barriers are concerned, the length and complexity of procedures are perceived as serious issues. Among others, a reform in the administrative structure has left inexperienced administrators and incompetent authorities in charge. In terms of building and planning issues, the excessive creation of conservation areas by groups opposed to RES deployment is a growing concern.

Chart 33. Average Severity and Spread per topic in the RES-E sector for 2018

The heat map mirrors the above-described situation. The scatter plot provides a snapshot of the gravity and extent of Estonian stakeholders' issues with RES-E in 2018. Here, the support scheme obstacle is still the main issue. However, this assessment may improve substantially if the foreseen auctions are successful. In that case, building and planning issues would become the main priorities for tackling the existing barriers to RES-e deployment in Estonia.



EE	HEATING AND COOLING	2013	2014	2015	2016	2017	2018
Administrative issues							
Building and planning issues							
Information issues							
Support scheme issues							

Chart 34. Heat map of the barrier indices per topic in the RES-H&C sector in Estonia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

For the present assessment, the Estonian RES-H&C sector is a unique case, as the MS does not intend to develop the sector further to achieve its 2020 targets. In 2010, 612 ktoe of final energy consumption were produced from solid biomass. The 2020 H&C-target as indicated by the Estonian NREAP amounts to only 607 ktoe of final energy consumption; thus, targets have already been surpassed, particularly considering that in 2014, 779.2 ktoe of final energy consumption came from renewable sources—predominantly solid biomass.

Based on the above-described situation, no growth is foreseen for the sector, rendering chart 1 and plot 2 redundant.

Barriers for the MS H&C sector have been identified, despite the absence of growth. These include the comprehensive refurbishment of the old district heating network and the general feed-in regime of the district heating network. The latter's shortcomings hamper feed-in if the consumption is met by production, while investment payback periods are often longer than the lifetime of the network. Investors are reluctant to invest money into heating infrastructure in the absence of any financial incentive scheme.

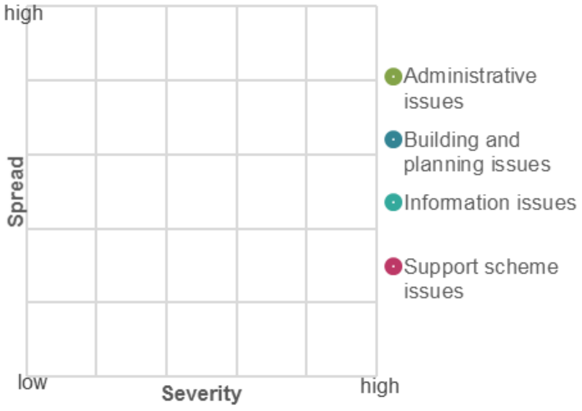


Chart 35. Average Severity and Spread per topic in the RES-H&C sector for 2018

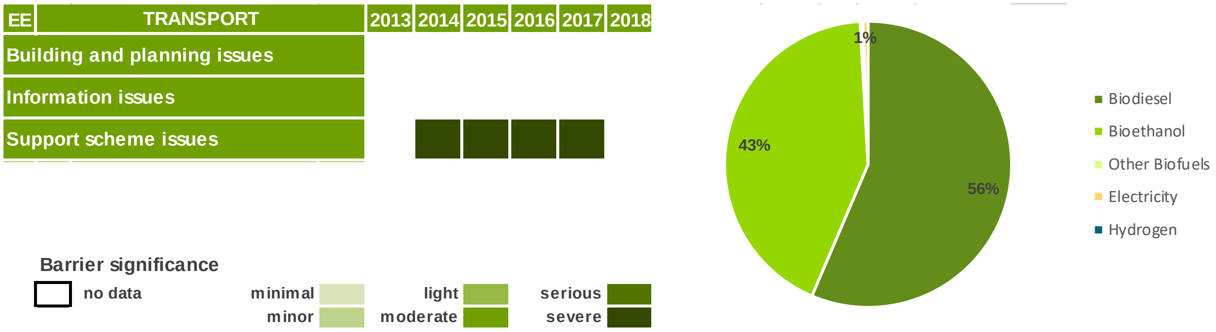


Chart 37. Heat map of the barrier indices per topic in the RES-T sector in Estonia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

Estonia's RES-T sector's development is limited by important support scheme issues. As visualised by the pie chart above, biodiesel as well as bioethanol are the two dominant RES technologies for the achievement of the planned 2020 targets for the transport sector in Estonia.

The main challenge for the Estonian RES-T sector over the last five years has been the biofuels' blending and selling obligations. The sector has not received any form of stimulus, leading to significant roadblocks for RES-T technologies.

The heat map visualises the stakeholders' growing concerns between 2014 and 2017, which abruptly dissipated in 2018, when the government passed a legislation obliging fuel retailers to blend fuels with a defined percentage of biofuels. Biofuel blending rates were established at 3.1% in May 2018, which will be raised to 6.4% in 2019 and to 10% in 2020. These steps provide incentives for the sector's - particularly biodiesel's and bioethanol's - development. The MS missing support framework long overshadowed any other issue in the sector.

Considering the very short period since the removal of the central barrier in the sector, i.e. the introduction of the new blending obligations, stakeholders have not reported any new issues in 2018. This situation is reflected in the empty scatter plot for 2018. Experiences from other European markets have shown that the removal of the central barrier will shift stakeholders' attention to other (already existing) barriers. It remains to be seen if this applies to the Estonian RES-T sector as well in the next years.

RES-T sector as well in the next years.

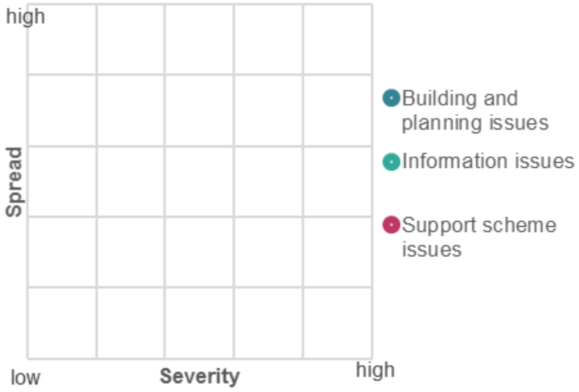


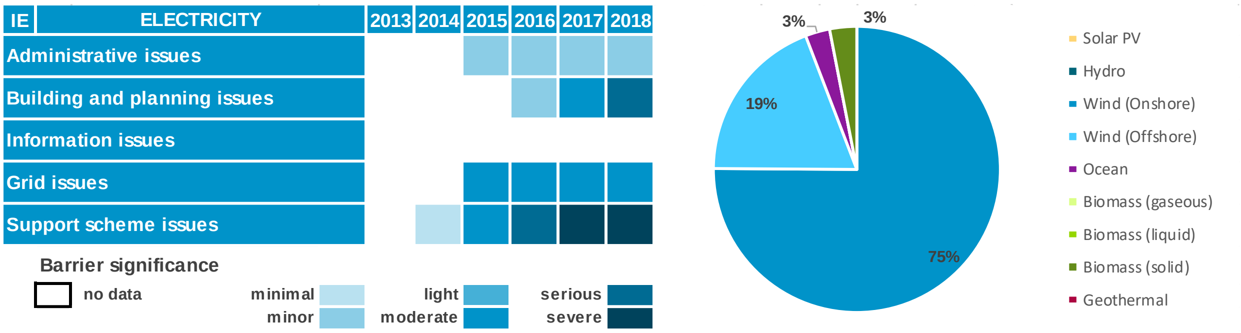
Chart 36. Average Severity and Spread per topic in the RES-T sector for 2018

Ireland

Table 36. Progress of Ireland on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		
	"One Stop Shop" ? (Art. 22(3)a)) ?	☒		
	Online application for permit?	☐		
	Maximum time limit for procedures?	☒		
	Automatic permission after deadline passed? (Art. 22(3)b))	☒		
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☑		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☒		Target model for electricity market induces spatial planning issues
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		Revision of Wind Development Planning Guidelines delayed
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Lengthy duration of grid access process for wind energy plants
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		High cost for RES-E access for wind energy
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		Lengthy delays of grid connection
	Priority of RES connection to the grid? (Art. 16 (1))	☑		Serious problems concerning the operation of the new electricity market
	Clear legal obligation for the system operator to reinforce the grid?	☐		Lack of District Heating Networks
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Low level of FiT support
				Prospective FiT calculation is problematic
				Uncertainty about the cost coverage of RES within the future target model
				Delays in the introduction of the new support scheme for RES
				Uncertainty about the future level of support for wind energy

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report



IE ELECTRICITY	2013	2014	2015	2016	2017	2018
Administrative issues			minor	minor	minor	minor
Building and planning issues				minor	moderate	serious
Information issues						
Grid issues			moderate	moderate	moderate	moderate
Support scheme issues		minimal	moderate	serious	severe	severe

Chart 38. Heat map of the barrier indices per topic in the RES-E sector in Ireland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Ireland is mainly hindered by major barriers dealing with support scheme, grid and building and planning issues. As visualised by the pie chart above, onshore and offshore wind are by far the most significant RES technologies for the achievement of the planned 2020 trajectory for the electricity sector in Ireland.

The dominant issues related to the support scheme in Ireland for RES-E over the analysed five years involve the delayed implementation of the target model for RES installations and the associated unclarity of cost coverage as well as the uncertainty of the future support level for wind projects, mainly offshore wind, through the introduction of technology-neutral tenders. Regarding building and planning issues, the new spatial planning requirements, introduced through the target model and the delayed revision of the Wind Development Planning Guidelines are perceived as challenges for the sector in 2018. For example, developers will be not be allowed to build wind installations in a distance of 1.5 to 2 km from other wind farms, thus decisively limiting suitable locations for the future. Finally, identified grid issues include the lengthy grid access procedure and the associated high costs. Here, the gate model, a group connection approach, allows a better grid development forecast for grid operators; however, it decisively lengthens the access period for installations. The heat map shows the importance of the above-mentioned issues. Especially, the support scheme and building and planning obstacles are lately perceived as more urgent. Grid issues have been reported since 2015, especially due to the gate model approach and the unclear connection process. However, it should be noted that a new connection procedure entered into force in March 2018. As caveats and flaws of the gate model approach rendered this grid connection model outdated, Ireland has introduced and updated its connection procedure. The so-called “Enduring Connection Procedure 1” (ECP-1), where grid connection is processed in “yearly batches” aims at accelerating grid connection for existing or new RES plants[245].

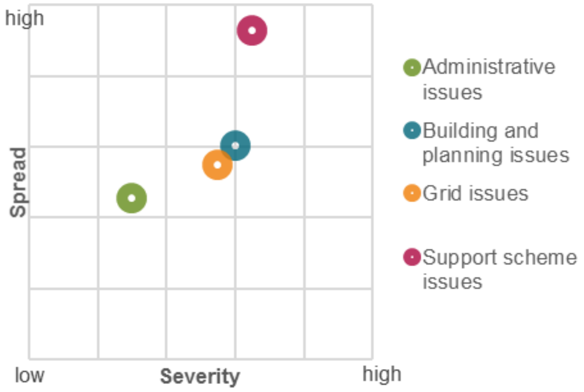


Chart 39. Average severity and spread per topic in the RES-E sector for 2018

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[245] https://www.cru.ie/wp-content/uploads/2017/04/CRU18058-ECP-1-decision-FINAL-27.03.2018.pdf

The scatter plot provides a snapshot of the severity and extent of Irish stakeholders' issues with RES-E in 2018. Support scheme issues reach a remarkable high spread value, i.e. affecting nearly all installations, while also seriously impacting on the individual development of the installation, when appearing.

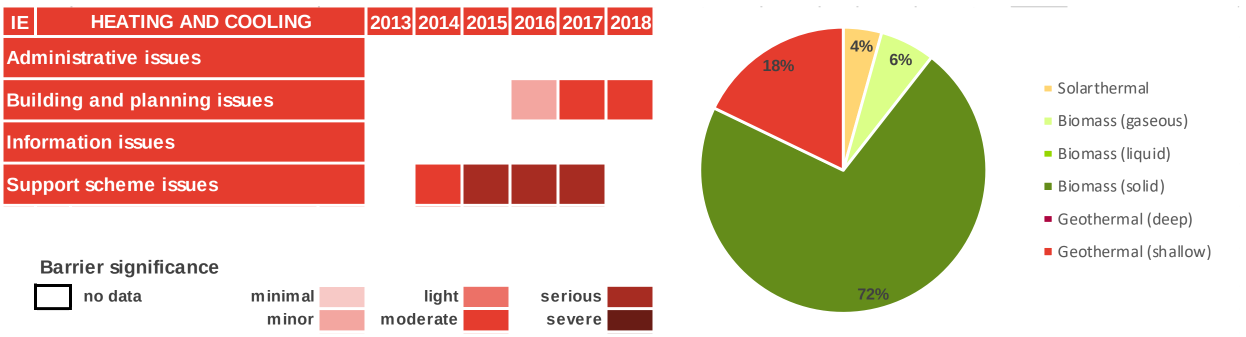


Chart 40. Heat map of the barrier indices per topic in the RES-H&C sector in Ireland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Ireland is characterised by moderate to serious barriers related to building and planning as well as support scheme issues. As visualised by the pie chart above, biodiesel as well as shallow geothermal are by far the most dominant RES technologies for the achievement of the planned 2020 trajectory for the H&C sector in Ireland.

The central barrier related to the building and planning framework in Ireland for RES-H&C over the analysed five years is the non or only poorly existing heating network. No comprehensive, nation-wide system is developed, but small networks are scattered over the MS. In addition, there is no political will to address the issue. This situation is reflected in the heat map, which indicates the growing issue of the missing district heating network over the last years.

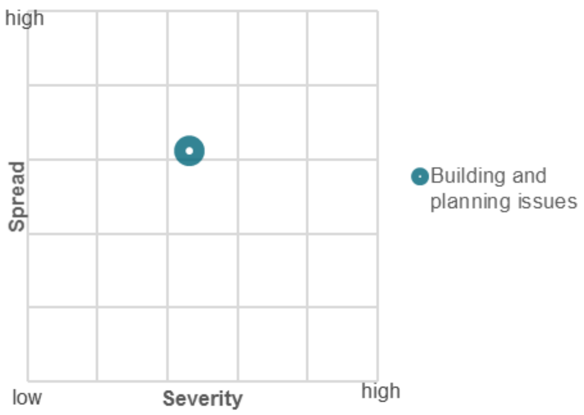


Chart 41. Average severity and spread per topic in the RES-H&C sector for 2018

Regarding the support scheme obstacles, the lack of a coherent and reliable support scheme for RES-H&C has seriously impacted on the sectoral development until 2017. Here, the heat map shows that the critical aspect of the missing support framework for H&C was of major concern; yet, the introduction of the “Support Scheme Renewable Heat” in 2017 addressed the barrier, which was not reported any more for 2018. The scatter plot provides a snapshot of the severity and extent of Irish stakeholders’ issues with RES-H&C in 2018. After the solving of the support scheme issue through the introduction of the “Support Scheme Renewable Heat”, the infrastructure challenges remain the central barrier for H&C. A dominant share of installations is concerned by the missing network, which seriously affects their development. A political commitment is required to address the matter.

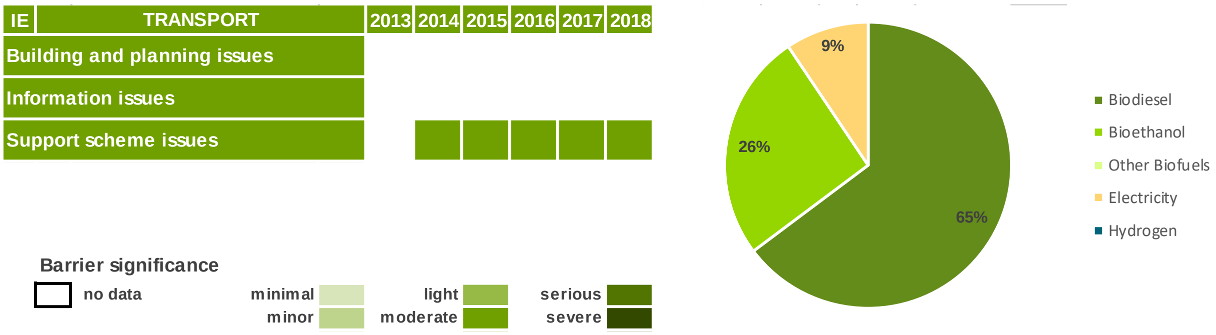


Chart 42. Heat map of the barrier indices per topic in the RES-T sector in Ireland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the RES-T sector in Ireland, progress is limited by issues related to the support scheme. As visualised by the pie chart above, biodiesel is the dominant RES technology for the achievement of the planned 2020 trajectory for the transport sector in Ireland, followed by bioethanol and e-mobility.

The main challenge for RES-T in Ireland over the last five years is the reliability of the support framework, as stakeholders perceive the quota system as unreliable and insufficient. Prior to 2011, a tax relief was operated, which had a positive impact on sectoral development. With the introduction of the quota system, the sector growth slowed down. Stakeholders blame the different number of certificates per RES-T technology and the yearly varying certificate price definition process as the two main factors.

The heat map visualises a general stagnation in the barrier indices regarding the support scheme issues, which mirrors the above-described situation.

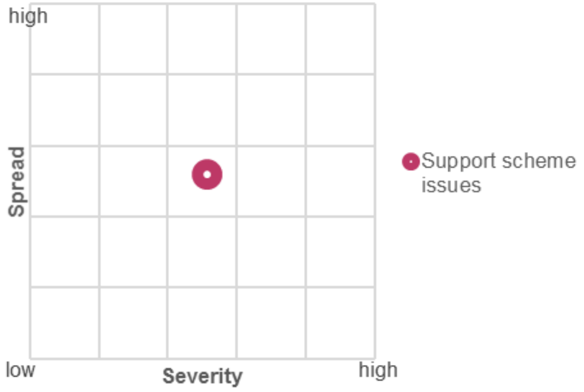


Chart 43. Average severity and spread per topic in the RES-T sector for 2018

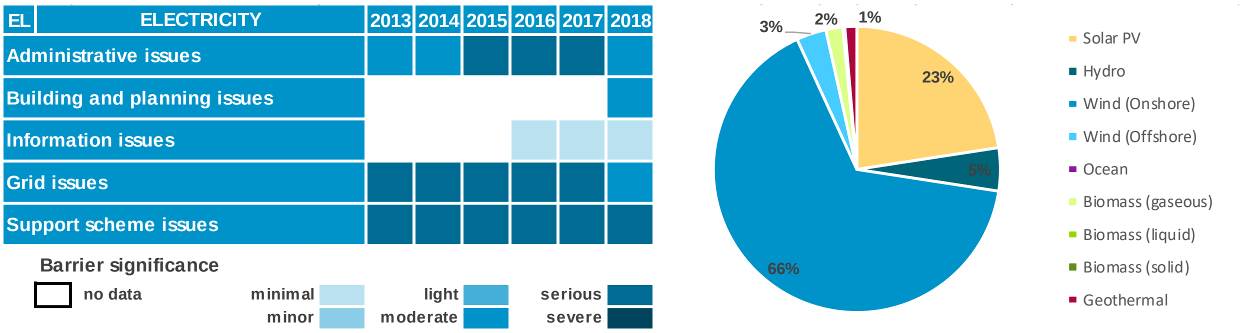
The scatter plot provides a snapshot of the severity and extent of Irish stakeholders' issues with RES-T in 2018. The support scheme remains the sole, central issue, covering other technical details, which might also exist. Yet, only a minor share of all installations is affected in 2018 and their development is only moderately hindered.

Greece

Table 37. Progress of Greece on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Issue of necessary licenses may need up to 5 months
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Lengthy administrative procedures for biomass/ biogas plants
	Online application for permit?	☐		Greek electricity market too complex for new entrants
	Maximum time limit for procedures?	☐		No equal treatment of RES among the regions
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☒	Only "grid congested"(in the report "saturated") regions are mentioned	**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑	District heating networks are eligible for support	Introduction of stricter guidelines amending the spatial planning framework may hinder the development of RES
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	Only the legal sources are mentioned	Lack of spatial planning taking into consideration the potential of the RES-H&C
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Lack of reliable information sources on available biomass feedstock
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Low prospects for biomethane deployment due to strong focus on natural gas
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Lack of internal coordination within the Hellenic Distribution Network Operator (HEDNO) leads to delays in the grid connection of PV plants
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☒		Grid congestion in certain areas due to lacking interconnections
	Priority of RES connection to the grid? (Art. 16 (1))	☐		High grid connection costs in areas with congested grid
	Clear legal obligation for the system operator to reinforce the grid?	☐		Congested grid for biomass/ biogas plants
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☑		Winners of the 2016 pilot have not yet received their Feed- In Premium
				Concerns regarding the future sustainability of the Special Account of RES
				Anxiety over the success of the new support scheme
				Lack of national long-term energy planning
				Uncertainty regarding the operation of short term markets for RES-E makes financing of new projects very difficult

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**



ELECTRICITY	2013	2014	2015	2016	2017	2018
Administrative issues	moderate	moderate	serious	serious	serious	moderate
Building and planning issues	no data	no data	no data	no data	no data	moderate
Information issues	no data	no data	no data	minimal	minimal	minimal
Grid issues	serious	serious	serious	serious	serious	moderate
Support scheme issues	serious	serious	serious	serious	serious	serious

Chart 44. Heat map of the barrier indices per topic in the RES-E sector in Greece 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Greece is mainly hindered by serious and moderate barriers related to support scheme, administrative, grid and building and planning issues. As visualised by the pie chart above, onshore wind and solar power are the most significant RES technologies for the achievement of the planned 2020 trajectory in the Greek electricity sector.

The dominant issue regarding the support schemes for RES-E over the analysed six years has been the lack of a long-term energy planning, which has harmed investment security since 2012. However, it should be noted that Greece has published a draft of its “National Energy and Climate Plan” in November 2018, where many stakeholders have responded to the public consultation[246]. Thus, it remains to be seen whether this will mitigate the issue of lacking planning. The current biggest concern for RES investors is the unclarity about the future funding of the Special Account for RES, which allocates the RES support to the project owners. In fact, the electricity supplier’s fee, imposed on all electricity retailers and representing a considerable input for the Special Account for RES, shall be gradually abolished by 2020. In addition, lawsuits against the Greek Electricity Market Operator (LAGIE) are currently ongoing and the final court decision may influence negatively the Account’s viability in the short and long term. Regarding grid issues, RES projects have to deal with high grid connection costs, a lack of transparency in the connection process as well congested grids lengthening the grid connection procedure. Administrative procedures are still impeded by long waiting periods for specific licenses such as the electricity generation license. Moreover, the building and planning processes are affected by conflicts between RES-E projects and environmental concerns. The heat map indicates stagnant support scheme issues at a relatively high level. The underlying barriers have changed in the past years but old problematic barriers were replaced by new ones. The decrease of administrative and grid related barriers results from improvements which have reduced the impact of the respective barriers. The scatter plot provides a snapshot of the severity and extent of Greek stakeholders’ issues with RES-E in 2018. Support scheme issues are most widespread but they do not practically prevent new istallations completely. Grid issues, on the other hand, are less widespread but are perceived as problematic when they occur.

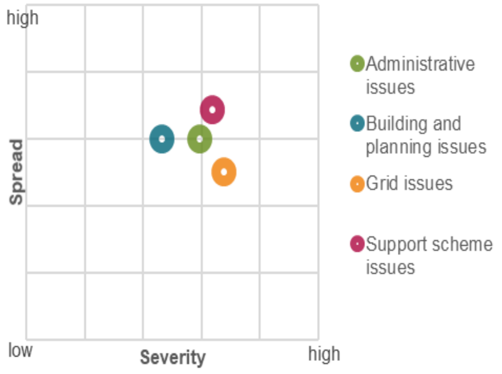


Chart 45. Average severity and spread per topic in the RES-E sector for 2018

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[246] http://www.opengov.gr/minenv/?p=9704

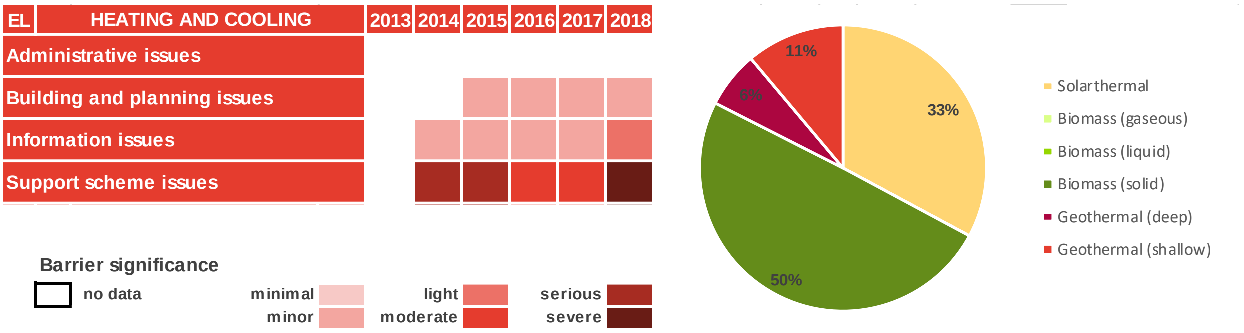


Chart 47. Heat map of the barrier indices per topic in the RES-H&C sector in Greece 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Greece is characterised by important barriers related to support scheme issues and minor building and planning and information issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Greek H&C sector, followed by solar thermal, and geothermal (shallow and deep).

Central RES-H&C barriers related to the Greek support scheme during the six years analysed involve the lack of a comprehensive relevant support scheme. There is currently only a limited amount of support for biomass provided through the Investment law, which is addressing only a limited number of interested investors. Also due to this, potential investors only have a limited access to financing. Geothermal and solar thermal installations suffer from the lack of support schemes as well. Information issues are twofold: First, public perception may suffer from the lack of professionalism by some installers. Second, the lack of communication between suppliers of different technologies is even more problematic, since it prevents the beneficial combination of technologies. In this regard, there is also a lack of communication in the biomass sector on available feedstocks, which obstructs a comprehensive and holistic evaluation of the Greek feedstock potential, let alone its identification. This barrier leads to building and planning issues as well, since land planning does not take into consideration the biomass potential.

The heat map shows that information and support scheme issues have deteriorated over the past years. Support scheme issues have become more problematic, as the impact of a lacking support schemes is becoming increasingly clear. The scatter plot provides a snapshot of the severity and extent of Greek stakeholders' issues with RES-H&C in 2018. The above outlined support scheme issues (i.e. the lack of effective support schemes) are dominant obstacles for a large share of installations and make investments very difficult. Information issues also impact a sizeable number of installations, albeit with less severity.

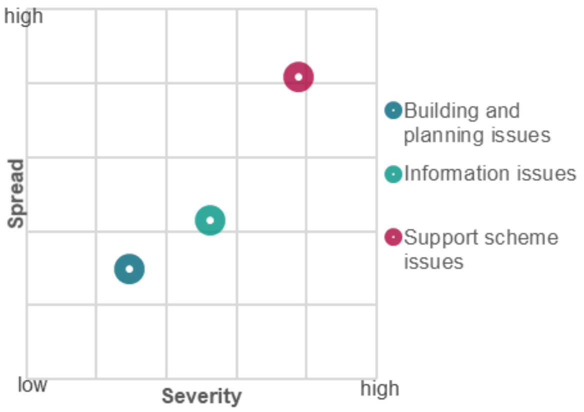


Chart 46.Average severity and spread per topic in the RES-H&C sector for 2018

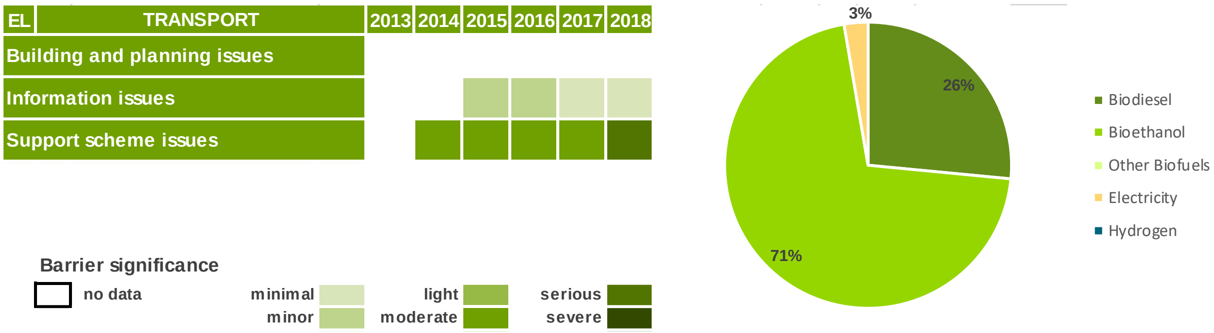


Chart 48. Heat map of the barrier indices per topic in the RES-T sector in Greece 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Greek RES-T sector, development is only slightly hindered by support scheme and information issues. As visualised by the pie chart above, bioethanol and biodiesel are the two dominant RES technologies for the achievement of the planned 2020 trajectory in the Greek transport sector.

The main challenges for RES-T in Greece over the last six years involve the lack of a long-term energy roadmap and the lack of information on the biomass potential for biofuels. The market structure of many dispersed small farmers that are the main producers for biofuels brings unnecessary constraints concerning the quota distribution. The lack of coordination delays the yearly quota distribution and this delay creates problems with the planning of future biofuel production, especially for investors and interested producers. This lack of predictability of the quota scheme prevents the market entry of new actors. A stronger coordination between stakeholders could be very beneficial for a solution of this barrier complex.

The heat map visualises a gradual deterioration of barriers regarding support scheme issues. This can be explained by the stronger perception of stakeholders of the existing barriers, due to their lack of improvement over time.

The scatter plot provides a snapshot of the severity and extent of Greek stakeholders’ issues with RES-T in 2018. It shows that support scheme issues affect stakeholders in a moderate to serious way. Information issues, on the other hand, affect only a limited number of stakeholders and that also only to a limited degree of severity.

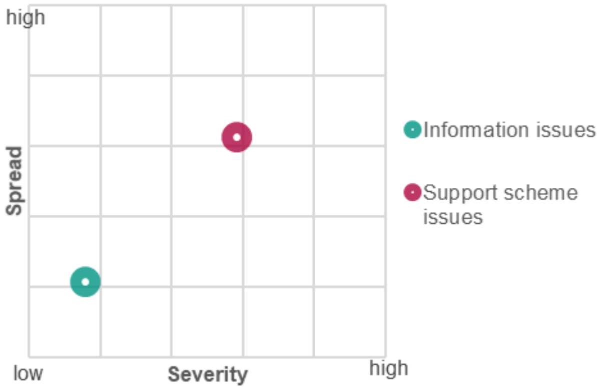


Chart 49. Average severity and spread per topic in the RES-T sector for 2018

Spain

Table 38. Progress of Spain on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Long enviromental impact assessment (EIA) previous to authorization
	“One Stop Shop” ? (Art. 22(3)a)) ?	☐		Lack of regulation for immature technologies
	Online application for permit?	☐		Complexity of administrative procedures
	Maximum time limit for procedures?	☐		Lack of regulation for shared self-consumption projects
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		Delays in administrative procedures for grid connection
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	⌛		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Non-existing strategy for RES-HC
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Lack of demand for solar thermal installations due to economic downturn & crisis in the housing sector
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Misinformation on the role of RES in the imbalance between the electricity system’s regulated costs and revenues
				Lack of transparency and coordination between stakeholders
				Lack of transparency and neutrality in the energy audits
				Lack of awareness towards RES-HC technologies
				Lack of quantitative data on the installed capacities for RES-HC installations
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Restriction of priority access and dispatch for RES-E
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		High connection costs
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Lack of grid infrastructure
	Priority of RES connection to the grid? (Art. 16 (1))	☐		Lack of interconnection capacities with EU transmission grid and (strong) delay in their build up
	Clear legal obligation for the system operator to reinforce the grid?	☑	Yes, according to Decision 2009/548/CE.	Heterogeneity of DSO technical requirements complicates project development
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☐		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Deep review of the support scheme introduces uncertainty
				Excessive and unfair tax regime
				Lack of promotion programmes and bad functioning of the (few) existing ones
				First wind and biomass tenders ever launched in Spain with a low realization rate
				Insufficient targets for biofuels in the transport sector

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

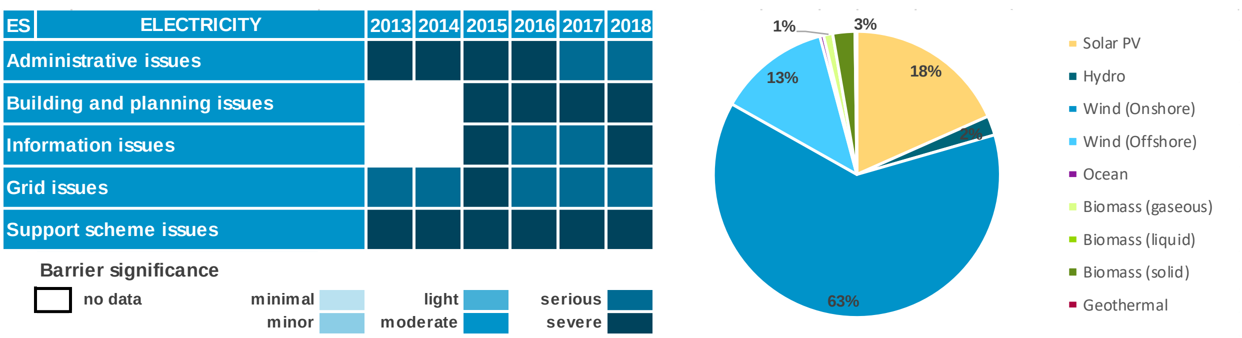


Chart 51. Heat map of the barrier indices per topic in the RES-E sector in Spain 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Spain is mainly hindered by significant barriers related to all five barrier topics. As visualised by the pie chart above, onshore wind is by far the most significant RES technology for the achievement of the planned 2020 trajectory in the Spanish electricity sector, followed by solar PV and offshore wind.

The dominant issues related to the support scheme in Spain for RES-E involve the abolishment of the FIT support framework in 2014 as well as the inadequate design of the tender scheme, introduced in 2016. The abolishment of the “Special Regime” for RES in 2014 through royal decree 413/2014 and the inherent retroactive measures have substantially distorted the Spanish RES market. In addition, the first tender round for wind and biomass projects introduced in 2016 was heavily criticised since projects that won the competitive auction have set the price to 0 €ct/kWh. Furthermore, the tender lacked a pre-qualification stage, which is considered essential to determine the financial and technical viability of a project. In the absence of pre-qualification criteria and a price set to zero, there is no guarantee that developers will be able to deliver all the projects. In contrast, the bidding round in 2017 resulted in high allocated capacities for solar and wind energy, which is a promising development considering the situation in previous years. Moreover, the royal decree 15/2018 includes some measures to ensure that projects will be implemented, i.e. the increase of the guarantees that RES projects developers have to pay to obtain access to the transmission grid (40 €/kW installed, instead of the former 10 €/kW installed) and obligation for the project developer to prove progress in the implementation of the project at different stages. Regarding building and planning issues, long environment impact assessment procedures, involving a high number of authorities and lengthening the overall administrative process by several months or even years, are seriously limiting the sectors growth.

As far as administrative issues are concerned, procedures are generally perceived as too complex, too long and not harmonised between the different regions. Finally, the existing restriction for RES in terms of priority dispatch has been the central grid issue in the MS over the past years. To this end, RES-E is only dispatched with priority to the grid, in times when the produced electricity from RES is offered at a price equal or inferior to the electricity price offered from conventional sources.

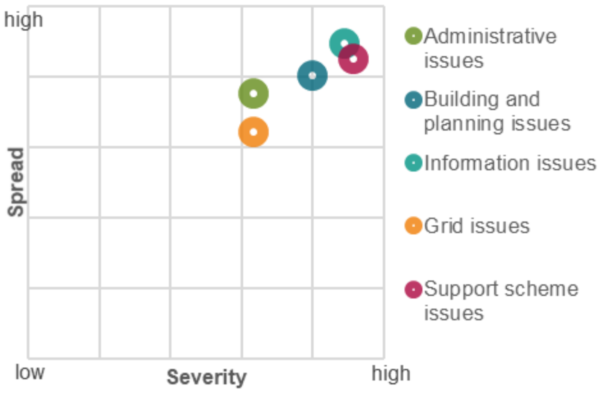


Chart 50. Average severity and spread per topic in the RES-E sector for 2018

The heat map indicates an overall stagnation at very high level in the barrier indices regarding the five barrier topics. Since the extreme market intervention in 2014, the Spanish RES market is highly distorted and has not gained its original stability. A long-term vision and strategy appear to be missing, which decisively limits the further sectoral growth. The scatter plot provides a snapshot of the gravity and extent of the Spanish stakeholders' issues with RES-E in 2018 and mirrors the above findings, with high severity values, affecting several RES-E installations and making a project development very difficult, respectively resulting in extreme delays and extra costs for the realisation of installations.

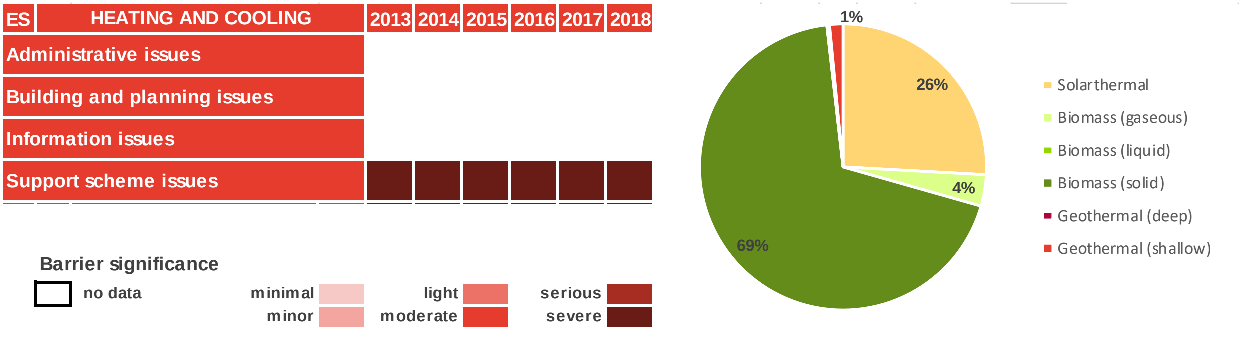


Chart 52. Heat map of the barrier indices per topic in the RES-H&C sector in Spain 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Spain is characterised by major barriers related to support scheme issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Spanish H&C sector, followed by solar thermal and gaseous biomass.

The central RES-H&C barrier related to the Spanish support scheme during the analysed six years is the lack of a comprehensive promotional programme for RES-H&C, respectively the bad functioning of existing ones. In addition, stakeholders flagged the lack of demand for solar thermal applications from the housing sector due to the past financial crisis and the downturn of the housing market. The recovery of the housing sector in 2018 has still did not have an effect on solar thermal developments.

The heat map indicates the stagnation at very high level of barrier indices for the support scheme issues. In absence of a long-term promotional framework, stimulating the development of RES-H&C, any other issue is perceived as being of secondary importance. In the H&C sector, there seems to be a lack of vision and strategy for further RES development. With the approaching horizon of 2020, stakeholders are even more urgently flagging the issue, as time for action is becoming shorter and shorter.

The scatter plot provides a snapshot of the severity and extent of Spanish stakeholders' issues with RES-H&C in 2018. It perfectly reflects the above-described situation, which already existed during the last years. The absence of a comprehensive support scheme for RES-H&C is the sole, but very dominant issue, affecting nearly all RES-H&C installations and heavily hindering project realisation, leading to substantial delays and extra costs.

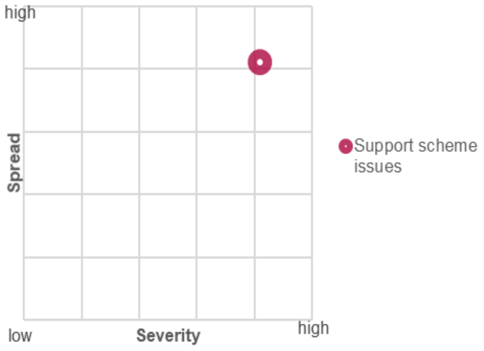
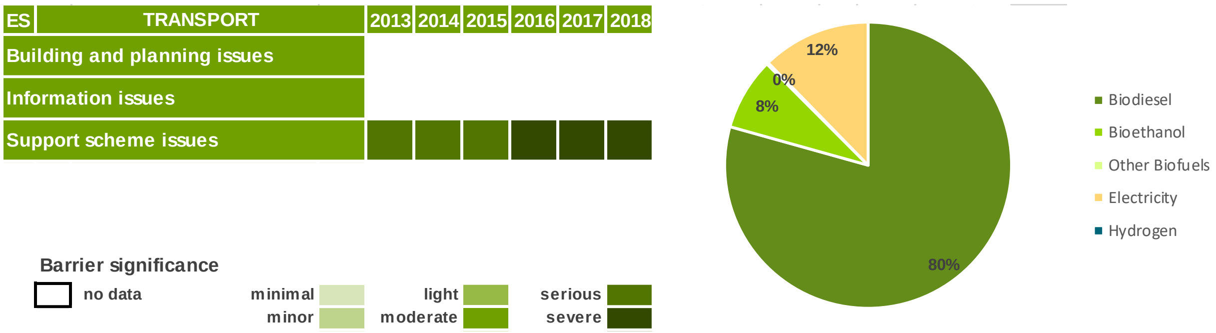


Chart 53. Average severity and spread per topic in the RES-H&C sector for 2018



ES	TRANSPORT	2013	2014	2015	2016	2017	2018
Building and planning issues							
Information issues							
Support scheme issues		▨	▨	▨	■	■	■

Chart 54. Heat map of the barrier indices per topic in the RES-T sector in Spain 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Spanish RES-T sector, development is seriously limited by issues related to the support schemes. As visualised by the pie chart above, biodiesel as well as electricity are the two dominant RES technologies for the achievement of the planned 2020 trajectory in the Spanish transport sector.

The main challenges for RES-T in Spain over the last six years involved the lack of a comprehensive RES-T strategy, the lowering of biofuel quotas during the last years as well as the missing long-term stimulation of individual e-mobility. Regarding the biofuel quotas, the Spanish government reduced the original quota obligations for the different biofuel sources. To this end, the quota for biofuels was reduced from 6.5% to 4.1%, the biodiesel one from 7% to 4.1% and the quota for ethanol from 4.1% to 3.9%. This reduction has led to much lower market attractiveness for developers and investors. Additionally, lobby groups advocate against third generation biofuels, even though the majority of RES-T market actors is already producing these fuels. Finally, stakeholders flagged the missing long-term strategy for e-mobility. However, Spain is currently preparing the Integrated National Plan for Energy and Climate 2021- 2030 (PNIEC) where ambitious e-mob ility objectives for 2030 have been announced.

The heat map visualises a gradual increase in the barrier indices regarding support scheme issues. As for the RES-E and RES-H&C sectors, a vision for RES-T is lacking, which impacts decisively on the sectoral development.

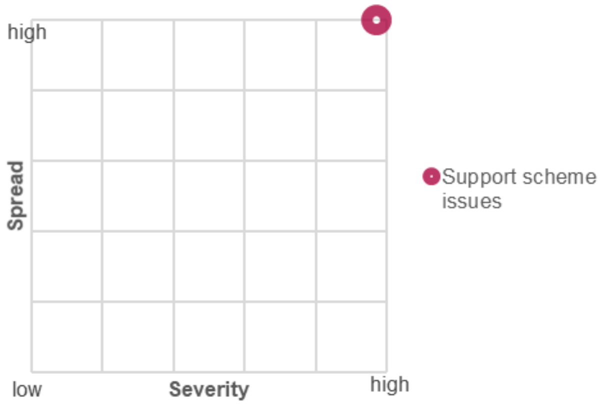


Chart 55. Average severity and spread per topic in the RES-T sector for 2018

The scatter plot provides a snapshot of the severity and extent of Spanish stakeholders' issues with RES-T in 2018. The value is reaching the maximum level in both aspects, meaning that all RES-T installations are affected and the development of projects is almost impossible or can only be realised with substantial delays and extra costs.

France

Table 39. Progress of France on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Lengthy administrative procedures
	"One Stop Shop" ? (Art. 22(3)a)) ?	☑		Numerous restrictions due to aviation and military safety requirements
	Online application for permit?	☑	PR only mentions an e-platform for the submission of tender proposals.	Too many appeals are dissuasive for wind energy developers
	Maximum time limit for procedures?	☐		Mandatory modification of the local land use plan prior to the implementation of ground-mounted PV systems
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		Complexity of administrative procedure for the Heat Fund
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☑	The Town Planning Code contains provisions on the installation of onshore wind plants in coastal areas.	**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Geographical restrictions of the Regional Wind Plans hinder project development
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	The use of RES is mandatory only in the residential sector through the RT 2012. The mandatory use of RES in other buildings is in planning.	
	Obligation to use RES in public buildings? (Art. 13 (5))	⌛	Renovation of state and local authority buildings is ongoing until 2020.	
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑	Grid connection of power plants is mandatory without any discrimination.	Deadline for grid connection of rooftop PV systems is too short
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑	TSO establishes regional RES grid connection plans with the DSOs.	Long waiting periods for the procurement of grid connection permits
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		Technical and financial constraints during grid connection procedure
	Priority of RES connection to the grid? (Art. 16 (1))	☒	Electricity producers have a guaranteed grid access. RES enjoy no prority.	Shortcomings of the regional grid connection plans for renewable energies
	Clear legal obligation for the system operator to reinforce the grid?	☑		Absence of transparency regarding grid operators
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑	RES grid connection plans specify how the costs of elec. works are shared among producers.	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☒	Grid reinforcement works financed by system operators, works from the production plant up to the connection point financed by producers.	
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Strong lobbying of conventional power producers
				Degressive revision of the feed-in tariff for PV on buildings
				Lack of stability and visibility of the support policy
				Shortcomings in the design of existing support schemes
				Rivalry between solar thermal energy and other energy efficiency measures

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

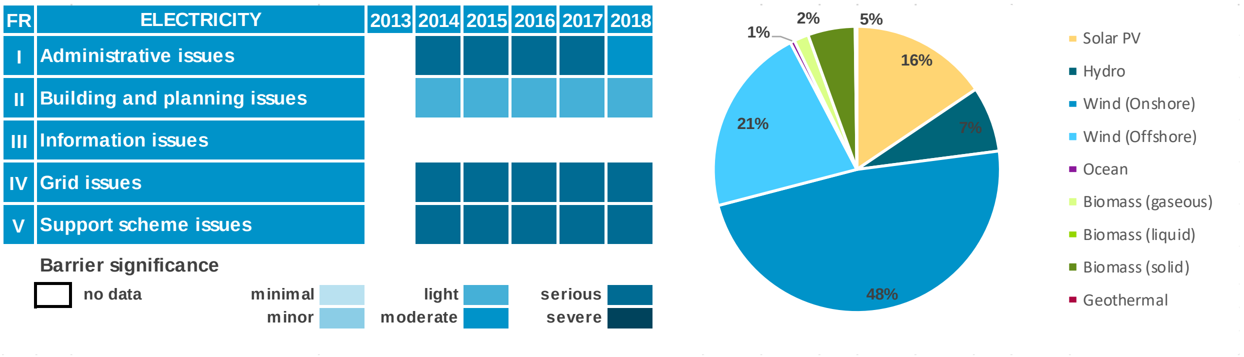


Chart 56. Heat map of the barrier indices per topic in the RES-E sector in France 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in France is mainly hindered by serious barriers related to support schemes as well as grid issues. As visualised by the pie chart above, on- and offshore wind power are by far the most significant RES technologies for the achievement of the planned 2020 trajectory in the French electricity sector.

The dominant issues related to the support scheme in France for RES-E over the analysed five years involved the lacking political will for effective RES support schemes. This is due to the French government's large share in the major energy utility EDF, which is strongly focused on the nuclear sector and only partly on RES technologies. Nevertheless, improvements can be seen in the legislation of PV, where a FIT is also available for rooftop PV other than building-integrated ones since 2017. With regards to the grid, a major challenge is the uncertain legal definition determining which grid development costs shall be borne by the grid operator and which ones by the producer. This has led to a situation where RES producers are charged for a large part of the grid development costs, effectively hindering many RES projects. As the support scheme and grid issues are related to structural problems of the French energy sector, a major unbundling of the French government with the energy utility and grid operators is necessary to remove these issues.

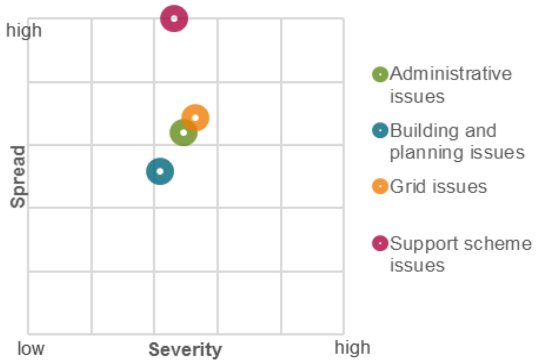
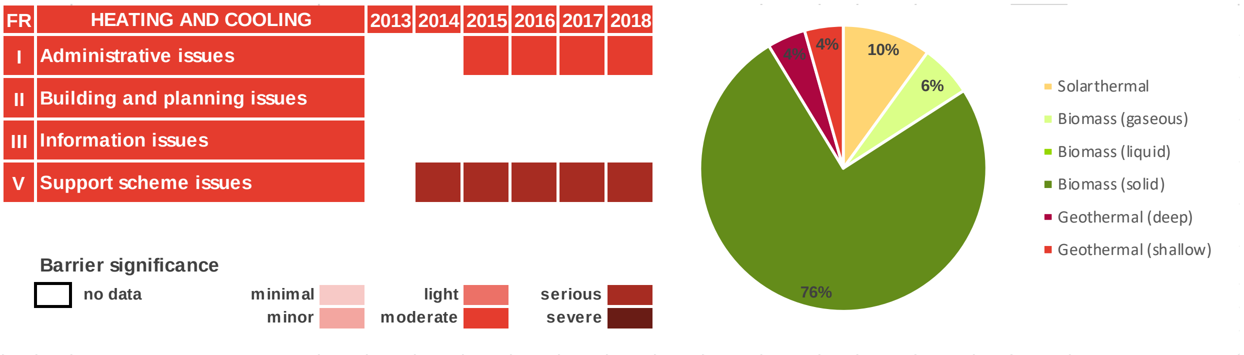


Chart 57. Average severity and spread per topic in the RES-E sector for 2018

The heat map indicates an overall stagnation in the barrier indices, except from the slight improvement regarding administrative issues. This is a result of the newly introduced limits for examination processes and simplified permit procedures, which for example combine building permits and ICPE authorisation for wind power installations.

The scatter plot provides a snapshot of the severity and extent of French stakeholders' issues with RES-E in 2018. Support schemes are ranked as the isssue affecting most technologies, whereas grid issues have the strongest hindering potential, although not affecting all installations. In fact, RES projects far from connection points have to bear relatively high costs for grid development, increasing upfront realisation costs. Poorly designed and ineffective support schemes affect all technologies and can be explained by lobbying activities in the legislative field impeding a large RES expansion.



FR	HEATING AND COOLING	2013	2014	2015	2016	2017	2018
I	Administrative issues			🟥	🟥	🟥	🟥
II	Building and planning issues						
III	Information issues						
V	Support scheme issues		🟫	🟫	🟫	🟫	🟫

Chart 58. Heat map of the barrier indices per topic in the RES-H&C sector in France 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in France is characterised by serious barriers related to support schemes and moderate barriers related to administrative issues. No barriers were reported by stakeholders regarding building and planning as well as information issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the French H&C sector, followed by only marginal shares for solar thermal energy, geothermal energy and liquid biomass.

Central RES-H&C barriers related to the French support schemes during the five years analysed, are the lack of stability and visibility of major support programmes like the Heat Fund. In this regard, the downwards tendency of the Heat Fund is confirmed by the significant cut in support volume from 2018 onwards. This reduces planning security for project developers. The Fund might get an increase in funding in 2019, pending budget approval. Further shortcomings of the support schemes are the focus on large projects and the existence of uniform energy efficiency requirements regardless of the technology type. In addition, the high cost of RES-H&C devices combined with the lack of adequate support results in households settling on refurbishment measures instead of installing RES-H&C systems, since they do not have the budget to do both. In terms of administrative barriers, the complexity of application procedures is a major factor hindering potential projects. These includes requirements for project size, type of project developer, maximum investment constraints, compliance with community rules and the price spread between heat produced from RES as compared to conventional energy sources.

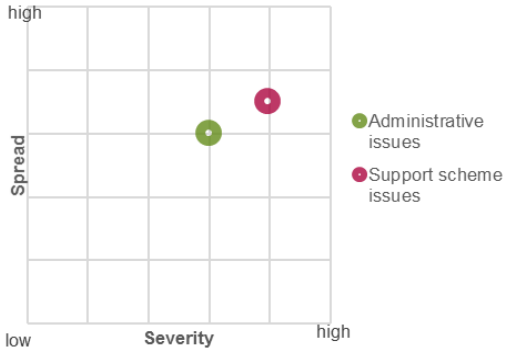
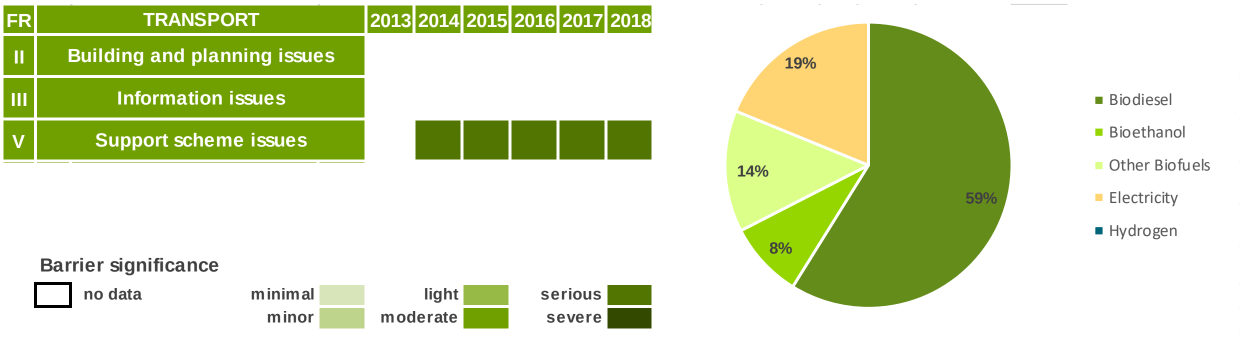


Chart 59. Average severity and spread per topic in the RES-H&C sector for 2018

The heat map shows a stagnation of barrier indices for administrative and support scheme issues, with a constant significance at a moderate and serious level, respectively. The annual definition of the major support scheme, the Heat Fund, poses a constant insecurity to the long-term prospect of the support programme. Also, no simplifications of the complex support requirements have been undertaken over the years.

The scatter plot provides a snapshot of the severity and extent of French stakeholders' issues with RES-H&C in 2018. Here, support schemes are considered both more important and widespread then administrative issues.



FR	TRANSPORT	2013	2014	2015	2016	2017	2018
II	Building and planning issues						
III	Information issues						
V	Support scheme issues		🟩	🟩	🟩	🟩	🟩

Chart 60. Heat map of the barrier indices per topic in the RES-T sector in France 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the French RES-T sector, progress is hindered by issues related to the support schemes. As visualised by the pie chart above, biodiesel is by far the most dominant technology planned for the achievement of the planned 2020 trajectory in the French transport sector. To a lesser extent, electricity and other biofuels are also considered in the trajectories.

The main challenges for RES-T in France over the last five years involved the lack of regulatory stability and visibility of support policies in the long term. In fact, while the production of biofuels was originally vigorously encouraged, current debates rather discuss their limitation. This lack of visibility is all the more critical since investors of first generation biofuels are the same as those of second generation biofuels, and the means of production for the first generation have not yet been amortised. Investors who had bad experiences from the unstable support policy for first generation biofuels may be more reluctant to invest in the second generation fuels. Furthermore, the freeze of the biodiesel share in conventional diesel at 7% has been hindering the overall deployment of RES technologies in the transport sector.

The heat map visualises the barrier severity regarding support scheme issues, with a level remaining constant during the five years analysed. No major change has been noted over the time period with regard to the blending quotas.

The scatter plot provides a snapshot of the severity and extent of French stakeholders' issues with RES-T in 2018. The support scheme remains the sole, central issue, seriously limiting the growth potential of the sector and affecting the very dominant share of RES-T installations. This affects a large share of renewable technology types, while showing a relatively high severity.

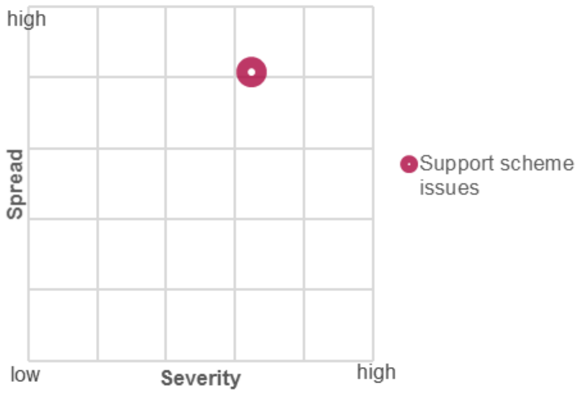


Chart 61. Average severity and spread per topic in the RES-T sector for 2018

Croatia

Table 40. Progress of Croatia on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		Poor implementation of administrative procedures for RES-E due to the lack of know-how
	“One Stop Shop” ? (Art. 22(3)a)) ?	☒		Expensive and insufficiently transparent costs of administrative procedures
	Online application for permit?	☐		Complex and poorly executed administrative procedures for RES-HC
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☒		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑	Refers mostly to the simplified administrative procedures for roof-top solar PV	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☒		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Suitable locations for RES-E projects poorly integrated into spatial and environmental planning
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Lack of reliable and uniform data on RES-E potential, particularly for small hydropower
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Narrow and often negative public discourse towards RES-E
				Insufficient communication between social partners, stakeholders and the government
				Lack of awareness among farmers and municipal waste companies for using biodegradable waste for biogas production
				Negative public perception about district heating
Grid issues	Grid usage fee?	☒		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Deep approach to grid connection costs
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Insufficiently transparent and enforceable grid development plans
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Lack of district heating infrastructure
	Priority of RES connection to the grid? (Art. 16 (1))	☐		Non-transparent grid connection costs
	Clear legal obligation for the system operator to reinforce the grid?	☑		Lack of support for the injection of biomethane into the grid
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☒		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☒		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☑		Retroactively introduced balancing costs
				Frequent policy changes and lack of transparent long-term goals
				Slow adoption of necessary by-laws
				No permanent support scheme for hybrid and electric cars
				Missing national support scheme for RES-H&C

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

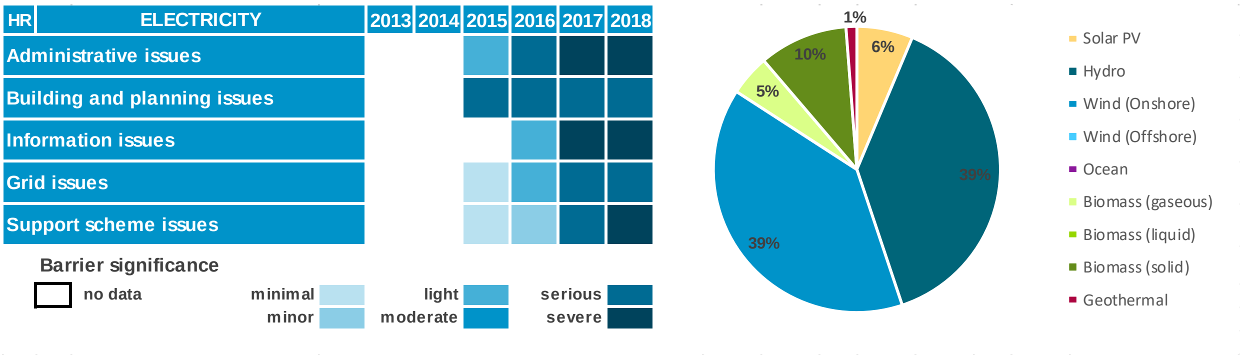


Chart 62. Heat map of the barrier indices per topic in the RES-E sector in Croatia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Croatia is mainly hindered by important barriers in all five5 barrier topics. As visualised by the pie chart above, hydro power and onshore wind are by far the most significant RES technologies for the achievement of the planned 2020 trajectory in the Croatian electricity sector.

The dominant issue related to the support scheme in Croatia for RES-E involves the uncertain situation regarding the new support scheme. In 2016, the new RES Act entered into force, providing a general framework; yet, requiring for precising by-laws. Most of the by-laws have still not been enacted, making the RES Act non-enforceable. At the end of December 2018, the first by-law was enacted and the RES Act was changed specifying the new deadline of six months for adopting the remaining by-laws. Regarding information issues, the insufficient communication between the government and the market stakeholders is a persistent obstacle. Generally, stakeholders flagged the often detected top down ad hoc manner of government decisions, without consultation or cooperation with competent markets stakeholders. As far as administrative obstacles are concerned, the high and often intransparent costs of the administrative procedure were flagged, caused by a high number of required permits and high costs related to the environmental impact studies, particularly for small hydro installations. In addition, procedures are perceived as being overly complex, without a one-stop-shop or an online application procedure in place. Concerning the identified building and planning issues, the poor identification and inclusion of favourable RES locations in the spatial panning is perceived as a major roadblock for the sectoral development. Finally, regarding grid issues, stakeholders pointed out the deep cost approach for grid connection, causing at times substantial additional costs for developers, particularly regarding grid reinforcements to allow for further connections, affecting especially smaller RES projects.

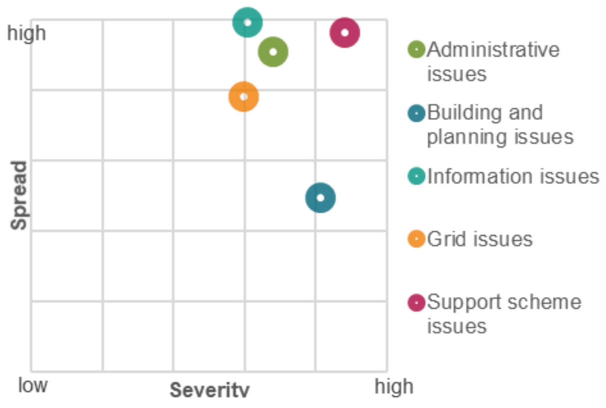


Chart 63. Average severity and spread per topic in the RES-E sector for 2018

The heat map indicates a relative stagnation at very high level and for some topics even an increase to the highest level of barrier indices over the past couple of years, highlighting the urgency of the issues mentioned above.

The scatter plot provides a snapshot of the severityand extent of Croatian stakeholders' issues with RES-E in 2018 and mirrors the above flagged issues in an outstandingly high severity and spread level for nearly all topics.

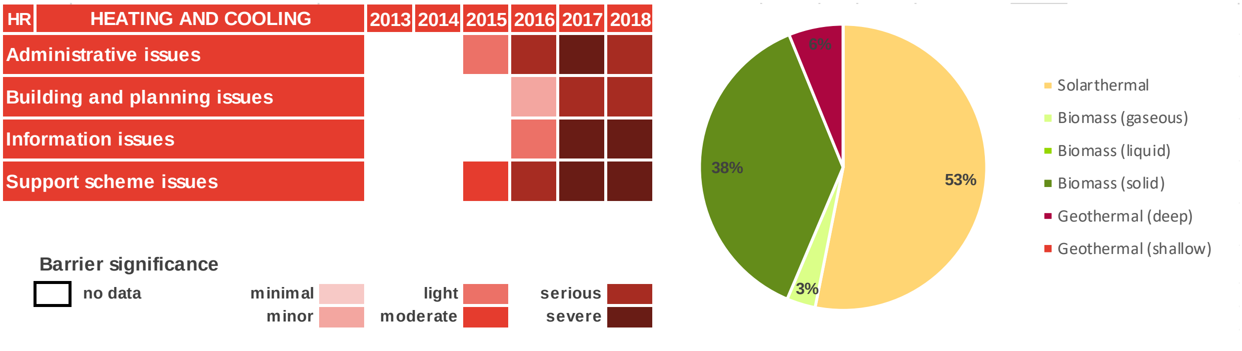


Chart 64. Heat map of the barrier indices per topic in the RES-H&C sector in Croatia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Croatia is characterised by significant barriers related to all four barrier topics. As visualised by the pie chart above, solar thermal is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Croatian H&C sector, followed by solid biomass and deep geothermal.

The central RES-H&C barrier related to the Croatian support scheme is the missing support framework for renewable H&C installations. Even though the NREAP of 2013 foresees for the implementation of a dedicated support scheme, the actual adoption has not happened yet. Regarding information issues, the insufficient communication between the government and market stakeholders, as already highlighted for the electricity sector, is also a major concern in the H&C sector. The identified administrative issues involve the overly complex and numerous administrative procedures and permits required for CHP installations. Information is often not publicly available and a one-stop-shop or an online application process is not in place. As far as building and planning issues are concerned, the lack of district heating infrastructure has been highlighted as a central obstacle for sectoral growth as well as the fact that wood is still a primary heating source of private households, limiting the demand for central solutions. The heat map indicates a relative stagnation of barrier indices for the different topics. This is the result of the missing strategy for a comprehensive application of RES in the H&C sector, manifested inter alia by the barriers mentioned above.

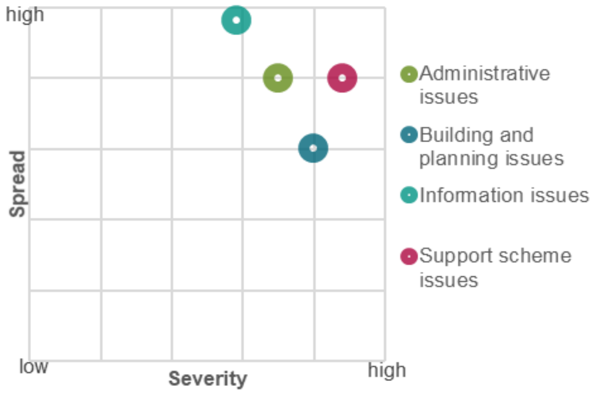


Chart 65. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severity and extent of Croatian stakeholders' issues with RES-H&C in 2018. The insufficient communication between the government and market staholders is affecting nearly all installations and limits their development decisively. The missing support scheme is even more significant, thus impacting the sectoral development and making a realisation of H&C projects almost impossible. Also the administrative and building and planning issues are causing substantial project delays and additional costs and affect a dominant share of installations.

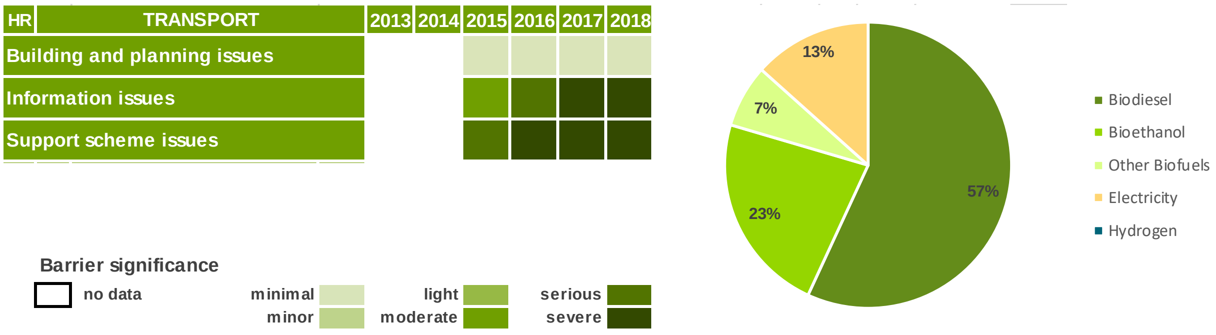


Chart 66. Heat map of the barrier indices per topic in the RES-T sector in Croatia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Croatian RES-T sector, development is limited by major issues related to the support schemes and the information exchange. As visualised by the pie chart above, biodiesel as well as bioethanol are the two dominant RES technologies for the achievement of the planned 2020 trajectory in the Croatian transport sector.

The main challenges for RES-T in Croatia over the last four years affecting support schemes involve the lack of a legal framework for advanced biofuels and the instability of existing promotional schemes. In this regard, the discussion on a framework for advanced biofuels is ongoing since 2016 with no clear perspective on finalisation yet. In the absence of a scheme for advanced fuels, a support framework for diesel and gasoline was introduced; yet without an effective control or targets and concrete implementation of foreseen measures. For individual e-mobility a support scheme in the form of purchase incentives was introduced in 2014 but it was not provided every year reflecting high policy instability. After being absent for two years, the purchase incentives for electric and hybrid vehicles were re-launched in 2018. E-mobility shall contribute 13% to the in the NREAP foreseen RES-T development towards 2020. As far as information issues are concerned, the insufficient communication between the government and market stakeholders is a central concern in the RES-T sector as well.

The heat map visualises a relative stagnation of the barrier indices, with high levels in the barrier indices regarding the support scheme and information issues. The growing concern of market stakeholders, mainly rooted in the approaching 2020 horizon, leads to an even higher perceived urgency for actions. Generally, also in the RES-T sector, a comprehensive strategy for RES appears to be missing.

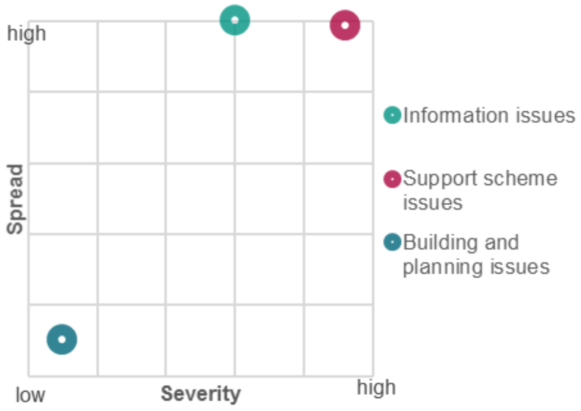


Chart 67. Average severity and spread per topic in the RES-T sector for 2018

The scatter plot provides a snapshot of the severity and extent of Croatian stakeholders' issues with RES-T in 2018 and reflects the before mentioned aspects. Both support scheme as well as information issues are affecting all RES-T technologies. The information issues are further aggravating the situation and are leading to substantial delays and additional costs of RES-T projects.

Italy

Table 41. Progress of Italy on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Lack of harmonised administrative procedures for spatial planning
	"One Stop Shop" ? (Art. 22(3)a)) ?	☑	modello unico	Incorrect application of legal provisions regarding building licences and permits
	Online application for permit?	☐		Complexity of the legal framework
	Maximum time limit for procedures?	☑	Maximum time limit has been reduced from 180 to 90 days.	Long waiting times between the submission of application for support and the granting of support
	Automatic permission after deadline passed? (Art. 22(3)b))	☑	Automatic permission after 30 days.	Multi-level administrative regulation lengthens administrative procedures
	Increased cooperation between institutions/streamlining of permit procedures?	⌛		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Lack of regulation for district heating
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		Burocratic delays hinder the expansion of district heating in Italy
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		Inconsistent RES-H&C legislation dealing with environmental aspects
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Lack of knowledge on RES-T opportunities
				Lack of information on the use of RES for heating purposes
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Uncertain regulations and procedures for grid connection
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		Low degree of standardisation resulting in long waiting times
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		High costs for the imbalance of production forecasts
	Priority of RES connection to the grid? (Art. 16 (1))	☑		
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	⌛		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	⌛	Two incentivated pilot projects regarding storage systems with power intensive features (Storage Lab) have bean launched in Sardinia and Sicily. There are no incentives for final clients and producers.	
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Revision of incentive for existing plants other than PV introduces uncertainty among project developers
				Revision of incentive for existing PV plants leads to uncertainty among project developers
				Lack of adequate support and charging infrastructure for RES-T
				Inadequately balanced incentive amounts for each RES-E technology
				Lack of long-term visibility and attractiveness of the RES-E support scheme

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

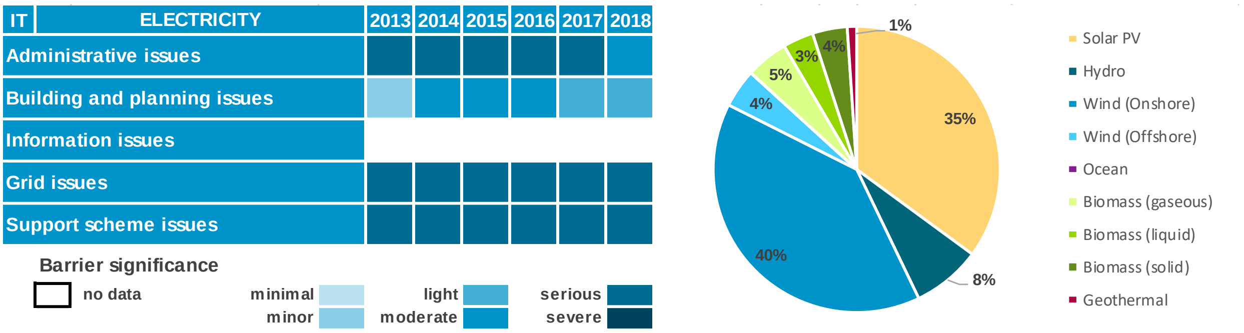


Chart 68. Heat map of the barrier indices per topic in the RES-E sector in Italy 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Italy is mainly hindered by serious barriers related to support, grid and administrative issues. As visualised by the pie chart above, onshore (and to a lesser extent offshore) wind and solar PV are by far the most significant RES technologies for the achievement of the planned 2020 trajectory for the electricity sector. Hydro power and biomass technologies are playing a less significant role in the Italian electricity sector.

The dominant issues related to the support scheme for RES-E over the analysed six years involved the lack of long-term visibility and attractiveness of the main support scheme. The relevant legislation for support schemes frequently changed and these reforms are often delayed. As a consequence, investors struggle to know in advance which type of support scheme they can benefit from, which makes it difficult to establish their business plan. For example, on 29 June 2016, the national government published DM 23 June 2016 with substantial delay, as it was supposed to be published in December 2015 at the latest. This decree supported the deployment of RES, except PV, until the end of 2016. As of mid-2018, this barrier still persists. The national government is enacting the Decree on the RES Support Scheme 2018-20 with one-year delay. This has led to an increased cautiousness from banks, which has resulted in a limited access to financing. PV investors are facing a particularly peculiar situation because the Italian government has revised retroactively the incentive for existing PV plants. Such measures with retroactive effect are a serious threat to investment confidence. Grid issues are related to the long and unclear grid connection procedures due to a lack of standards and high costs for balancing out volatile electricity.

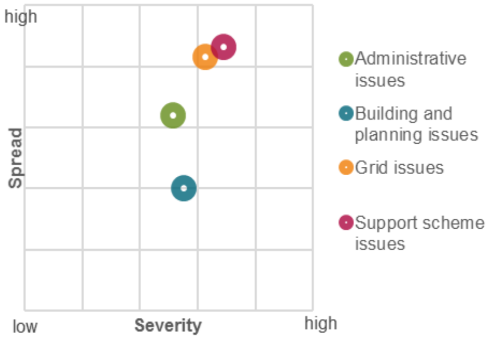


Chart 69. Average severity and spread per topic in the RES-E sector for 2018

Administrative processes are impeded by a lack of harmonised procedures for spatial planning, lengthy processes, also due to many involved authorities. The administrative regulation is extensive and fragmented between local, regional and national level. The shared regulatory competency at different levels of government causes confusion. Consequences are uncertainty of durations and of outcomes of approval processes.

The heat map indicates an overall stagnation in the barrier indices for grid and support scheme issues. For administrative as well as building and planning issues the situation has improved, which is partly due to the fact that the cumbersome registry system for PV has been abolished and the Renewable Energy Decree 2018 is being revised at the moment and should be issued shortly. The scatter plot provides a snapshot of the severityand extent of Italian stakeholders’ issues with RES-E in 2018. Support and grid issues affect a very dominant share of all installations and that to a very serious extent. Administrative as well as building and planning issues are much less spread and also affect installations in not such a severe way.

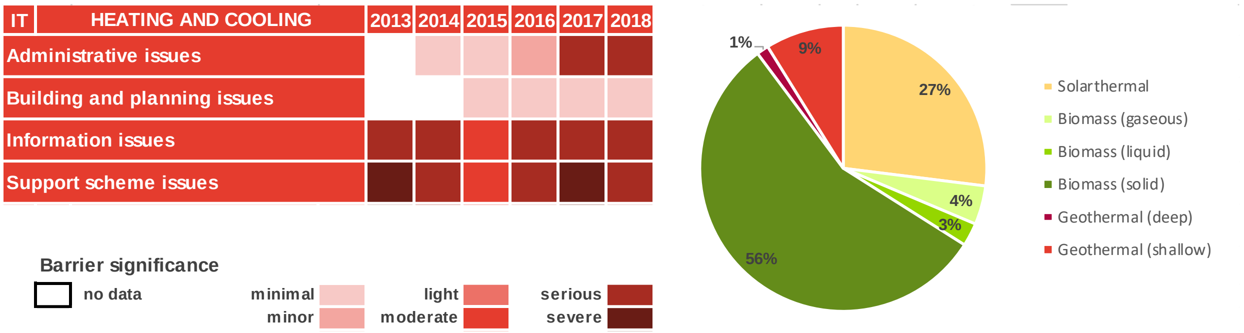


Chart 70. Heat map of the barrier indices per topic in the RES-H&C sector in Italy 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Italy is characterised by serious barriers related to support scheme, information and administrative issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Italian H&C sector, followed by solar thermal and geothermal energy.

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The main support scheme issues are characterised by weaknesses of the legal framework, leading for example to inconsistencies between measures of different nature. For example, the regulatory management of medium to large-sized biomass plants using ashes is problematic, since ashes are still classified as a waste, and not as soil improvers. Another issue is the lack of regulation for district heating, which creates uncertainty and additional costs. The lack of information is another serious issue, because consumers are unaware of RES-H&C as an energy solution. Moreover, information is scarce regarding the granting of permits or how to request funding. The main barriers dealing with administrative issues over the past six years are connected to the complexity of administrative procedures. This is because the current legal framework for RES-H&C is a complex mix of measures arising from laws not specific to RES-H&C. Norms often lack clear and harmonised references so that the interpretation of rules differs depending on the regions. This is a particular problem in case of geothermal installations. The heat map indicates a diverse picture regarding the development of barrier indices for the different topics. While the indices for support schemes show a decrease, the ones for administrative and building and planning issues have increased in the last year. The barriers for support schemes have improved thanks to the new Conto 2.0 in force since 31 May 2016. The government has assigned a higher budget to increase incentives and also reduced the time span to receive the incentives.

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The scatter plot provides a snapshot of the severity and extent of Italian stakeholders’ issues with RES-H&C in 2018. The above-described support scheme issues are still the dominant obstacle for a large share of installations and seriously impede their development. Building and planning issues affect a similar amount of installations but to a much lesser degree of severity. Administrative issues, such as the above-described complexity of administrative procedures and the lack of harmonised references in the laws, are more important as such, but they affect fewer installations.

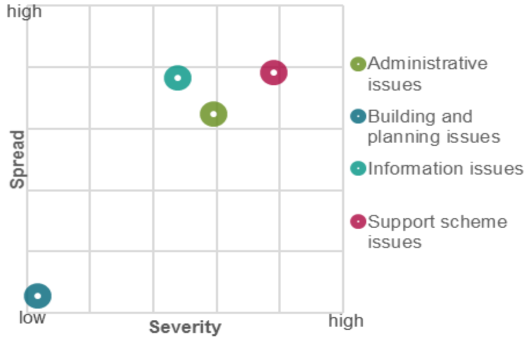
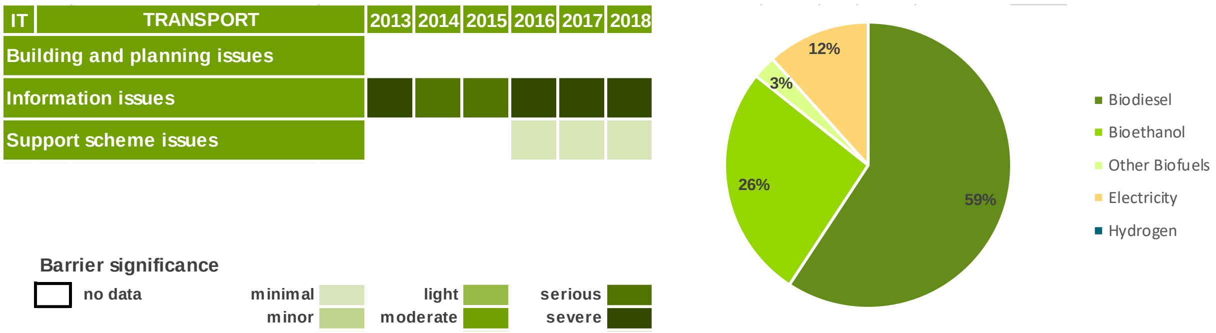


Chart 71. Average severity and spread per topic in the RES-H&C sector for 2018



IT	TRANSPORT	2013	2014	2015	2016	2017	2018
	Building and planning issues						
	Information issues	🟩	🟩	🟩	🟩	🟩	🟩
	Support scheme issues				🟩	🟩	🟩

Barrier significance

☐ no data

minimal 🟩 minor 🟩 light 🟩 moderate 🟩 serious 🟩 severe 🟩

Chart 72. Heat map of the barrier indices per topic in the RES-T sector in Italy 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Italian RES-T sector, development is mainly hindered by information issues and to a much smaller degree by support scheme issues. As visualised by the pie chart above, biodiesel, bioethanol as well as electricity are the included RES technologies for the achievement of the planned 2020 trajectory in the Italian transport sector.

The main challenges for RES-T in Italy over the last six years involves the lack of information on suitable RES-T support measures and fiscal benefits to promote biofuels by many policy decision makers. This has direct ramifications on other issues, such as taxation in this sector. In fact, taxation is so high that it makes biofuels economically impossible to compete with fossil fuels. This influences all the steps in the process from the beginning (initial policy decision-making) to the identification and implementation of the suitable support schemes. There has been a legal change on 2 March 2018: The Minister of Economic Development signed the interministerial decree in support of biomethane and biofuels in the transport sector. The new system of incentives will support all the owners of biomethane and biofuels plants installed before 31 December 2022. Biofuels producers will receive a compensation for the higher production costs they face in order to allow them to compete with fossil fuels producers in the transport sector. The amount of the incentives will be revised annually in order to keep the support in line with changes in the production costs. Due to the short period of implementation, the consequences are not clear, yet. The e-mobility sector suffers from lacking incentives and an insufficient infrastructure.

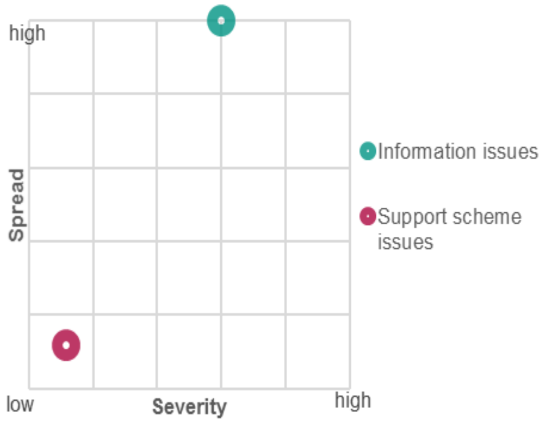


Chart 73. Average severity and spread per topic in the RES-T sector for 2018

The heat map shows an overall stagnation in the barrier indices regarding information issues at a very high level. This can be linked to the slow development to overcome the identified communication roadblocks. On the other hand, there are new initiatives both with new support schemes as well as the development of a new infrastructure. It remains to be seen how well these positive developments will be communicated and what their impact will be. The scatter plot provides a snapshot of the severity and extent of Italian stakeholders’ issues with RES-T in 2018. Information issues remain the main, dominating barrier, which affects almost all RES-T applications, although only to a moderate level of severity.

Cyprus

Table 42. Progress of Cyprus on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		High cost of administrative procedure
	“One Stop Shop” ? (Art. 22(3)a)) ?	☐		Bureaucracy lengthens administrative procedures
	Online application for permit?	☒		
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	⌛		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☑	For teleheating and cooling in planning	**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Environmental protection issues hinder RES development
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	Only the legal source is mentioned	
	Obligation to use RES in public buildings? (Art. 13 (5))	☑	Only the legal source is mentioned	
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑		**Barriers due to information issues**
				Lack of coordination between agencies and Ministries
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Lack of transparency of the grid regulation
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☒		Grid connection cost are charged to plant operators
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		
	Priority of RES connection to the grid? (Art. 16 (1))	☑		
	Clear legal obligation for the system operator to reinforce the grid?	☒		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑	Some support schemes have expired	**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☒		Unreliable RES-E strategy
				Insufficient support to biomass
				Limited access to finance for new PV projects

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

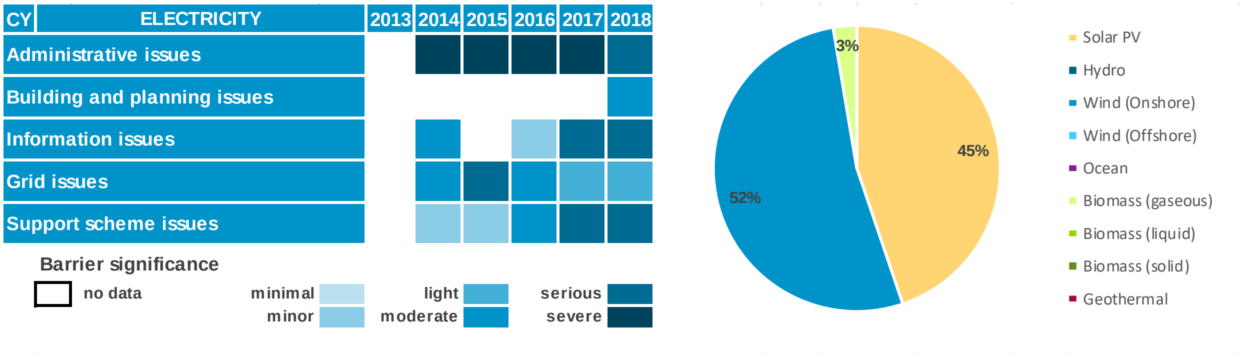


Chart 74. Heat map of the barrier indices per topic in the RES-E sector in Cyprus 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

According to their NREAP, onshore wind and solar PV are by far the most significant RES technologies for the achievement of the 2020 trajectory targets for the electricity sector in Cyprus. The development of these technologies is mainly hindered by substantial administrative barriers.

The dominant administrative barriers in Cyprus are related to permitting procedures, which are long and complex, involve many authorities and thus cost time and money. The permitting procedure for a 100 kW PV plant can last up to 15 months and one for for an average-sized wind park can take more than 20 months, without guarantee of approval. In addition, the administrative fees levied by each authority significantly increases project costs. All these aspects undermine the confidence of investors in Cyprus.

As shown in the heat map, barriers related to support scheme issues have also increased over the last years. This is mainly due to stakeholders' uncertainty with regards to the introduction of a new support scheme aiming at facilitating the participation of RES in the electricity market. The electricity market is a rather unknown field for the operators of small and medium-sized RES plants, causing insecurity regarding future investment plans. Under this scheme applications for PV installation of over 1 MW have increased fivefold, while there has been a tendency for large PV installations, some of which have a capacity of more than 10 MW, which is eight or ten times higher than the ones currently in operation[247]. However, wind energy stakeholders claim that wind power is marginalised[248].

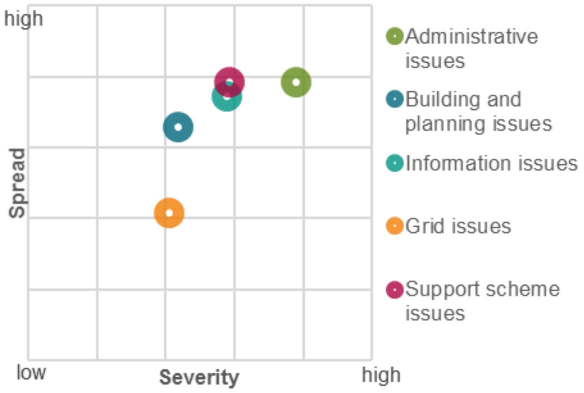


Chart 75. Average severity and spread per topic in the RES-E sector for 2018

The scatter plot provides a snapshot of the severity and extent of Cypriot stakeholders' issues with RES-E in 2018. Administrative barriers are substantial and affect almost every RES-E plant. Furthermore, barriers dealing with support schemes and information issues also seriously hinder the development of renewable energy installations and affect a very dominant share of installations.

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[247] https://inbusinessnews.reporter.com.cy/business/article/190453/brochi-oi-aitiseis-ga-fotoboltaika-parka

[248] http://www.sigmalive.com/news/oikonomia/530475/syndesmos-aiolikis-energeiasaneksigiti-anoxi-se-agora-ilektrismou

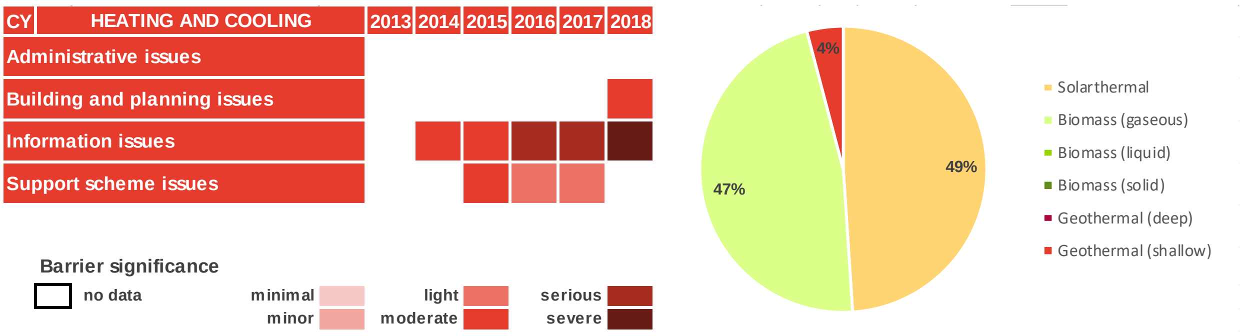


Chart 76. Heat map of the barrier indices per topic in the RES-H&C sector in Cyprus 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-H&C in Cyprus is mainly hindered by serious barriers dealing with information issues. As visualised by the pie chart above, solar thermal energy and gaseous biomass are by far the most significant RES-H&C technologies for the achievement of the planned 2020 trajectory in the H&C sector.

As shown above, barriers dealing with information issues affected the development of RES-H&C in Cyprus since they were first reported in 2014. This is mainly due to the lack of communication and cooperation between the different administrative institutions: competencies in RES for the H&C sector are split between multiple energy agencies and ministries.

The heat map also indicates light to moderate support scheme barriers until 2017. This can be attributed to the delays in the energy efficiency support scheme's announcement. It finally entered into force in 2018 under the name "Energy Upgrading of Enterprises". The delay curbed investors' enthusiasm, as they were unsure when the support scheme would be finally implemented. Generally, the unreliability of the general RES strategy & support scheme has been a fundamental barrier to the development of Cyprus' RES H&C sector in the past years.

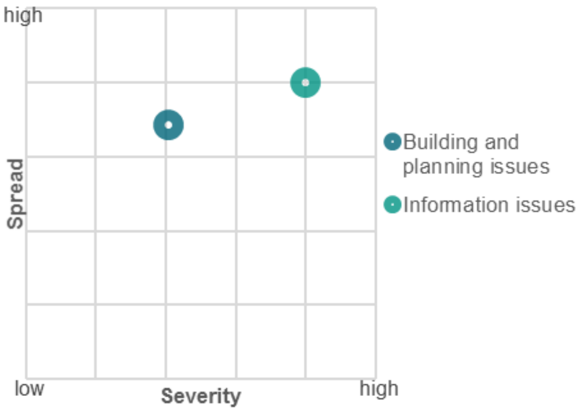


Chart 77. Average severity and spread per topic for RES-H&C in 2018

The scatter plot provides a snapshot of the severity and extent of Cypriot stakeholders' issues with RES-H&C in 2018. It shows that the lack of information and communication mentioned above is by far the most dominant issue for stakeholders in Cyprus, both in terms of spread and severity. The extent of this barrier clearly overshadows other kinds of barriers. Yet, also the building and planning issues affect a very large share of RES installations; however, only with a substantial lower severity.

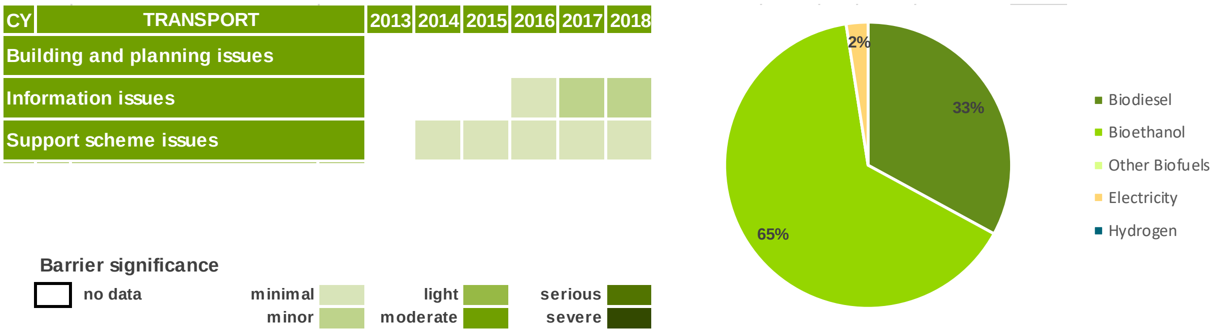


Chart 78. Heat map of the barrier indices per topic in the RES-T sector in Cyprus 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-T in Cyprus has been hindered by support scheme and information issues. As visualised by the pie chart above, bioethanol and biodiesel are by far the most significant RES for the achievement of the planned 2020 trajectory in the transport sector.

Barriers dealing with support scheme issues have affected the development of RES-T in Cyprus since they were first reported in 2014. This is mainly due to the lack of support to counterbalance the high production costs of biofuels. In fact, biodiesel's stringent criteria increase the costs of producing biofuels locally. For example, used fried oils recycled as biodiesel should come from non-genetically modified crops. As a result, most used fried oil collectors prefer to export their used fried oil to Greece, where their sales are more profitable. Meanwhile, Cyprus imports biodiesel from other non-EU countries.

The heat map also indicates the presence of barriers related to information issues. Similar to the RES-H&C sector, this is due to the lack of communication and cooperation between the different administrative institutions, as competencies in RES for transport are split between multiple energy agencies and ministries.

The scatter plot provides a snapshot of the severity and extent of Cypriot stakeholders' issues with RES-T in 2018. As shown by the green dot, information issues are more widely spread and affect RES plants more significantly than barriers dealing with support scheme issues. This is explained by main support scheme-related barriers only affecting biofuels, whereas the lack of communication between competent authorities affects the RES-T sector as a whole.

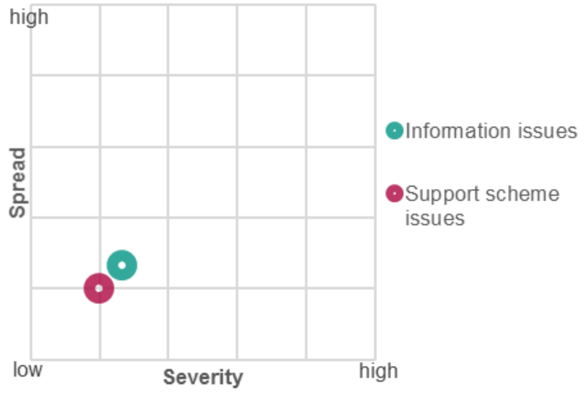


Chart 79. Average severity and spread per topic for RES-T in 2018

Latvia

Table 43. Progress of Latvia on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		
	"One Stop Shop" ? (Art. 22(3)a)) ?	☒		
	Online application for permit?	☒	The existing support system is closed for new applications.	
	Maximum time limit for procedures?	☑		
	Automatic permission after deadline passed? (Art. 22(3)b))	☒		
	Increased cooperation between institutions/streamlining of permit procedures?	☒		
	Facilitated procedures for small scale projects	☑	Draft regulation sets out simpl. procedures for connecting micro-generators for the production of RES-E for self-consumption.	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☒	The Law on the Energy Performance of Buildings obliges owners of new or renovated buildings to consider using RES heating and cooling systems.	
	Obligation to use RES in public buildings? (Art. 13 (5))	☒		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☒	The training programmes for RES installers in Latvia are not regulated by law, though natural persons must have a construction management certificate to offer services	**Barriers due to information issues**
Grid issues	Grid usage fee?	☒		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Unbalanced distribution of costs for grid connection
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		
	Priority of RES connection to the grid? (Art. 16 (1))	☒		
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☒		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑	Support scheme on hold and closed for new plants until 2020.	**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☑	Temporary tax on subsidised electricity was introduced on 1.1.2014 for companies receiving financial support for electricity from RES or CHP until 31.12.2017.	Lack of long-term predictability of the national RES policy
				Absence of a general strategy and legal framework for developing RES
				Moratorium on additional quotas for RES-E producers
				Absence of policy instruments and long-term strategy for biofuels since 2011
				Slow development of e-mobility due to the lack of permanent support scheme for hybrid and electric cars

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

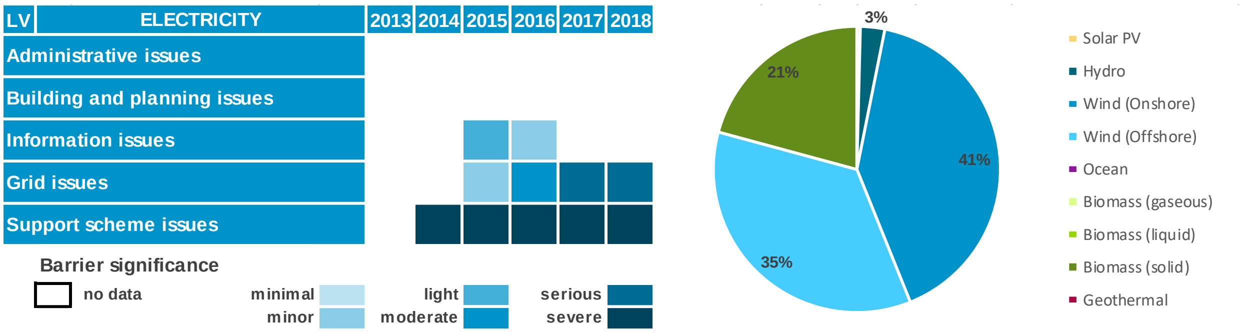


Chart 81. Heat map of the barrier indices per topic in the RES-E sector in Latvia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Latvia is effectively hindered by major barriers related to support scheme issues. As visualised by the pie chart above, onshore and offshore wind power as well as solid biomass are by far the most significant RES technologies for the achievement of the planned 2020 trajectory for the electricity sector in Latvia.

The dominant issue for RES-E investments in Latvia over the analysed six years involves the lack of an active support scheme. The current support scheme (a hybrid of a FIT/tender & quota system) is on hold since 2011 until 2020, because the costs of the existing support scheme were considered too high, and there were allegations that the support schemes were intransparently allocated. Another roadblock related to grid issues is the unbalanced distribution of grid access costs. Under the current regime, plant operators shall bear all costs for grid connection, including the reinforcement of the grid. The combination of these two barriers make investments in RES-E almost impossible.

The heat map resonates with the description above as it shows a continuing and persistent negative state in the barrier indices, particularly regarding support scheme issues. Considering the negative situation regarding support and grid issues, it is very likely that administrative or planning issues have not been noticed yet. Due to the lack of business models, investors do not even reach the point in the development of a project that would allow them to encounter these additional barriers.

The scatter plot provides a snapshot of the severity and extent of Latvian stakeholders’ issues with RES-E in 2018. The gravity of the support scheme issues is clearly reflected in the respective spread and severity values. The lack of support schemes affects all plants and makes new installations impossible. In contrast, the above-described allocation of grid access costs also affects almost all installations, but the consequences are not that grieve. Therefore, the spread value of grid issues is also very high, but the severity value is more moderate.

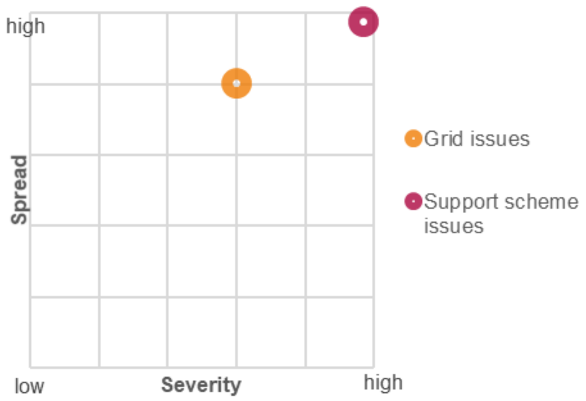


Chart 80. Average severity and spread per topic in the RES-E sector for 2018

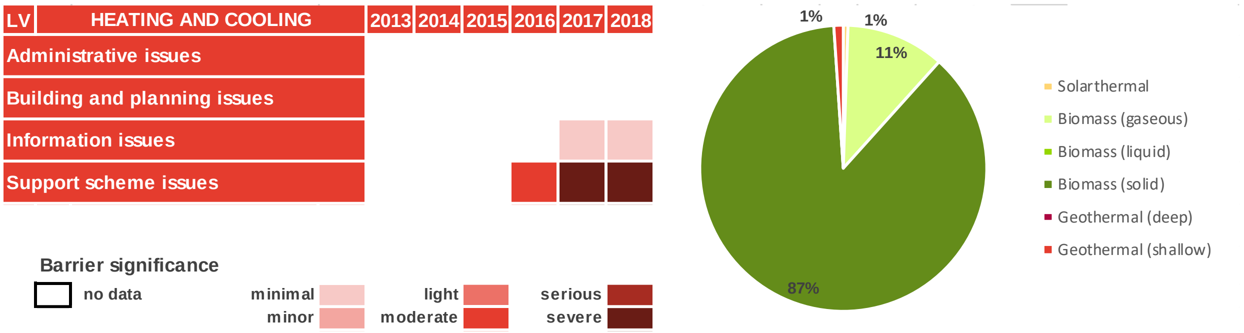


Chart 82. Heat map of the barrier indices per topic in the RES-H&C sector in Latvia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Latvia is characterised by important barriers related to support scheme issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory for the heating and cooling sector in Latvia, followed by biogas. Other technologies play no significant role.

The primary barriers related to the support scheme in Latvia for RES-H&C over the analysed six years involved the absent general strategy and legal framework for developing RES. In the past years the main focus of support is on energy efficiency and investments in district heating. The Energy Strategy 2030 has been in place since March 2013 and sets long-term actions to ensure energy supply, competitiveness, energy efficiency, and the use of RES. However, the effect of this strategy is limited, due to the fact that it is not legally binding. As a consequence, no support scheme has been implemented that would allow for additional investments in the H&C sector.

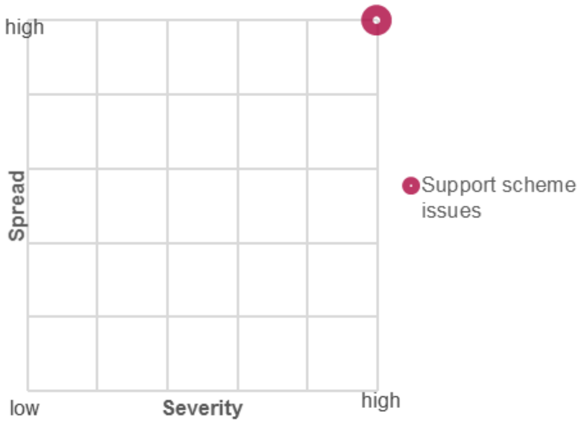


Chart 83. Average severity and spread per topic in the RES-H&C sector for 2018

The heat map resonates with that description as it shows a continuing and persistent negative state in the barrier indices regarding support scheme issues. The scatter plot provides a snapshot of the severity and extent of Latvian stakeholders' issues with RES-H&C in 2018. The severity of the support scheme issues is clearly reflected in the respective spread and severity values. The lack of an effective and legally binding RES strategy or a support scheme negatively affects the incentive for investments in any RES-H&C installations and makes new investments impossible. Therefore, the spread and severity values of supports issues are at a maximum value.

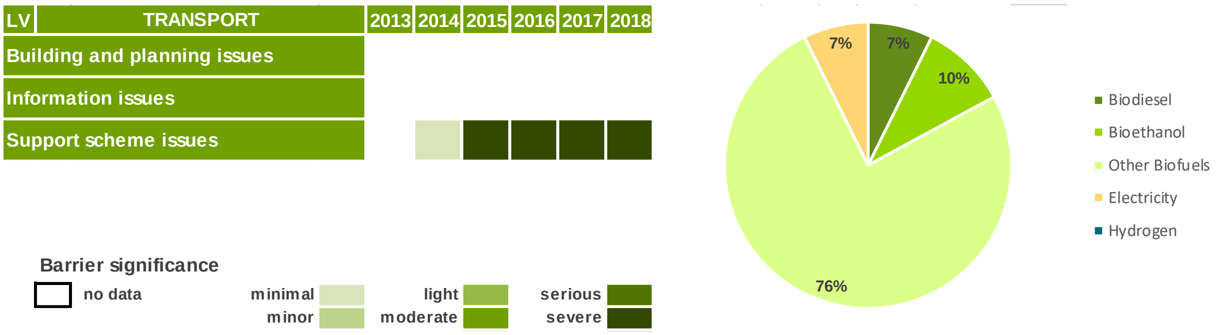


Chart 84. Heat map of the barrier indices per topic in the RES-T sector in Latvia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the RES-T sector in Latvia, the development is rendered impossible by issues related to the support scheme. As visualised by the pie chart above, other biofuels are the dominant RES technologies for the achievement of the planned 2020 trajectory, followed by bioethanol and biodiesel as well as electric cars sharing the third rank.

The main challenges for RES-T in Latvia over the last five years are connected to the absence of a general RES strategy and RES-T support schemes. Both the "Biofuel Production and Use in Latvia (2003-2010)" programme and the national support programme "Aid for Biofuel Production" ended in 2010, and there are no new support schemes in place. For almost seven years there has been no clear information on policy instruments for biofuels. This hampers investments in new biofuel-producing facilities. The same also holds for the e-mobility sector where there is no long-term mechanism to promote and support the development of vehicles powered by electricity from RES, except from insufficient tax reliefs and short-term subsidy programmes.

The heat map visualises this negative, stable situation. Since there have been no changes of the legal framework over the past years, the barrier indices stayed at a negative, high value. The scatter plot provides a snapshot of the severity and extent of Latvian stakeholders’ issues with RES-T in 2018. The support scheme remains the sole, central issue, significantly preventing the transport sector from living up to its potential across all technologies.

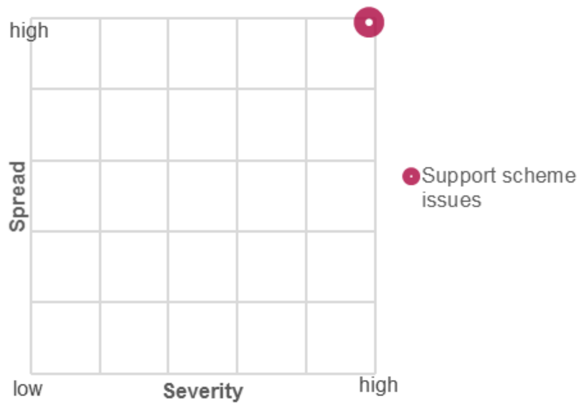


Chart 85. Average severity and spread per topic in the RES-T sector for 2018

Lithuania

Table 44. Progress of Lithuania on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		Some administrative procedures take too long
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		RES related competencies are scattered among different Ministries
	Online application for permit?	☐		Duration of administrative processes for roof-top PV installations above 5 kW should be reduced
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑	Some measures were implemented until 1.01.2017 to streamline the construction permitting procedures	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Limitations for onshore wind farms by sanitary protection zones
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Limitation of wind power development near air surveillance radars
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		Hydropower virtually stopped due to strict environmental requirements
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑		**Barriers due to information issues**
				Greater dissemination of information in the field of renewable energy is needed
				Greater dissemination of information in the field of renewable energy is needed
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Limitation of biogas supply by consumer demand
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		Costly grid connection
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Seasonality for biogas
	Priority of RES connection to the grid? (Art. 16 (1))	☐		Obsolete infrastructure
	Clear legal obligation for the system operator to reinforce the grid?	☑		Insufficient infrastructure for electric cars
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑	Reference to the respective national legal act.	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☒	For RES-E, deep cost structure is applied. RES producer covers 40% of connection cost for plants <350kW, 20% for plants >350kW. In addition, RES producer covers up to 10% of grid reinforcement, expansion and development cost.	
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑	Transmission of electricity produced from RES can be restricted or suspended but only in case of an emergency of the energy system or for other technical reasons, however, only on a non-discriminatory basis.	
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Standstill due to the transition from an old key support scheme to a new one
				Financial support is spontanious, uncoordinated and unpredictable
				Too small national biofuel market
				Net metering – electricity storage fee
				Limitations with regard to preliminary studies for offshore development

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

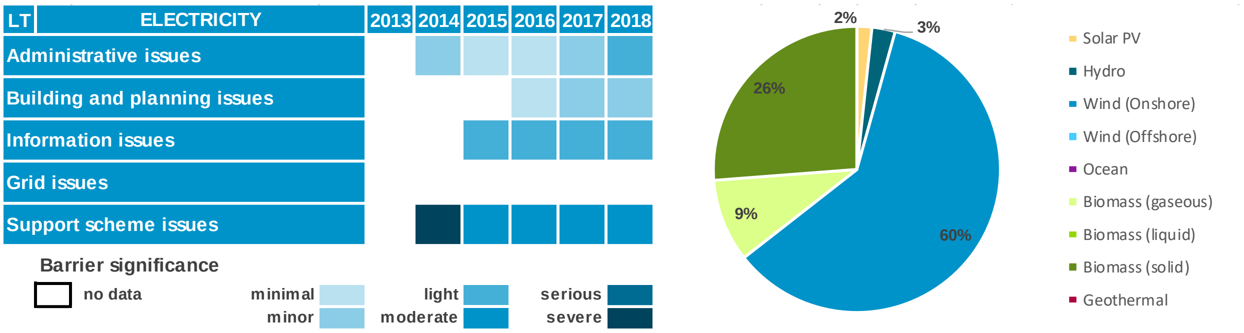


Chart 86. Heat map of the barrier indices per topic in the RES-E sector in Lithuania 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Lithuania is mainly hindered by moderate barriers related to support issues. As visualised by the pie chart above, onshore wind is by far the most significant RES technology for the achievement of the planned 2020 trajectory for Lithuania's electricity sector, followed by solid biomass and solar PV.

The dominant issues related to Lithuania's RES-E support scheme over the analysed five years hinges on the support framework's uncertain future. The current tender- FIT scheme featured technology caps that were reached in 2015/2016. No new tenders have been opened since. A new support framework, RINKA+ (market+) is under preparation, but it has not been adopted yet. It is assumed to introduce technology-neutral tenders, starting in the second half of 2019. Stakeholders from the wind sector - the most important technology for achieving the 2020 trajectory – expressed concerns that PV could primarily benefit from decreasing technology prices, allowing them to win the technology-neutral tenders. In addition, stakeholders are awaiting the implementation of the New National Energy Independence Strategy, adopted in June 2018 and defining RES targets for all sectors for 2030, 2045, 2050 and ultimately leading to a 100% renewable supply. The Strategy is however criticised, because it does not define the concrete measures to reach these targets; this is left to by-laws, which still have to be developed; the draft of the Strategy Implementing Action Plan for the upcoming five years is awaiting Parliament's approval.

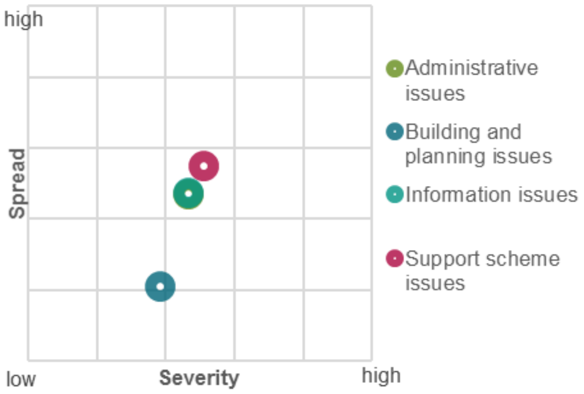


Chart 87. Average severity and spread per topic in the RES-E sector for 2018

The heat map indicates a slight decrease in the barrier indices, particularly for the support scheme issues. This is rooted in the aforementioned issue, namely that stakeholders in 2014 assumed that technology caps will be exhausted, halting the support scheme. With the perspective of a new support framework, even if not yet realised, the barrier was perceived as less significant.

The scatter plot provides a snapshot of the severity and extent of Lithuanian stakeholders' issues with RES-E in 2018. Market participants' anticipations of a new support framework and future incentives are reflected in a fairly low severity estimation of the issue, only affecting a minor share of all installations.

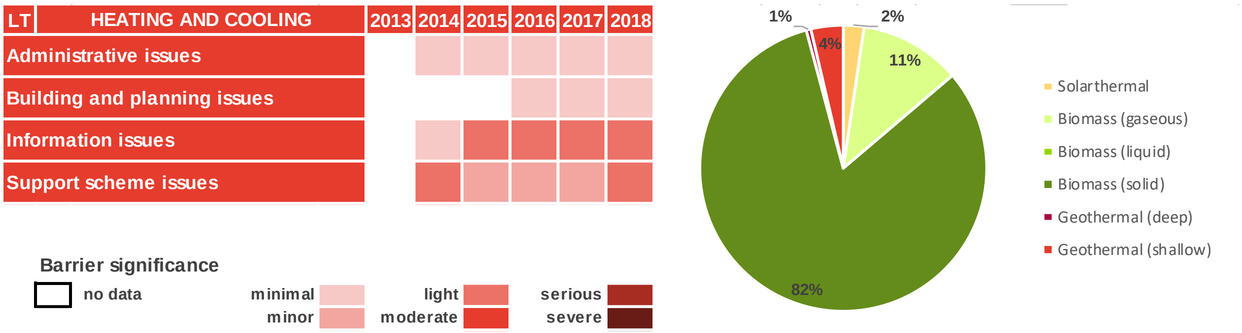


Chart 88. Heat map of the barrier indices per topic in the RES-H&C sector in Lithuania 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Lithuania is mainly characterised by minor to light barriers related to information as well as support scheme issues. As visualised by the pie chart above, solid biomass is by far the most dominant RES technology for the achievement of the planned 2020 trajectory for the Lithuanian H&C sector, followed by gaseous biomass and shallow geothermal energy.

The central barriers in Lithuania for RES-H&C over the analysed five years are similar to those of the RES-E sector. They include the lack of concrete measures in the New National Energy Independence Strategy to meet RES trajectories and the missing support for the replacement of old and inefficient wood-fired boilers by more efficient ones. The heat map indicates a slight increase of the barrier index for support schemes. This is explained by the absence of concrete measures and the need of specific by-laws implementing the new Strategy which was published in June 2018 (the draft of the Strategy Implementing Action Plan for the upcoming five years is awaiting Parliament's approval).

As far as information issues are concerned, stakeholders report a long and laborious coordination between ministries due to scattered RES competencies. For example, the Ministry of Education is responsible for the policy-making in the field of education and dissemination of information, however, renewable energy is not among its priorities. For RES policy-making the Ministry of Energy is responsible, but it receives no financing for education and information dissemination measures.

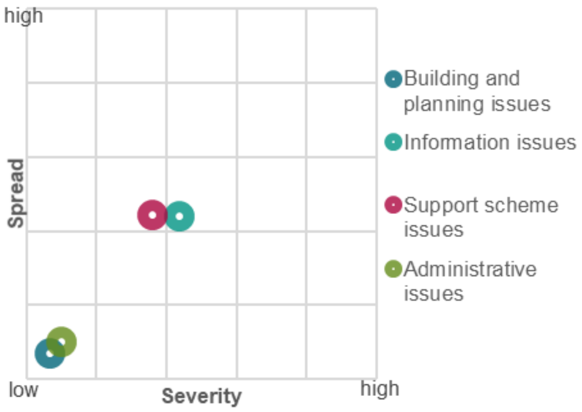


Chart 89. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severity and extent of Lithuanian stakeholders' issues with RES-H&C in 2018. The above outlined information and support scheme issues affect sectoral growth. However, only a minor share of barriers is affected and RES-H&C installations' development is only minorly affected, slightly delaying project realisations and moderately raising project costs.

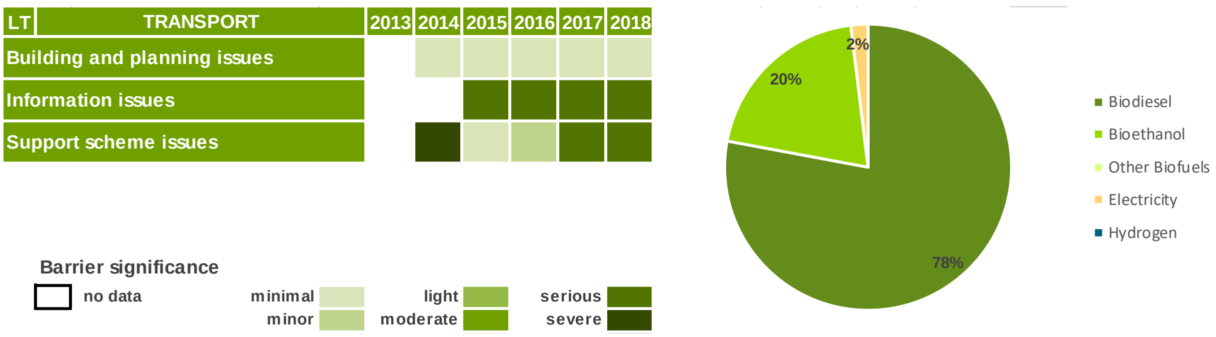


Chart 90. Heat map of the barrier indices per topic in the RES-T sector in Lithuania 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the RES-T sector in Lithuania, progress is seriously hampered by information and support scheme issues. As visualised by the pie chart above, biodiesel is by far the single most dominant RES technology for the achievement of the planned 2020 trajectory in the Lithuanian transport sector, followed by bioethanol and a very small share of e-mobility.

The unsecure support framework and the missing concrete measures for the individual RES sectors and technologies in the New National Energy Independence Strategy are perceived as dominant issues for the Lithuanian RES-T sector. In addition, the size of the national biofuel market as well as the lack of a legal framework for e-mobility are further challenges of the sector. Regarding information issues, the scattered competency for the sector over different governmental institutions has an even more important impact on the RES-T developments. The sector's infancy necessitates guidance and support, which is hindered by long coordination processes between competent institutions and, at times, conflicting interests. The heat map visualises the prominence of information issues and the growing concern on the support framework. The former has stagnated at a very high level, while the support scheme issues are perceived in a stronger way by stakeholders since 2017.

The scatter plot provides a snapshot of the severityand extent of Lithuanian stakeholders' issues with RES-T in 2018. The two barrier issues outlined above, also have an impact on 2018's sectoral development, with a very high severity level. They add to the cost burden and delay project realisations. In addition, the majority share of all installations is affected by the aforementioned issues.

Chart 91. Average severity and spread per topic in the RES-T sector for 2018

Luxembourg

Table 45. Progress of Luxembourg on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☒		
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		
	Online application for permit?	☐		
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☒		Refusal of the Ministry to provide building permits for ground-mounted PV installations
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		Eligibility criteria for wind power plants not transparent to the public
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑		**Barriers due to information issues**
				Lack of information and communication regarding the most adapted RES-HC technologies for Luxembourg
				Over-pricing of subsidised RES-HC facilities
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Unforeseeable grid connection problems lead to high grid connection cost
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		
	Priority of RES connection to the grid? (Art. 16 (1))	☐		
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☐		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☒		Lack of sectoral plans for the development of renewable energies
				Low focus on self-consumption schemes
				Uncertainty concerning the further promotion of solarthermal energy
				Insufficient support schemes for biofuels

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

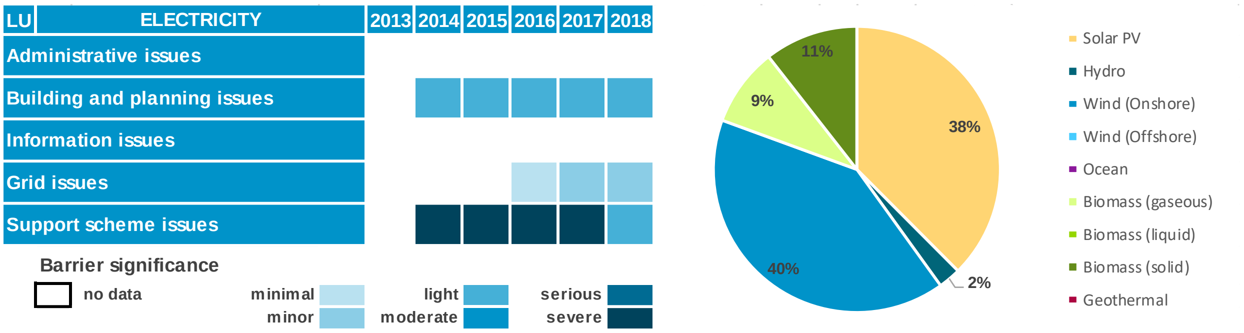


Chart 92. Heat map of the barrier indices per topic in the RES-E sector in Luxembourg 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Luxembourg is mainly hindered by major barriers related to support scheme issues as well as light barriers related to building and planning issues. As visualised by the pie chart above, onshore wind and solar PV are by far the most significant RES technologies for the achievement of the planned 2020 trajectory in the Luxembourgish electricity sector.

The dominant issues related to the support schemes in Luxembourg for RES-E over the analysed five years involved the non-existence of sectoral plans for the development of RES, which especially hindered the growth of the wind, solar and biomass sectors. These plans amongst others provide an overview of the suitable wind turbine sites in Luxembourg, both from an economic and from an eligibility perspective. They were developed recently by the Ministry of Sustainability in cooperation with the largest wind power producer (SEO). However, these plans are not officially published yet, and therefore not accessible to the public. The heat map shows an improvement of the barrier index for support scheme-related issues. This is mainly caused by the introduction of a support mechanism in the form of a tendering procedure for larger solar PV installations in 2018.

A central barrier in the field of building and planning relates to the lack of transparency on the eligibility criteria for wind power plants. officially published. This is seen as a strong burden for other potential wind power producers as the accessibility of potential spaces is limited and administrative procedures might take longer.

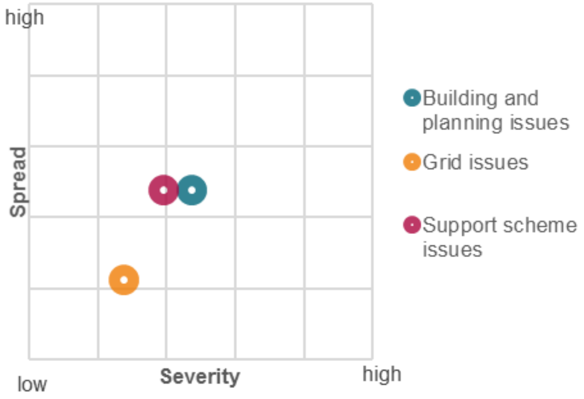


Chart 93. Average severity and spread per topic in the RES-E sector for 2018

The scatter plot provides a snapshot of the severity and extent of Luxembourgish stakeholders' issues with RES-E in 2018. Building and planning and support scheme issues affect a moderate share of all installations; yet, building and planning issues even more importantly hinder the development of installations. Grid issues affect fewer installations and that to a lesser extent.

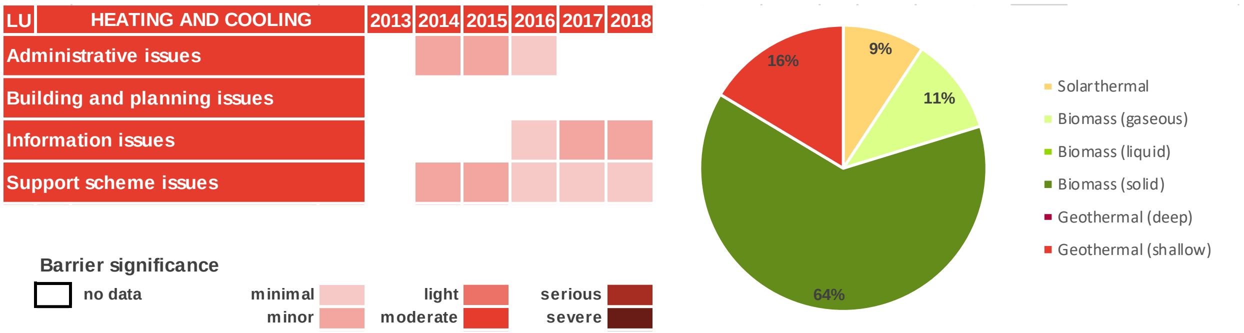


Chart 94. Heat map of the barrier indices per topic in the RES-H&C sector in Luxembourg 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Luxembourg is characterised by minimal to minor barriers related to information and support scheme issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Luxembourgish H&C sector, followed by shallow geothermal, biogas and solar thermal.

Central RES-H&C barriers related to the Luxembourgish support scheme during the five years analysed include uncertainties concerning the future promotion of solar thermal energy. There are ongoing discussions on the substitution of solar thermal installations through the use of PV for the heating of boilers. It might therefore be the case that solar thermal installations will be less used in the future, which leads to an increased skepticism regarding the use of this technology.

The main barrier affecting information issues is the lack of awareness and communication regarding the most adapted RES technologies. The current thermal regulation imposes the use of RES in buildings. However, all types of RES are not necessarily adapted to Luxembourg. In detail, people are not sufficiently informed about the poor profitability of solar thermal systems in Luxembourg, so that the uptake of this technology is poor.

Minimal administrative issues were reported between 2014 and 2016, due to the complexity of the subsidy regime in place. As shown by the heat map, this barrier was solved thanks to the introduction of so-called energy advisors by the Luxembourgian energy agency “Myenergy”, supporting applicants in their submission of applications for support schemes.

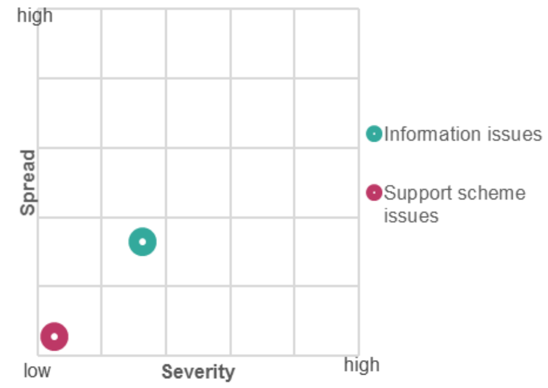
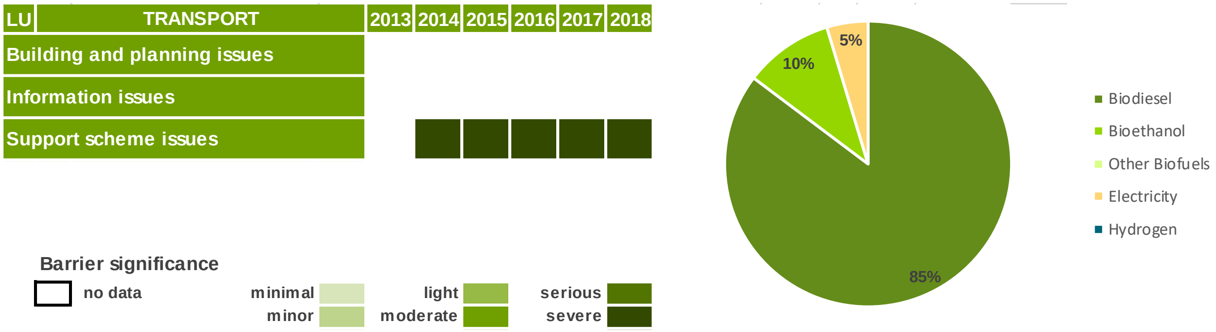


Chart 95. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severity and extent of Luxembourgish stakeholders’ issues with RES-H&C in 2018. The above outlined information issues are dominant obstacles for a light share of installations and impede their development. Support scheme issues, as affecting mainly solar thermal applications, only impact a minor number of installations, with less severity.



LU	TRANSPORT	2013	2014	2015	2016	2017	2018
	Building and planning issues						
	Information issues						
	Support scheme issues		■	■	■	■	■

Chart 96. Heat map of the barrier indices per topic in the RES-T sector in Luxembourg 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Luxembourgish RES-T sector, development is limited to issues related to the support scheme. As visualised by the pie chart above, biodiesel is the dominant RES technology for the achievement of the planned 2020 trajectory in the Luxembourgish transport sector, followed by biogas and electricity.

The main challenge for RES-T in Luxembourg over the last five years was the insufficiency of support schemes for biofuels. Even though the official national strategy aims at a focus on biofuels, the support policy implemented for biofuels is rather limited. First, the existing support scheme solely consists in the definition of biofuel quota to be fulfilled by oil companies selling gasoline or diesel for transport purposes, whereas other MS provide additional support measures for biofuels, such as reduced energy tax rates. On the other hand, the government of Luxembourg has pronounced itself against first generation biofuels and plans not only to limit their maximum incorporation rate, but also to condition their support upon social and ecological criteria. According to the government, first generation biofuels have proven not to meet the requirements of sustainable development. Instead, the government has committed itself to supporting the development of second generation biofuels.

The heat map visualises an overall stagnation in the barrier indices regarding support scheme issues. Aside from the above-mentioned barrier, this can be linked to the slow developments in the promotion of electric transportation.

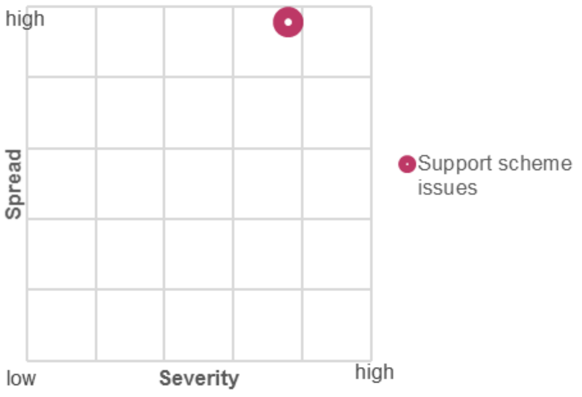


Chart 97. Average severity and spread per topic in the RES-T sector for 2018

The scatter plot provides a snapshot of the severity and extent of Luxembourgish stakeholders' issues with RES-T in 2018. The support scheme remains the sole, central issue, limiting the growth potential of the sector and affecting the very dominant share of RES-T installations.

Hungary

Table 46. Progress of Hungary on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Large number of competent authorities slow down permitting procedures
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Introduction of special technical and spatial restrictions hinder the development of wind power plants
	Online application for permit?	☑		Unreasonable and varying cost of administrative procedures
	Maximum time limit for procedures?	☑	Reduced to 30 days.	No tendering procedures opened within the new remuneration scheme METÁR
	Automatic permission after deadline passed? (Art. 22(3)b))	☑		Increased administrative burden for biofuels due to ILUC debate
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		National fire protection regulation negatively affects PV plants
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	Addressed according to types of building	Introduction of special technical and spatial restrictions hinder the development of wind power plants
	Obligation to use RES in public buildings? (Art. 13 (5))	☒	Supported, but not obligatory.	Lack of processing capacities for exploring the country's bioethanol potential
				Lacking financial resources for district heating development
				Inexistence of state guarantee for geothermal drilling risks
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Postponed introduction of the Renewable Energy Act
				Lack of communication between interest groups and government
				Uncoordinated policy design
				Planning uncertainty under the new support scheme METÁR
				Contradictory political strategy on biofuels
Grid issues	Grid usage fee?	☑	Fees are not stated, but relevant regulation and its location.	**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑	RES power plants' connection receive discounts.	Lack of transparency in grid connection procedures
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Uncertainty about distribution grid fees
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑	RES power plants' connection receive discounts.	Insufficient incentives for DSOs for grid extension
	Priority of RES connection to the grid? (Art. 16 (1))	☑	Connection should be established within 30 days.	Limited integration possibilities of intermittent and decentralised RES-E capacity
	Clear legal obligation for the system operator to reinforce the grid?	☑		Inconsistent national regulatory framework for energy storage solutions
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑	Legal framework is referenced.	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑	Referenced.	
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☒		No tendering procedures opened within the new remuneration scheme METÁR
				No real technological differentiation of feed-in and premium tariffs (within tenders)
				Insufficient and unstandardised state-funded soft loan and investment programmes for RES-E projects
				VAT negatively affects PV projects
				No tenders for wind power

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

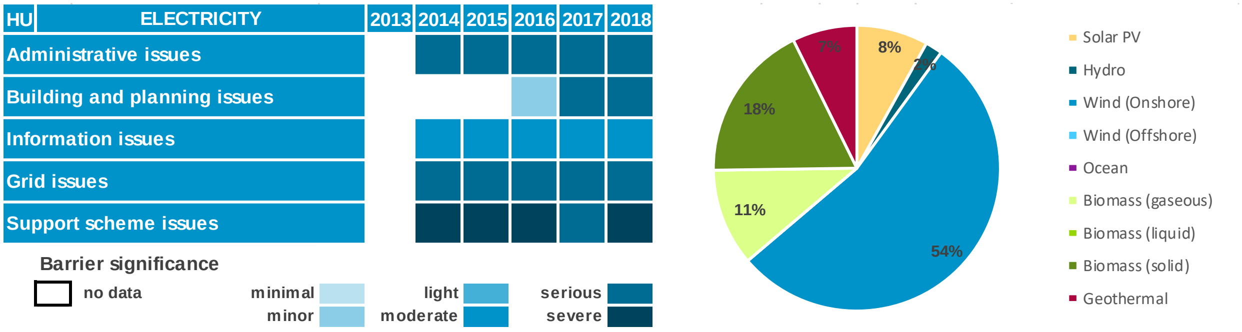


Chart 98. Heat map of the barrier indices per topic in the RES-E sector in Hungary 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Hungary is mainly hindered by significant barriers related to support schemes as well as serious barriers on administrative issues, building and planning issues and grid issues. As visualised by the pie chart above, onshore wind is by far the single most significant RES technology for the achievement of the planned 2020 trajectory targets for the electricity sector in Hungary, followed by solid and gaseous biomass.

The main issues related to the support scheme in Hungary for RES-E over the analysed five years include uncertainties regarding the new remuneration scheme METÁR. As far as administrative issues are concerned, the involvement of a large number of authorities in the administrative process, the complexity of procedures leading to the long licencing times for RES-E installations while sometimes not leaving enough time for applications, as well as high and often varying administrative costs are the central barriers to sectoral growth. Grid issues involve the limited integration possibilities of intermittent RES-E capacities, the lack of potential connection points and the semi-deep approach for the grid connection, resulting in high costs for developers. Building and planning issues arose from the introduction of technical and spatial restrictions hindering the development of wind onshore projects as of September 2016.

Chart 99. Average severity and spread per topic for RES-E in 2018

The heat map indicates a general stagnation in the barrier indices related to the administrative, grid and support schemes issues, yet with a high level of severity strongly affecting the development of the RES-E sector. As far as the support scheme is concerned, some insecurities have been resolved through the introduction of the METÁR remuneration scheme in June 2017. This translates into a slight improvement conveyed through the improvement of support scheme barriers in 2017; yet, the lack of published tenders since have led to the decrease of the matter's state.

The scatter plot provides a snapshot of the severity and extent of Hungarian stakeholders' issues with RES-E in 2018. Support schemes remain the central issue, seriously hindering development and affecting almost all RES plants. Only a slightly lower spread is detected for grid and building and planning issues; yet, their severity is also very high, resulting in substantially longer lead times for project realisation and high extra costs.

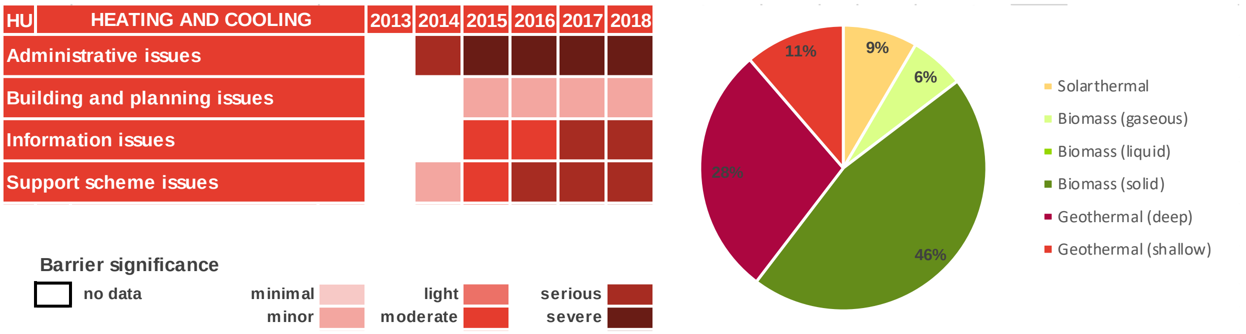


Chart 100. Heat map of the barrier indices per topic in the RES-H&C sector in Hungary 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-H&C in Hungary is mainly hindered by heavy barriers related to administrative procedures and support schemes. As visualised by the pie chart above, solid biomass and deep geothermal are by far the most significant RES-H&C technologies for the achievement of the planned 2020 trajectory in the H&C sector in Hungary.

The central barriers related to the administrative procedure in Hungary for RES-H&C over the analysed five years include the duration of the licencing process for RES-H&C installations as well as the high number of involved authorities further increasing project lead times through long administrative procedures. Regarding the support scheme, dominant issues comprise the insufficient support scheme availability and the unpredictable launch of support programmes, resulting in an unsteady development of demand in Hungary.

The heat map indicates stagnation at a very high level of the barrier indices for administrative issues and an increase in the barrier indices for the support scheme issues. As far as the administrative issues are concerned, the above-described barriers have not improved over the analysed years and weighs down the sector's development.

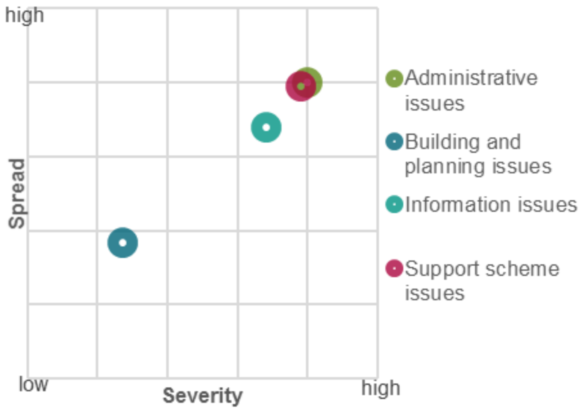


Chart 101. Average severity and spread per topic for RES-H&C in 2018

Regarding support scheme challenges, new barriers have been identified over the last years, increasing the gravity of barrier effects. The overly strong focus on biomass negatively impacts the development of other RES-H&C technologies. Although, it should be noted that biomass is the dominant technology to achieve 2020 targets.

The scatter plot provides a snapshot of the severity and extent of Hungarian stakeholders' issues with RES-H&C in 2018. The scatter plot shows that the lengthy and complex administrative processes mentioned above is by far the most dominant issue for stakeholders in Hungary this year, both in terms of spread and severity. Support scheme issues are ranked second and seriously impact the sector's development; yet, not affecting all RES plants equally.

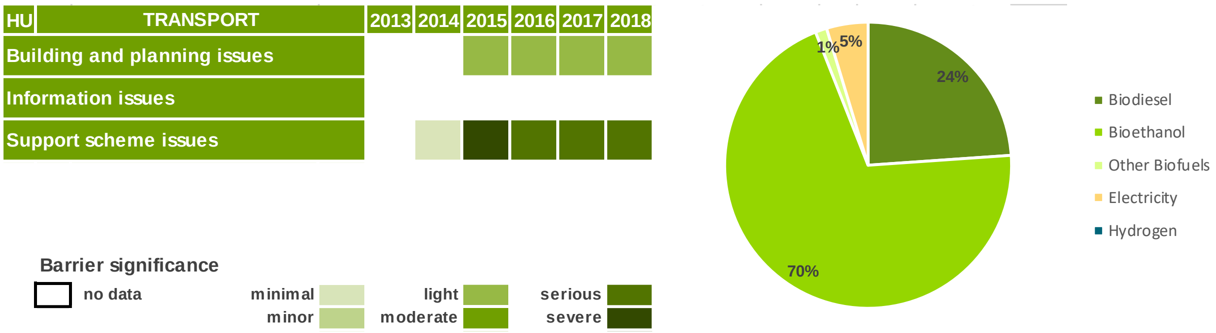


Chart 102. Heat map of the barrier indices per topic in the RES-T sector in Hungary 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the RES-T sector in Hungary, progress is seriously hampered by issues related to the support scheme. As visualised by the pie chart above, bioethanol is by far the most significant RES for the achievement of the planned 2020 trajectory targets for the transport sector in Hungary, followed by biodiesel.

As shown above, barriers dealing with support scheme issues have strongly affected the development of RES-T in Hungary since 2015. Low RES-T targets of the MS as well as the unambitious enforcement of planned objectives poses the largest barrier. The original plan foresaw a gradual increase of the quota obligation from 4.9% in 2014 to 6.5% in 2018. In December 2016, the Hungarian government decided to leave the quota at 4.9% until December 2019. In addition, stakeholders flagged the missing general support strategy alongside the quota obligation and the unambitious national target for advanced biofuels as barriers for the sectoral biofuels deployment. These particularly hinder the development of second generation biofuels. Currently, research projects on second- generation biofuels in Hungary are conducted at the level of basic research by research institutes or universities. Without state support, investors are reluctant to invest in such projects, since they are very costly and the technology is still immature. As far as building and planning issues are concerned, stakeholders report a lack of processing capacities for exploring the MS bioethanol potential. In fact, taking into consideration Hungary's corn production, bioethanol output could be increased approximately eightfold.

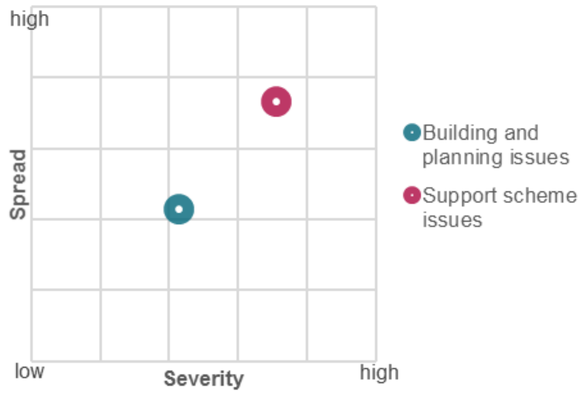


Chart 103. Average severity and spread per topic for RES-T in 2018

The heat map confirms the stagnation of support scheme issues' barrier indices at a very high level. The missing support strategy for advanced biofuels represents a significant obstacle to their deployment in the MS.

The scatter plot provides a snapshot of the severity and extent of Hungarian stakeholders' issues with RES-T in 2018. The above-described support scheme issues seriously impede the growth of the sector and affect the majority of installations. Building and planning issues only hinder growth to a lesser extent and only affect a small share of installations.

Malta

Table 47. Progress of Malta on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☐		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		State aid rules complicate FiT application procedure
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Required clearences from the Planning Authority complicate funding application procedure
	Online application for permit?	☐		Mandatory study for large PV plants assessing their influence on the electricity grid leads to higher administrative cost for PV operators
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☑		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☒		Planning conflicts due to space limitations
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Environmental constraints hinder the development of wind power
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐	Training & certification of installers of autogas conversion kits implemented	**Barriers due to information issues**
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Sporadic occurrence of grid connection problems
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		
	Priority of RES connection to the grid? (Art. 16 (1))	☑		
	Clear legal obligation for the system operator to reinforce the grid?	☒		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☒		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☒		No long-term security of support measures for RES-T
				Lack of a national renewable energy action plan
				No long-term security of support measures for RES-HC

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

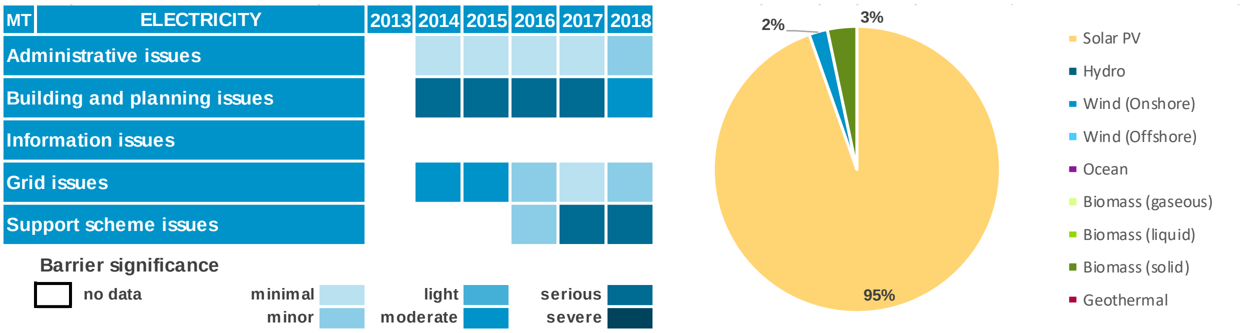


Chart 105. Heat map of the barrier indices per topic in the RES-E sector in Malta 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Malta is mainly hindered by serious barriers related to building and planning as well as support scheme issues. As visualised by the pie chart above, solar PV is by far the most significant RES technology for the achievement of the planned 2020 trajectory targets in the Maltese electricity sector.

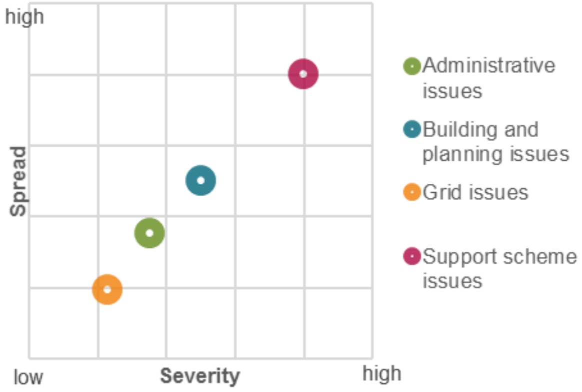


Chart 104. Average severity and spread per topic in the RES-E sector for 2018

The dominant issue related to building and planning in Malta for RES-E over the analysed five years is the occurrence of conflicts regarding the use of space. The demographic and geographic characteristics of the MS create issues for spatial planning, as Malta is a very small and densely populated state. Spatial planning, thus, considers devoting areas to RES, but often clashes with other planning needs. As there is not much space available on the island, the cost of land is extremely high so that there is a huge financial burden for large-scale RES installations in Malta. The heat map indicates a mixed development of the barrier indices, including increasing barriers for support scheme-related issues. This is mainly rooted in the fact that a binding framework for the deployment of solar PV in Malta was missing and hindering the development of larger installations for years. This problem was addressed by the publication of the Solar Farm Policy in October 2017, establishing a framework for larger installations and indicating eligibility criteria for large-scale PV installations. In addition, concrete construction sites on the islands are identified. The scatter plot provides a snapshot of the severity and extent of Maltese stakeholders' issues with RES-E in 2018. The ratio of severity and spread values is for all topics homogenous. Support scheme issues affect a very dominant share of all installations, followed by building and planning issues, which mainly hinder the deployment of large-scale installations. Administrative and grid issues are only affecting a lower share of installations.

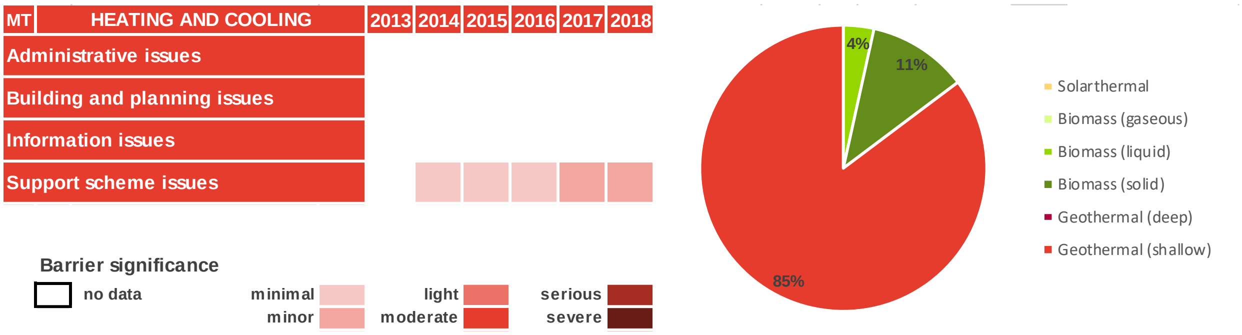


Chart 106. Heat map of the barrier indices per topic in the RES-H&C sector in Malta 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Malta is characterised by only minor barriers related to support scheme issues. As visualised by the pie chart above, heat pumps are the most dominant RES technology for the achievement of the planned 2020 trajectory in the Maltese H&C sector, followed by solid and liquid biomass.

The central RES-H&C barrier related to the Maltese support scheme during the five years analysed involves the lack of long-term security of the support framework. There are subsidies promoting the use of solar water heaters and aerothermal heat pumps in place, which are allocated in the beginning of the year on a first come first served basis. This leads to a certain insecurity among the applicants. But however, in general the heating demand and therefore the effectiveness of heating technologies is comparably low on the Maltese islands due to the climatic conditions.

The heat map indicates a stagnation regarding the support scheme issues with constantly minor values.

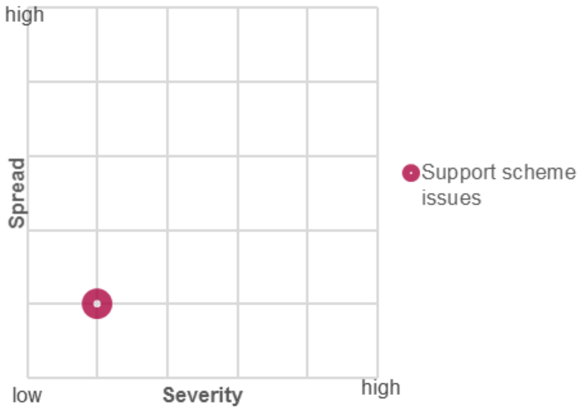
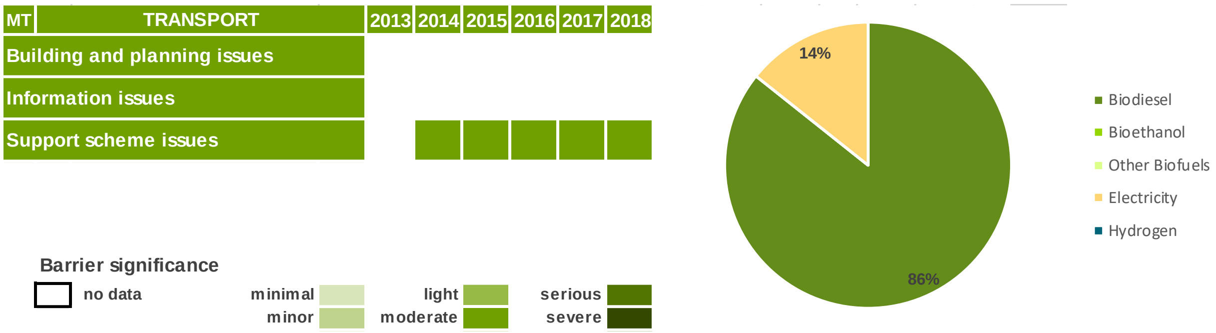


Chart 107. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severity and extent of Maltese stakeholders' issues with RES-H&C in 2018. The support scheme remains the sole, central issue, however only minorly limiting the growth potential of the sector and affecting a minor share of RES-H&C applications.



MT	TRANSPORT	2013	2014	2015	2016	2017	2018
Building and planning issues							
Information issues							
Support scheme issues			🟩	🟩	🟩	🟩	🟩

Chart 108. Heat map of the barrier indices per topic in the RES-T sector in Malta 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Maltese RES-T sector, development is limited to issues related to the support scheme. As visualised by the pie chart above, biodiesel as well as electricity are the two dominant RES technologies for the achievement of the planned 2020 trajectory in the Maltese transport sector.

The major challenge for RES-T in Malta over the last five years involves the lack of long-term security of support. The main support measure in the transport sector for RES is a biofuel substitution obligation. However, there are no specific support measures for 2nd generation biofuels. Due to the limited availability of space, the biomass cultivation potential is extremely low in Malta. Also, despite a certain potential for e-mobility resulting from short average distances and one of the highest vehicle rates per capita, this technology is not sufficiently promoted, so that the uptake of electric vehicles is hindered.

The heat map visualises a stagnation in the barrier indices regarding support scheme issues. This is because there have been no changes and apparently no focus in the past years.

The scatter plot provides a snapshot of the severity and extent of Maltese stakeholders' issues with RES-T in 2018. The support scheme remains the sole, central issue, moderately limiting the growth potential of the sector and affecting a moderate share of RES-T applications.

Chart 109. Average severity and spread per topic in the RES-T sector for 2018

Netherlands

Table 48. Progress of the Netherlands on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Onshore wind interferes with military and civil aviation radars
	“One Stop Shop” ? (Art. 22(3)a)) ?	☐		RES insufficiently considered in local spatial planning
	Online application for permit?	☑		The certification of building-integrated PV components is complex and expensive
	Maximum time limit for procedures?	☐		Geographical Limitation of Zipcode Model
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑	Large-scale RES projects fall within the national coordination arrangement which allows the national government to coordinate the decision-making process. Furthermore, coordination arrangements have been introduced for provincial governments and municipalities.	
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Uncertainty about expansion of airports and flight paths
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		RES insufficiently considered in local spatial planning
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑		**Barriers due to information issues**
				Insufficient dissemination of information on building-integrated PV
Grid issues	Grid usage fee?	☑	The report mentions there are transportation fees	**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Insufficient grid capacity for the planned PV installations
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Overcapacities in neighbouring countries may lead to curtailment of RES plants in the Netherlands
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		
	Priority of RES connection to the grid? (Art. 16 (1))	☑		
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		SDE+ only pays after installations are already running
				Insufficient funding for geothermal and biomass plants
				Uncertainty about the governmental strategy on shallow heat pumps and solar boilers on the household scale
				The modified rules on the cumulating of support schemes for large solar installations reduce their financial stability

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

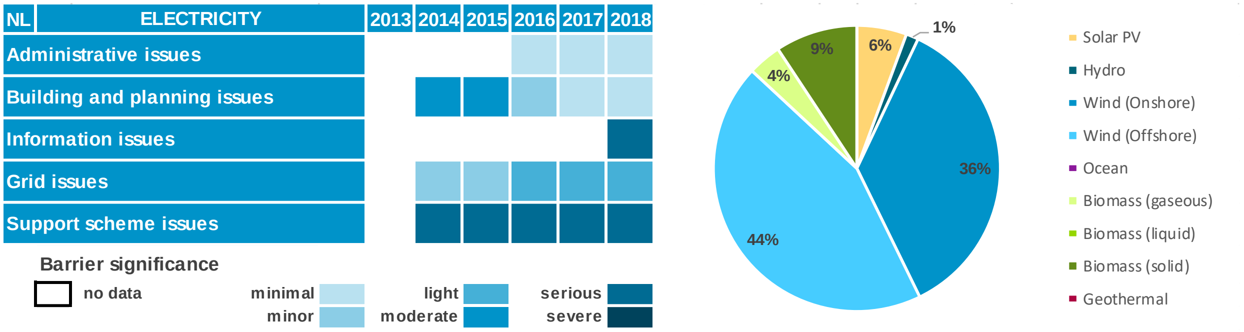


Chart 110. Heat map of the barrier indices per topic in the RES-E sector in the Netherlands 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in the Netherlands is mainly hindered by moderate to serious barriers regarding support schemes, grid and information issues. As visualised by the pie chart above, onshore and offshore wind are by far the most significant RES technologies for the achievement of the planned 2020 trajectory for the Dutch electricity sector.

The dominant issues related to the support schemes in the Netherlands for RES-E over the analysed five years are the uncertainty of policy consistency after municipal and national elections, with a tendency of new governments to decisively change the support framework; the missing short-term targets in the “Energieagenda”, which are especially needed for the 2020 target achievement; as well as a too strong focus on a general RES-E strategy on biomass. Regarding information issues, the training shortage of qualified technicians for the installations of RES plants reported in 2018 may heavily impact further sectoral development. Finally, identified grid issues are partially due to a non-harmonised development of the grid and the SDE+ support framework.

The heat map indicates an overall stagnation of the barrier indices. Some support obstacles, such as the uncertainty regarding policy stability are clarified for the time being. However, other barriers still impact on the sectoral development and limit the growth of RES technologies.

The scatter plot provides a snapshot of the severity and extent of Dutch stakeholders’ issues with RES-E in 2018. Information issues, particularly the shortage of trained professionals, are perceived as growing issues affecting a majority of installations at a moderate level. The above-described support scheme situation affects project development even more importantly. Grid issues only affect some RES plants; yet, if affected, their development is seriously hindered.

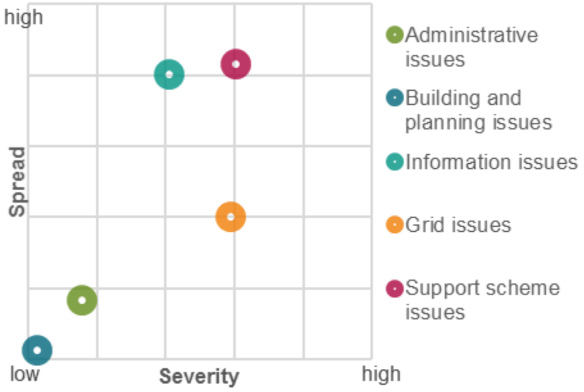


Chart 111. Average severity and spread per topic in the RES-E sector for 2018

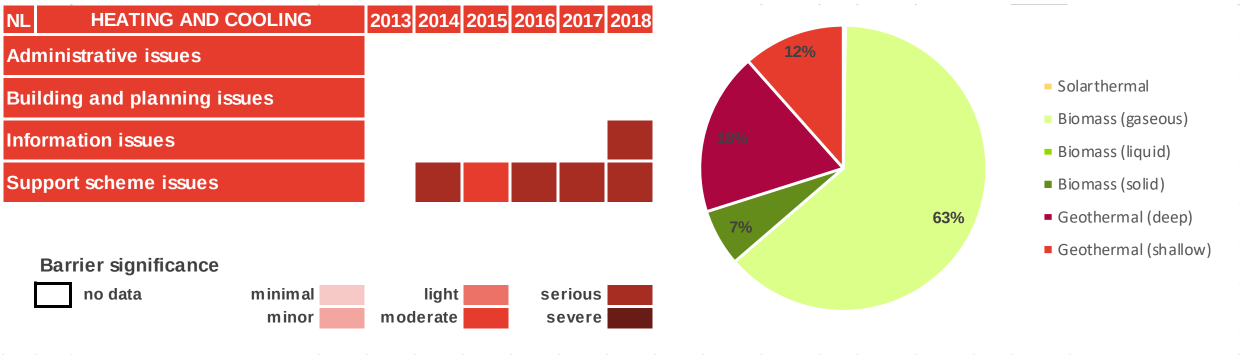


Chart 112. Heat map of the barrier indices per topic in the RES-H&C sector in the Netherlands 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in the Netherlands is characterised by serious barriers related to information as well as support scheme issues. As visualised by the pie chart above, gaseous biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory for the Dutch H&C sector, followed by shallow and deep geothermal energy.

The central barriers related to the support scheme in the Netherlands for RES-H&C over the analysed five years included the reliability of the general support strategy and framework in light of municipal and national elections, as also reported for the electricity sector; the lack of a short-term vision in the “Energieagenda”, which would also be required in the heating sector to meet defined 2020 targets; the insufficient priority given to shallow heat pumps and solar boilers on household level; the SDE+ support scheme eligibility criteria that requires a running system for the application of support, which burdens high pre-financing costs to the developers; as well as the general SDE+ yearly application cycles, which limit the possibility for support applications. Regarding information issues, the training shortage of qualified technicians for the installations of RES plants reported in 2018 may seriously impact further sectoral development. The heat map indicates an overall stagnation, respectively a slight increase for support scheme issues in the barrier indices. This is mainly caused by the fact that with the advancing time lapse for target achievements, stakeholders are identifying and perceiving the barriers as more urgent. The missing short-term vision, the lack of priority given to relevant RES technologies as well as some support criteria are now perceived as more urgent challenges. Yet, the Dutch government also addressed some concerns by introducing a bi-annual application possibility for RES developers, among others.

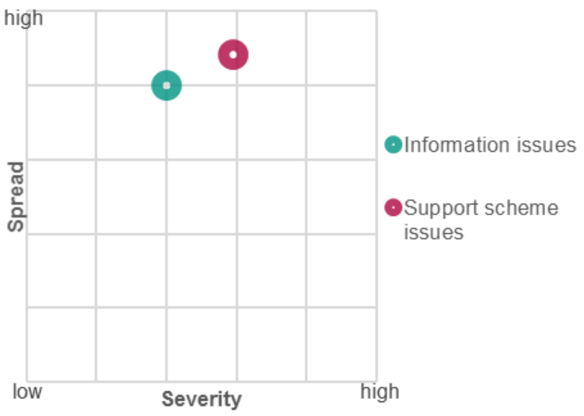


Chart 113. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severity and extent of Dutch stakeholders’ issues with RES-H&C in 2018. The above outlined support scheme issues affect the majority of installations with a moderate to serious severity. The shown information issues affect less installations and with a lower severity level.

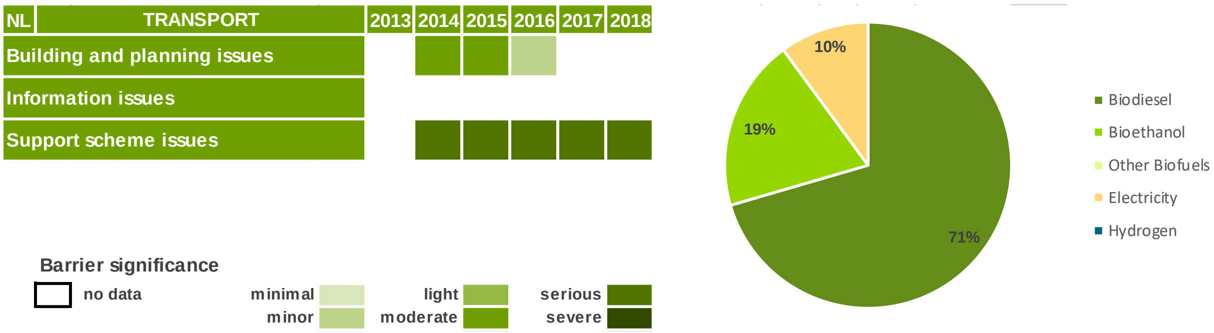


Chart 114. Heat map of the barrier indices per topic in the RES-T sector in the Netherlands 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Dutch RES-T sector, progress is hampered by issues related to the support scheme and the building and planning framework. As visualised by the pie chart above, biodiesel is the most important RES technology for the achievement of the planned 2020 trajectory for the Dutch transport sector, followed by bioethanol and e-mobility.

The main challenges for RES-T in the Netherlands over the last five years include aspects already mentioned in the RES-E and RES-H&C sectors. These cover the reliability of the general RES-T strategy and support framework in light of elections; the lack of a holistic vision for the transport sector, which results in a strong support of individual technologies; yet, without a comprehensive linkage of activities, the strong focus of the transport efforts on e-mobility, even though the technology shall only contribute to 10% of the 2020 target for transport; as well as the scattered competencies for the mobility sectors among a multitude of ministries and governmental institutions.

The building and planning issue reported in early years concerned the lack of a broader available infrastructure for biogas fired private cars. Here, a strong focus was given to heavy-duty and public transport. As shown by the heat map, barriers dealing with building and planning issues disappeared thanks to stronger efforts to roll out the required filling stations for private cars.

The scatter plot provides a snapshot of the severity and extent of Dutch stakeholders’ issues with RES-T in 2018. The support scheme remains the sole, central issue, affecting a majority of installations with a moderate severity that may cause substantial delays for the project realisation as well as extra costs for the developer.

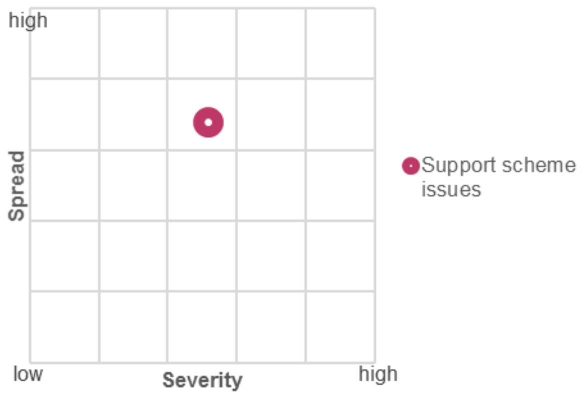


Chart 115. Average severity and spread per topic in the RES-T sector for 2018

Austria

Table 49. Progress of Austria on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		Long administrative procedures
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Complicated administrative procedure
	Online application for permit?	☐		Lack of harmonised guidelines in planning guidelines and call for proposals
	Maximum time limit for procedures?	☐		Eligibility spaces considerably limits the installation of wind power plants
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	⌛	A facilitated procedure for small scale PV is planned for mid-2018.	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Increasingly strict environmental impact assessment
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑		Implementation of the water framework directive complicates the development of hydropower plants
	Obligation to use RES in public buildings? (Art. 13 (5))	☑		Eligibility spaces considerably limits the installation of wind power plants
				Refurbishment requirements do not encourage enough the development of district heating
				Implementation of the Habitat Directive hinders the deployment of wind power plants
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Misleading perception of EV customers regarding the number of charging stations for e-vehicles
				Occasional resistance towards RES project development
				Lack of RE in industrial processes
				Distorted perception of governmental support
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Slow development of new grid structures
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Discrimination of domestic RE-producers by net grid service fees (G-component)
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Complications with grid connection
	Priority of RES connection to the grid? (Art. 16 (1))	☐		Multi-party PV Prosuming hindered by local DSOs
	Clear legal obligation for the system operator to reinforce the grid?	☐		Self-consumption is constrained by fees on the consumer side
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Low support volumes for RES projects
				Lack of political will to promote RES-HC systems
				Lack of promotion of rooftop RES plants for companies and industry
				Difficult economic operation for small hydro power plants
				Lack of federal strategies in accordance to national 100% RE target

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

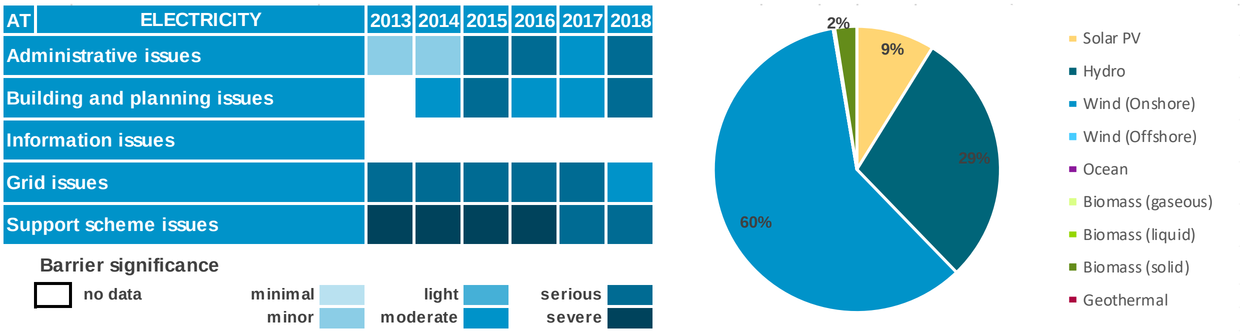


Chart 116. Heat map of the barrier indices per topic in the RES-E sector in Austria 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Austria is mainly hindered by serious barriers related to support issues. As visualised by the pie chart above, onshore wind and hydro power are by far the most significant RES technologies for the achievement of the planned 2020 trajectory in the Austrian electricity sector.

The dominant issues related to the support scheme in Austria for RES-E involved uncertainty regarding the reform of the Green Electricity Act until its entry into force in 2017 and the current restriction of the yearly support volume for RES projects, leading to long waiting times for new projects as well as insufficient support for almost all RES technologies, including PV, hydro and wind. The equal treatment of new and re-powered wind installations as well as the inconsistency of the FIT support periods and the potential life time of wind installations were also flagged as challenges.

The heat map indicates a relative stagnation in the barrier indices. The slight improvement in support scheme issues is mainly caused by the 2017 reform of the Green Electricity Act that addressed market actors' general uncertainty by providing a support outlook, while it also significantly raised the overall support budget. The Act minimised the contingency of a yearly support allocation. Nevertheless, the amount of planned and realised projects still remains at a low level, notably due to the persistence of other barriers. Regarding the building and planning issues, the length of grid development approval procedures, the local fragmentation of regulations as well as the unharmonized regional processes regarding the participation of local citizens in the grid development process are perceived stronger in 2018. The scatter plot provides a snapshot of the severity and extent of Austrian stakeholders' issues with RES-E in 2018. Grid and administrative issues affect a very dominant share of all installations; yet, administrative issues hinder even more importantly the development of installations. Stakeholders flagged here particularly the scattered regulations between the federal states regarding the water and conservations laws. Building and planning as well as support scheme issues are only affecting a slightly lower share of installations; however, their impact on the individual development is even higher, resulting in longer lead times and higher realisation costs.

The RES-H&C sector in Austria is characterised by moderate to serious barriers related to administrative, building and planning and support scheme issues. As visualised by the pie chart, shallow geothermal is the most dominant single RES technology for the achievement of the RES 2020 trajectory in Austria, followed by solid biomass and solar thermal.

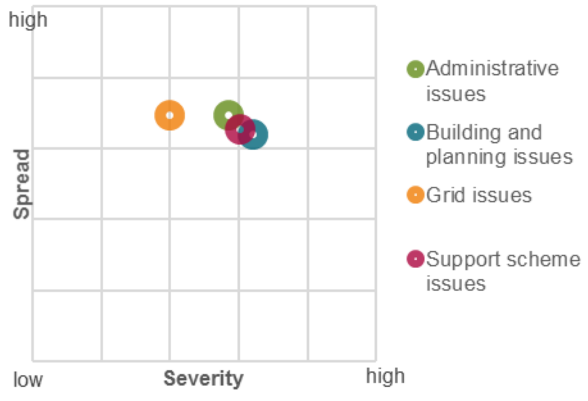


Chart 117. Average severity and spread per topic in the RES-E sector for 2018

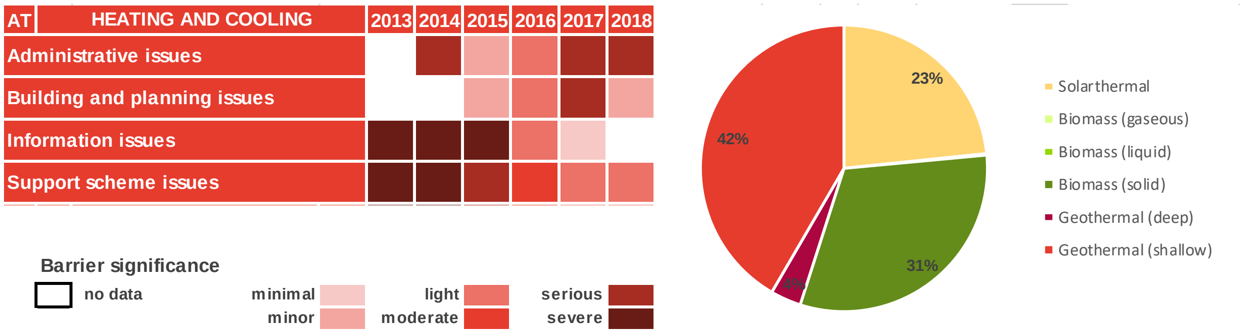


Chart 118. Heat map of the barrier indices per topic in the RES-H&C sector in Austria 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The heat map indicates a diverse picture regarding the development of barrier indices for the different topics. While the indices for information as well as support scheme issues show a decrease, the ones for administrative and building and planning issues have increased over the last years. Central RES-H&C barriers related to the Austrian support scheme involve the insufficient stimulation for the switch from oil-fired boilers to renewable solutions, such as wood pellet boilers, insufficient promotion to feed biomethane into the national gas grid, as well as the lack of RES in industrial solutions. Here, the improvement in the barrier indices since 2016 is mainly due to the introduction of attractive investment subsidies amounting to up to 40% of the initial price for biomass plants. Regarding administrative issues, the lack of harmonised guidelines among the federal states as well as the long lead times for the authorisation process of RES installations and the high number of involved authorities have been perceived as stronger barriers over the last years. Yet, from the European perspective Austria still remains a frontrunner for the application of renewable heating solutions. Finally, issues concerning information challenges included insufficient stimulation of the energy pass requirements to support RES and the lack of information on the biomass potential among final consumers. In this regard, the “Wärme aus Holz AT” campaign addressed the insufficient knowledge of the benefits and potential of renewable heating solutions. This raised awareness among final consumers, essentially eliminating the barrier by 2018.

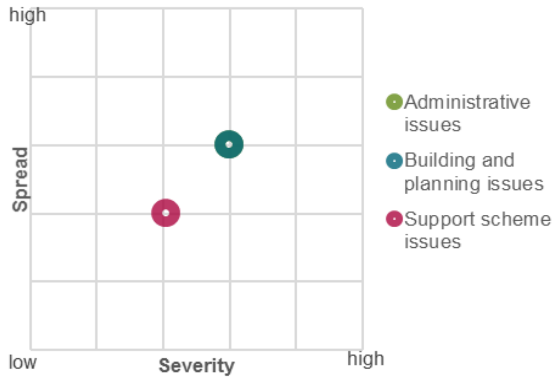


Chart 119. Average severity and spread per topic in the RES-H&C sector for 2018

The scatter plot provides a snapshot of the severityand extent of Austrian stakeholders’ issues with RES-H&C in 2018. The above outlined administrative and building and planning issues are dominant obstacles for a large share of installations and impede their development. Support scheme issues only impact a minor number of installations, with less severity.

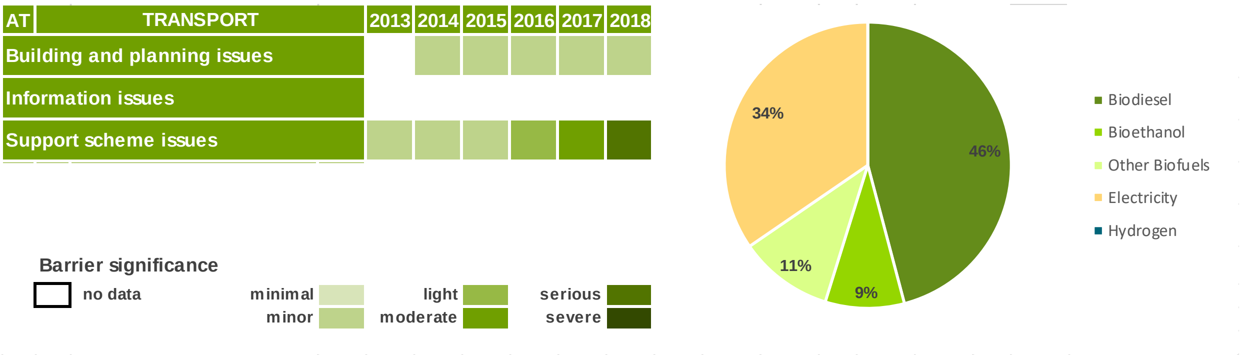


Chart 120. Heat map of the barrier indices per topic in the RES-T sector in Austria 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Austrian RES-T sector, development is limited to issues related to the support scheme. As visualised by the pie chart above, biodiesel as well as electricity are the two dominant RES technologies for the achievement of the planned 2020 trajectory in the Austrian transport sector.

The main challenges for RES-T in Austria in dealing with support scheme issues over the last six years involve the degradation of the admixing quota from E10 to E5 and the insufficient stimulation to foster the switch from combustion engines to electricity solutions. In this regard, an ‘action package’ for e-mobility was introduced in November 2016 including a financial package of €72 million, which stakeholders consider too low to be effective.

The heat map visualises an increase in the barrier indices regarding support scheme issues. This can be linked to the slow developments in electric transportation highlighting further roadblocks. The effects of the degradation of the admixing quota remains stable. As far as building and planning issues are concerned, stakeholders report the lack of efforts at municipal level to support the roll-out of electric vehicles through the required infrastructure to raise the technology’s attractiveness.

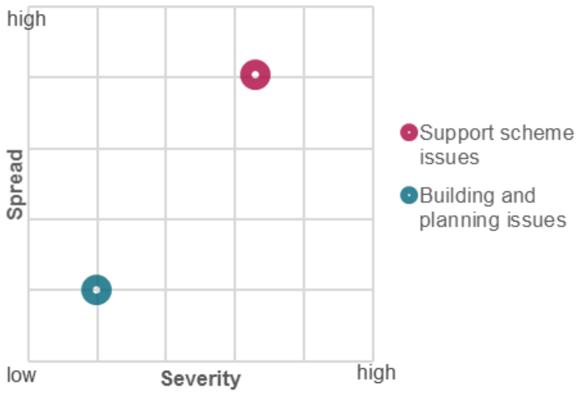


Chart 121. Average severity and spread per topic in the RES-T sector for 2018

The scatter plot provides a snapshot of the severity and extent of Austrian stakeholders’ issues with RES-T in 2018. The support scheme remains the sole, central issue, seriously limiting the growth potential of the sector and affecting the very dominant share of RES-T installations.

Poland

Table 50. Progress of Poland on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑	Evaluation of progress focuses on recent changes in RES law, including new support scheme, obligation of RES-E purchase from installations < 500kW by parties designated by the regulator	**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Complicated environmental permitting procedure
	"One Stop Shop" ? (Art. 22(3)a)) ?	☑		Lengthy administrative procedures affect all the project development process
	Online application for permit?	☐		Imprecise and discretionary pre-qualifications rules for participation in tenders
	Maximum time limit for procedures?	☐		Long appeal procedure
	Automatic permission after deadline passed? (Art. 22(3)b))	☒		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑	Policy 1 and Policy 8 (exemption from obtaining a licence for electricity generation); separate tenders for installations of up to 1 MW	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☒	Not applicable since spatial planning is prereogative of local authorities (report 2009-2010)	**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Spatial restrictions affect the construction of new wind plants
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Numerous appropriate land plots for RES belong to the Agricultural Property Agency
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		Lack of local spatial development plans
Informa tion	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑	"TSO/DSO is required to conclude a contract for connection to the grid with entities applying for connection to the network, based on the principle of equal treatment and to	Lack of clear energy policy leads to uncertainty from grid operators about their future grid expansion investments
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		Old and inefficient electricity grid
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Poor grid infrastructure limits the access of new RES-E producers to the grid
	Priority of RES connection to the grid? (Art. 16 (1))	☑	TSO/DSO is required to conclude a contract for connection to the grid with entities applying for connection to the network, based on the principle of equal treatment and to	Mandatory advance payment for grid connection without certainty on the grid connection point
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☐		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☑	Changing the amount of the substitution fee ("coupling subst. fee to market conditions," p. 12); other changes concern multi-fuel firing (biomass) and hydro, but affect only installations launched after 1.07.2016.	Unstable existing and proposed support system
				Unfavourable support scheme for prosumers
				Lack of clear vision and no support schemes for RES-HC
				Auctions as inappropriate support scheme for smaller installations

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

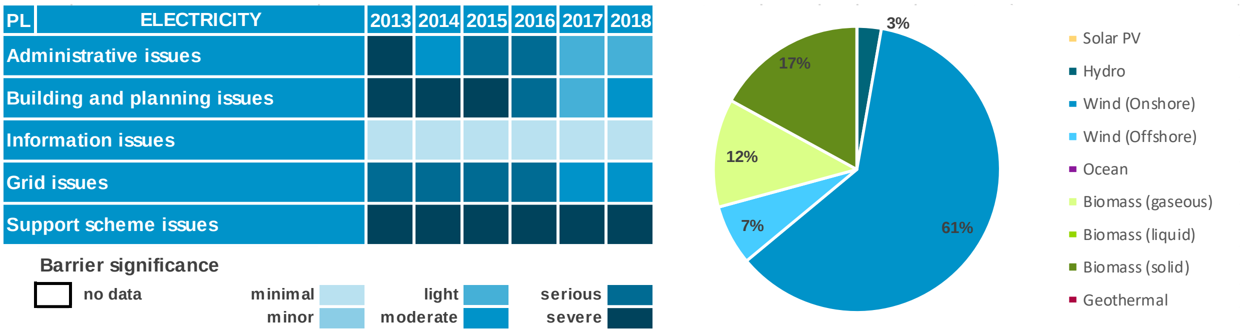


Chart 122. Heat map of the barrier indices per topic in the RES-E sector in Poland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Poland is mainly hindered by significant barriers related to support scheme issues. In addition, investors are facing moderate grid as well as building and planning issues. Administrative and information issues hamper the development of RES-E only to a light or even minor degree. As visualised by the pie chart above, onshore wind and to a lower degree offshore wind are the most significant RES technologies for the achievement of the planned 2020 trajectory in the Polish electricity sector. Other relevant technologies are solid and gaseous biomass.

The dominant issues related to the support schemes in Poland for RES-E over the analysed six years involved the uncertainty regarding the past and existing support scheme. Under the previous quota system, the prices for green certificates dropped by 80% over the past five years and rose only recently. This was also because of the governmental decisions to count coal-biomass co-firing as green energy and since the quota targets were lowered. The start of the current auctioning scheme has not increased investors' confidence. After a long preparation period due to the lengthy notification process, it became clear that there is no long-term plan regarding the volumes of energy or shares of particular technologies. An additional shortcoming is that the Polish government does not show a decisively strong commitment to support RES-E. Main grid barriers result from the old grid that causes additional costs and risks for investors. Building and planning issues are connected to building restrictions that make wind onshore installations almost impossible.

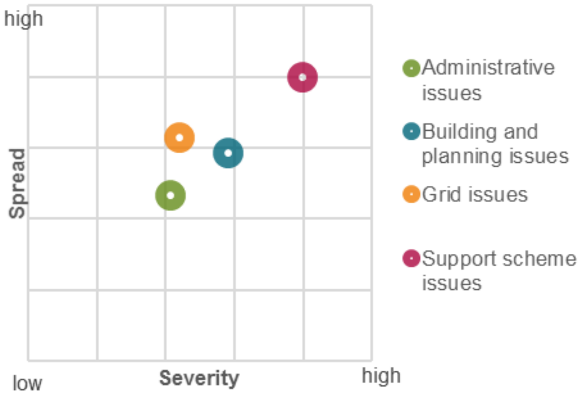


Chart 123. Average severity and spread per topic in the RES-E sector for 2018

The heat map indicates an overall stagnation in the barrier indices for support scheme issues and a slight decrease in other fields. It is not clear though, whether this improvement is due to an improved framework or whether support scheme issues have become so dominant that stakeholders ignore other issues. The scatter plot provides a snapshot of the severity and extent of Polish stakeholders' issues with RES-E in 2018. Support scheme issues show the highest value, they render new projects for most installations almost impossible. Building and planning issues and grid issues are comparable. The former's effect is more significant, and the latter is more widespread. Administrative issues have a more moderate tendency.

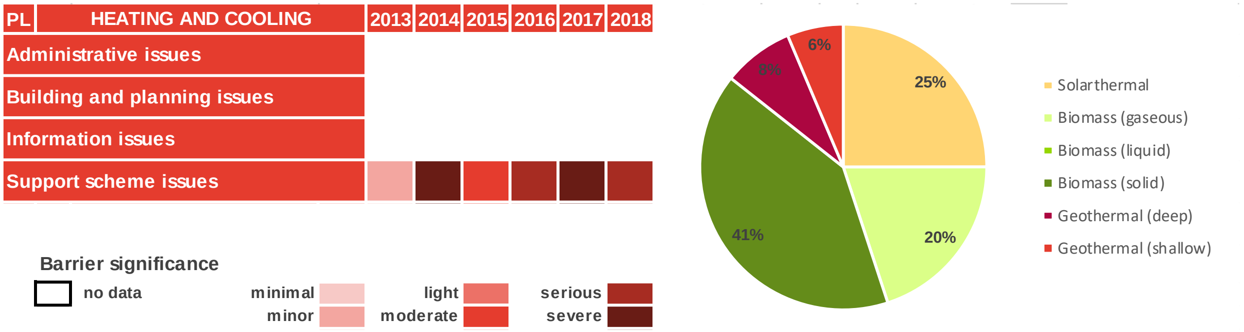


Chart 124. Heat map of the barrier indices per topic in the RES-H&C sector in Poland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Poland is characterised by serious barriers related to support scheme issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology selected for the achievement of the planned 2020 trajectory in the Polish H&C sector, followed by liquid biomass, solar thermal and geothermal technologies.

The central RES-H&C barrier related to the Polish support scheme during the six years analysed is the lack of an effective support scheme. To some extent, this can be explained by the nature of the sector. The heating sector is highly locational and the produced heat cannot be transported as easily as electricity, but has to be used for a predefined and local goal. Therefore, a general support scheme that simply allows for the funding of a certain amount of generated energy (such as a feed-in-tariff or a tendering scheme) would be much less effective than support schemes known in the RES-E sector. To this end, only investment support is granted, with minor effects. Another challenge is, however, that the government and the stakeholders have not developed a common vision and targets for the H&C sector. Targets exist only for CHP, but officially there is no mention of fuel mix or emission performance standards, neither for integrated heating systems nor for individual systems. Without clear targets, it is difficult to communicate the necessity of action and to choose the right policies and tools.

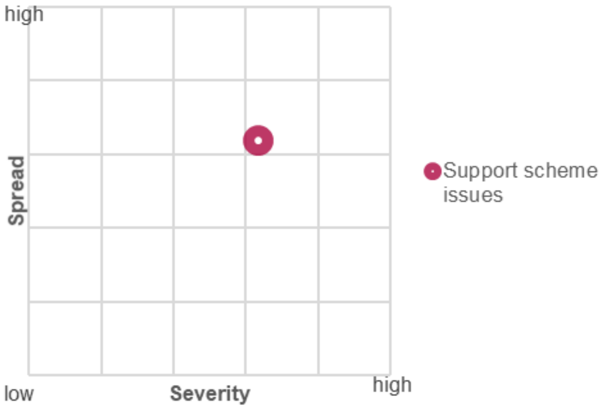


Chart 125. Average severity and spread per topic in the RES-H&C sector for 2018

The heat map indicates an inconsistent development of support scheme issues, which annually fluctuated between severe and moderate evaluations. One reason for the current more positive trend was that the RES Act was adopted which abolished some key barriers. Nevertheless, the current conditions still need to follow that positive trend to allow Poland to live up to its potential.

The scatter plot provides a snapshot of the severity and extent of Polish stakeholders’ issues with RES-H&C in 2018. The above outlined support scheme issues are the sole and dominant obstacles for a large share of installations and impede their development.

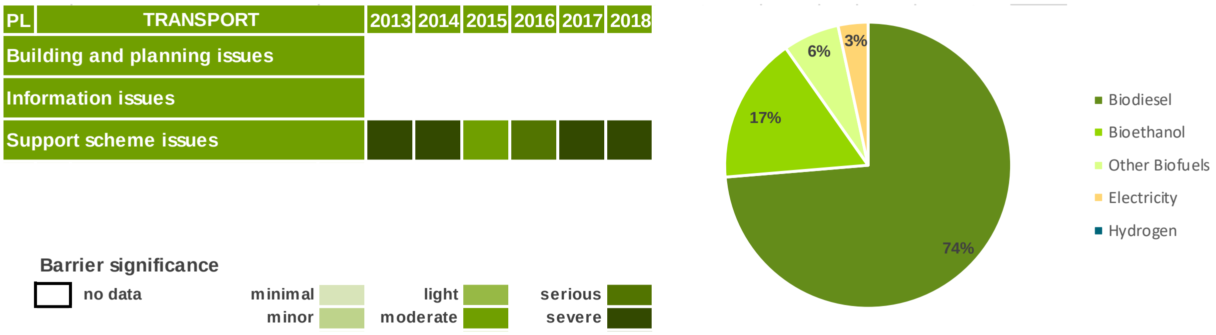


Chart 126. Heat map of the barrier indices per topic in the RES-T sector in Poland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of the Polish RES-T sector is limited by issues related to the support schemes. As visualised by the pie chart above, biodiesel is the dominant RES technologies for the achievement of the planned 2020 trajectory in the Polish transport sector. Bioethanol and other biofuels also play a relevant role. For e-mobility, only a smaller share is foreseen in the original Polish NREAP.

The main challenges for RES-T in Poland over the last six years was an unbalanced planning in the sector. The strong state support for the development of electric cars and the goals for the use of electric cars announced in the Plan for Responsible Development and the legislative framework implemented in 2018 are not combined with an increased production of electric energy from RES. New technologies in biofuels production are not supported.

The heat map visualises a relative stagnation of support scheme issues. This can be linked to the slow developments in the biofuel sector.

The scatter plot provides a snapshot of the severityand extent of Polish stakeholders' issues with RES-T in 2018. The support scheme remains the sole, central issue, seriously limiting the growth potential of the sector and affecting the very dominant share of most RES-T applications that are based on biofuels. It remains to be seen whether that development can be compensated by future increase in the e-mobility sector.

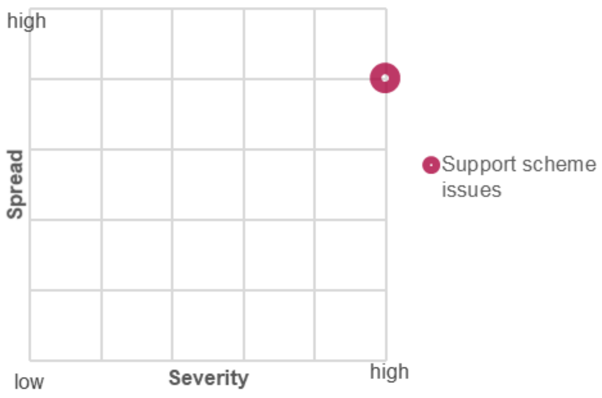


Chart 127. Average severity and spread per topic in the RES-T sector for 2018

Portugal

Table 51. Progress of Portugal on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑	For the three sectors (RES-E, RES-H&C, RES-T).	**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		New licensing procedure rules might jeopardize new projects
	“One Stop Shop” ? (Art. 22(3)a)) ?	☐		Lengthy and expensive environmental permitting process
	Online application for permit?	☐		Lack of spatial compatibility assessment beforehand leads to land use conflicts for certain RES projects
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Lack of certification schemes for RES-HC installations
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	⌛	There is a project (not executed yet) to create a national registry system of installers of small-scale renewable thermal systems (solar thermal, heat pumps and biomass systems).	**Barriers due to information issues**
				Insufficient information on RES-H&C technologies
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		The self-consumption regime does not account for the benefits of self-consumption production units
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		Difficult integration of RES-HC facilities in the refurbishment of existing buildings in urban areas
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Lack of regulatory framework supporting the use of biogas and hydrogen for vehicles
	Priority of RES connection to the grid? (Art. 16 (1))	☐		
	Clear legal obligation for the system operator to reinforce the grid?	☐		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐	There are current negotiations to transfer statistics with another EU Member-State.	
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☐		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Reduction of the support period for small hydro-power plants
				Lack of fiscal benefits for RES-HC plants
				The pricing of biodiesel does not ensure the profitability of the biodiesel production industry
				Bad fiscal conditions for private micro-producers affect projects' profitability
				Largely unexploited biomass potential

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

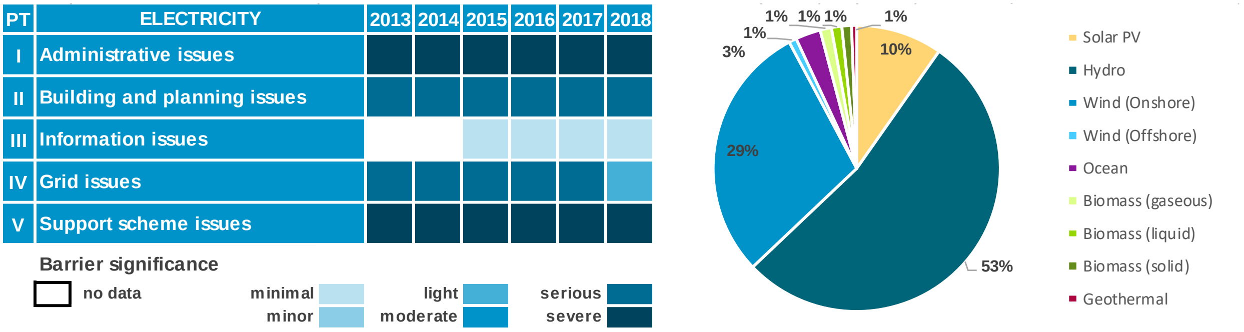


Chart 128. Heat map of the barrier indices per topic in the RES-E sector in Portugal 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Portugal is mainly hindered by important barriers related to administrative and support issues and serious issues related to building and planning issues as well as grid issues. As visualised by the pie chart above, hydro power, onshore wind power and solar PV are the most significant RES technologies for the achievement of the planned 2020 trajectory in the Portuguese electricity sector.

The barriers under the category of administrative issues are mainly related to complex procedures due to several involved authorities that are not coordinated, and legislation being spread over numerous legal sources. A service portal (“SERUP”) has been set up to overcome this problem but it failed to provide a one-stop-shop. As a consequence, administrative procedures are time-consuming and expensive, and it is not always possible to comply with the referred deadlines. The main barrier regarding support schemes is the uncertainty about new support mechanisms. Decree-Law 215-B/2012 has set a moratorium for all large RES-E projects introduced by Decree-Law 25/2012. It has changed the existing electricity generation regimes, namely the Ordinary Regime and the Special Regime, promoting a consolidation of the legal regime applicable to large RES-E projects. New RES-E plants should be paid according to the Wholesale Electricity Market price (MIBEL). Support schemes were therefore extinguished and can only be envisaged via a specific power granting tender to be launched by the competent energy authority. However, an ordinance defining the details of these tenders is still to be published. Building and planning issues are connected to burdensome environmental licencing requirements. Grid issues are connected to lacking interconnectors and high connection costs. However, the latter is currently being addressed through the signing of an interconnection expansion deal signed between Portugal, Spain and France. The deal recognises that new interconnections require reinforcements in existing grids (which should be identified as a matter of urgency). A successful implementation of the deal would ease this barrier significantly. The heat map indicates an overall stagnation in the barrier indices, a slight change can be only seen for grid issues after unclear rules for RES curtailment were solved.

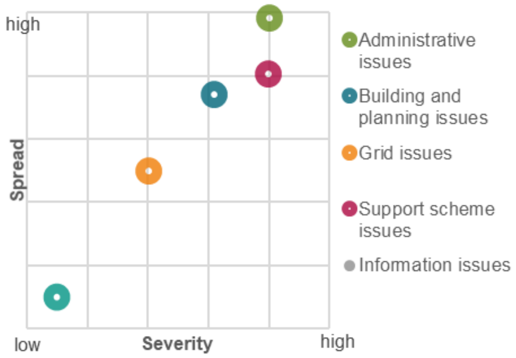


Chart 129. Average severity and spread per topic in the RES-E sector for 2018

The scatter plot provides a snapshot of the severity and extent of Portuguese stakeholders’ issues with RES-E in 2018. Administrative issues affect almost all installations and impede successful projects seriously. Support scheme issues are equally noteworthy but affect fewer installatations (yet the majority of new ones). Building and planning and especially grid issues are less problematic but still worrying.

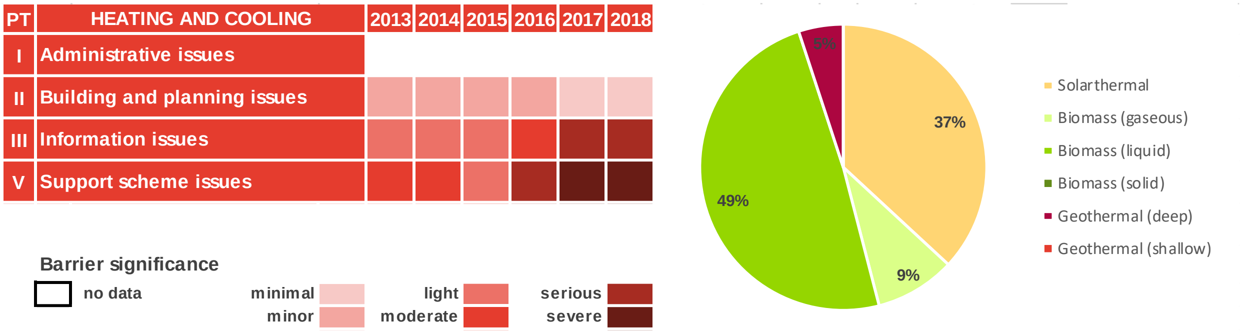


Chart 131. Heat map of the barrier indices per topic in the RES-H&C sector in Portugal 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Portugal is mainly characterised by strong barriers related support schemes and information issues. As visualised by the pie chart above, solid biomass and solar thermal are the most dominant RES technologies for the achievement of the planned 2020 trajectory in the Portuguese H&C sector, followed by biogas and geothermal energy.

The central barrier for RES-H&C in Portugal is a lack of an effective RES-H&C strategy. Both the Green Growth Commitment and the Green Tax Reform have not proposed measures for the RES-H&C sector. In addition, incentives were removed in recent years: Under the previous micro generation regime, the installation of solar thermal panels or biomass boilers was mandatory in order to receive the FIT. Under the new self-consumption and small units' legislation, which was published in October 2014 and changed the micro generation regime, the installation of these systems is no longer mandatory. Regarding information issues, the information on RES-H&C technologies is insufficient. There is a lack of awareness about the RES-H&C technologies and their benefits for policy makers, the general public, urban planners as well as installers. The barrier especially affects the biomass technology because it is a new source for a large share of the general population and there is a lack of diffusion of this sort of RES technology. The heat map indicates a diverse picture regarding the development of barrier indices for the different topics. Information and support scheme issues have become worse over the past years, partly due to an increased resistance from the public. The scatter plot provides a snapshot of the severity and extent of Portuguese stakeholders' issues with RES-H&C in 2018. The above support scheme issues affect almost all existing RES-H&C projects to a major degree. Information issues are less negative but still problematic in international comparison. Building and planning issues have only a slight impact and affect only few installations and also show a more positive trend.

Chart 130. Average severity and spread per topic in the RES-H&C sector for 2018

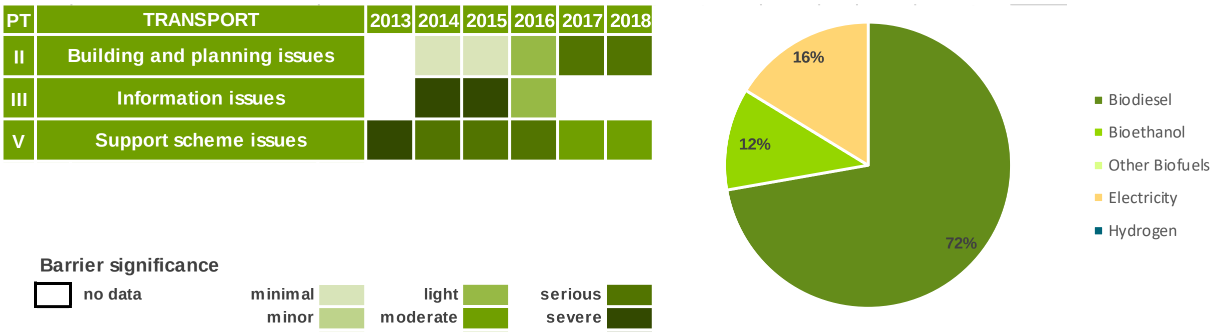


Chart 132. Heat map of the barrier indices per topic in the RES-T sector in Portugal 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Portuguese RES-T sector, progress is hindered by barriers related to building and planning issues as well as support scheme issues. As visualised by the pie chart above, biodiesel as well as electricity and other biofuels are the dominant RES technologies for the achievement of the planned 2020 trajectory in the Portuguese transport sector.

The main challenges for RES-T regarding building and planning issues are the lack of incentives in terms of agriculture policy and land planning for 2nd generation biofuels because there is a risk that the demand for it is not sufficiently high. Another problem is the delayed development of charging infrastructures. These barriers are perceived as stronger by stakeholders over time, as shown by the heat map.

With regards to support scheme issues, the main barrier is the blending limit for biofuels in the EU market. There is no recommendation for the development and commercialisation of higher biofuels mixtures in Portugal, since there is no longer a binding European target for RES in transport for the time after 2020 and this already has implications for current decisions. Also the blending obligation for 2019/2020 was lowered in 2019 to 7%, rather than 10%. Information issues were quite relevant some years ago but are not perceived as a barrier by stakeholders since a couple of years, partially because the underlying ILUC discussion has slowed down in Portugal.

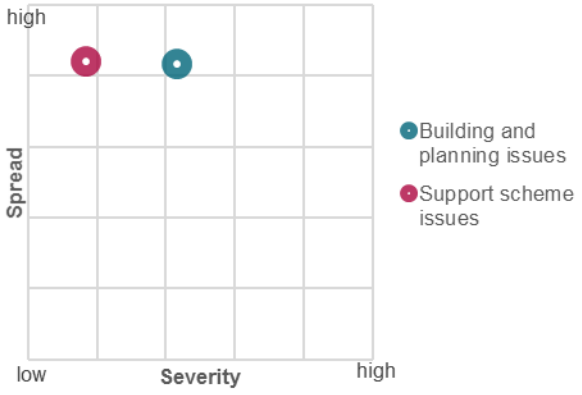


Chart 133. Average severity and spread per topic in the RES-T sector for 2018

The scatter plot provides a snapshot of the severity and extent of Portuguese stakeholders’ issues with RES-T in 2018. The building and planning issues affects a very large number of RES-T applications but only at a moderate level of severity. Support scheme issues affect even a bit more applications but only at a very light degree of severity.

Romania

Table 52. Progress of Romania on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Inconsistent licensing procedures among the regions
	“One Stop Shop” ? (Art. 22(3)a)) ?	☐		Long administrative procedures lead to higher project costs
	Online application for permit?	☐		
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑	Small producers are allowed to close bilateral contracts.	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Poorly maintained district heating network
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Lack of funding for subsidy programmes promoting RES-H&C
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☒	RES have priority grid access and priority dispatch. RES plants and CHP plants with a capacity ≤ 1 MW have a higher priority.	Insufficient grid development
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	⌛	A plan is currently developed for the reinforcement of transmission and distribution of electricity grid. Planned for 2019.	Increasing duration of grid connection process
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Inconsistent cost distribution for grid expansion in the course of grid connection
	Priority of RES connection to the grid? (Art. 16 (1))	☑	Priority access and dispatch for RES and high CHP plants	No possibility of injecting biomethane into the grid
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑	Expenditure regarding the changing electricity transmission installations as result of connecting new users is subject to regulation in force.	
	RES-priority in dispatch? (Art. 16 (1))	☑	Priority access and dispatch for RES and high CHP plants	
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	⌛		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑	Only for biomass and other less exploited resources (geothermal, biogas).	**Barriers due to support scheme issues**
				Suspension of the support scheme for big scale projects
	Retroactive measures affecting the support scheme for RES?	☐		Frequent amendments to the Renewable Energy Law
				Inconsistent remuneration for RES-E
				Governmental ruling by emergency ordinances
				Decrease of average Green Certificate prices due to an oversaturated market

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

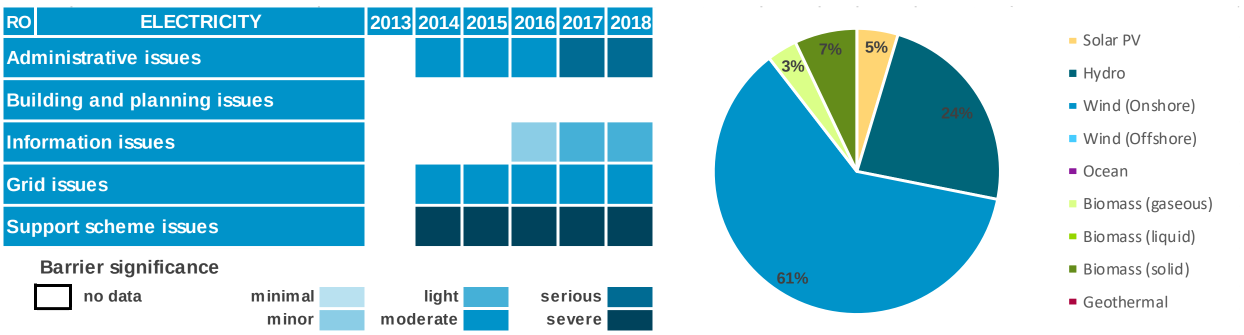


Chart 134. Heat map of the barrier indices per topic in the RES-E sector in Romania 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Romania is mainly hindered by important barriers related to support scheme issues, serious barriers related to administrative issues and moderate barriers related to grid issues. As visualised by the pie chart above, onshore wind and hydropower are by far the most significant RES technologies for the achievement of the planned 2020 trajectory in the Romanian electricity sector.

The dominant issues related to the support scheme for RES-E over the analysed five years revolve around inherent weaknesses of the main support scheme, which is a quota system. RES investors have been suffering for the past four years from plummeting green certificate prices which were caused by an oversupply of certificates. Actions by responsible authorities have not improved the situation. Due to insufficient regulation, the utilisation of RES-E by prosumers is impossible, too. The faults in the support schemes cause additional roadblocks such as lacking access to financing. Additional difficulties result from burdensome administrative procedures. Licencing procedures differ in the different regions and generally take longer than in most other MS. Grid issues are relevant mainly at distribution grid level and comprise insufficient grid development as well as high connection costs. Due to insufficient regulation, the utilisation of RES-E by prosumers was impossible, too. However, starting from 2019 a new support scheme in form of net metering is in place, which will benefit prosumers owning installations for self-consumption with a capacity below 27 kW.

The heat map indicates an overall stagnation in the barrier indices. Support schemes issues have been at a severe level for the past five years, which underlines the lack of state actions to address these issues. Also with regards to the other issues, a relevant development has not taken place.

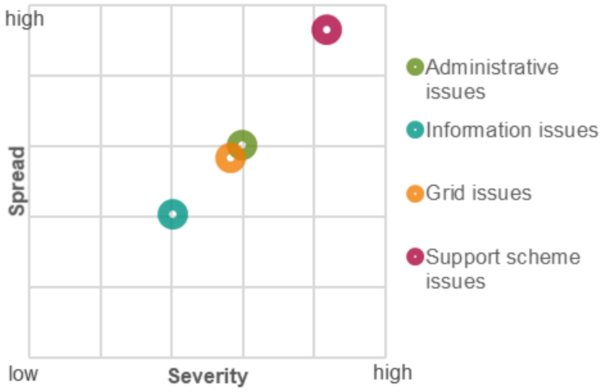


Chart 135. Average severity and spread per topic in the RES-E sector for 2018

The scatter plot provides a snapshot of the severityand extent of Romanian stakeholders' issues with RES-E in 2018. Support scheme issues are the most dominant ones, as they affect almost all RES-E installers and investors across the sector, in such a significant way that new installations are practically impossible, except from small scale PV with a capacity below 27 kW thanks to the entry into force of a new regulation from 2019 onwards. Barriers related to administrative and grid issues are also noticeable but to a lesser degree and they affect a smaller group of project developers.

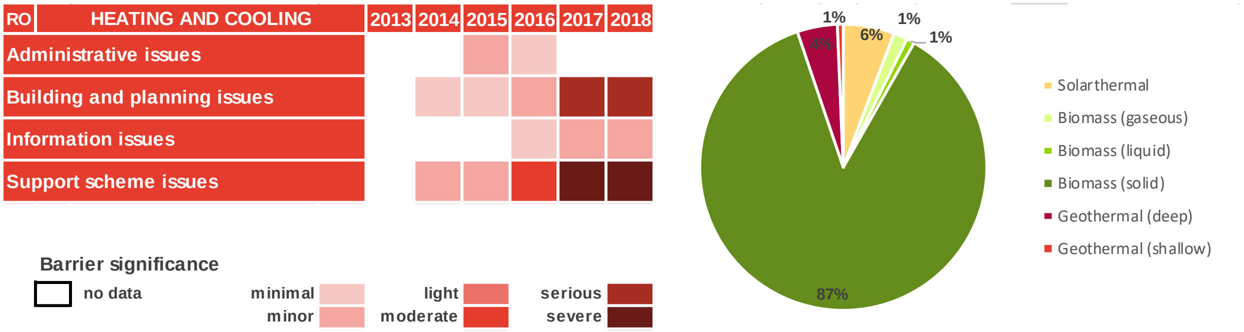


Chart 136. Heat map of the barrier indices per topic in the RES-H&C sector in Romania 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Romania is characterised by heavy barriers related to support scheme issues and serious barriers related to building and planning issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Romanian H&C sector, followed by solar thermal and geothermal.

Central RES-H&C barriers related to the Romanian support scheme during the six years analysed involve the insufficient funding of RES-H&C technologies. The existing schemes to support RES-H&C installations lack funding. Also, the building regulations do not create an effective incentive for investments in RES-H&C. As a consequence, Romania cannot use its huge potential in the RES-H&C sector. Building and planning issues are mainly related to the poorly maintained district heating network. The resulting high energy losses prevent the good utilisation of district heating grids. Information issues are manifested by a lack of qualified installers and craftsmen for biogas power plants, which hamper the development of a lasting industry sector. The heat map indicates a diverse picture regarding the development of barrier indices for the different topics over the past years. While the indices for building and planning issues show an overall deterioration, there has been an improvement with regards to administrative issues. A positive development is that some of the administrative issues were perceived less negative than three years ago. It is not clear though, whether these barriers were actually removed or whether they were simply not relevant anymore because investors did not try any investments due to the existing support scheme barriers. The scatter plot provides a snapshot of the severity and extent of Romanian stakeholders’ issues with RES-H&C in 2018. The above outlined support scheme issues and building and planning issues are dominant obstacles for a large share of installations and impede their development. Information issues only impact a minor number of installations, with less severity.

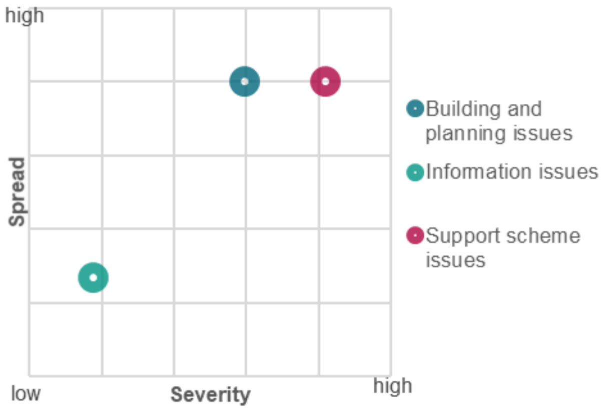


Chart 137. Average severity and spread per topic in the RES-H&C sector for 2018

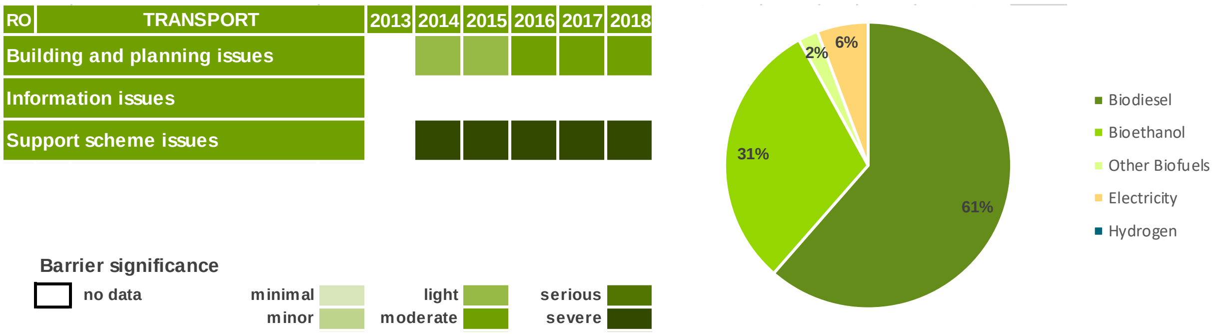


Chart 138. Heat map of the barrier indices per topic in the RES-T sector in Romania 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Romanian RES-T sector, progress is hindered by significant issues related to the support schemes and moderate barriers dealing with building and planning issues. As visualised by the pie chart above, biodiesel as well as bioethanol are the two dominant RES technologies for the achievement of the planned 2020 trajectory in the Romanian transport sector.

The main challenges for RES-T in Romania over the last five years involve the lack of an effective support scheme for biofuels. There are no financial incentives for fuel retailers to purchase biodiesel and bioethanol and there are no financial support measures for biomethane in Romania, neither in form of a support scheme nor as a tax exemption. The building and planning issues are connected to the lacking infrastructure. There is an insufficient number of GPL and CNG stations. Further down the value chain, the infrastructure for processing vegetable oils has to be improved, also due to the fact that there are only a few established suppliers. The infrastructure for electric cars is insufficiently developed as well.

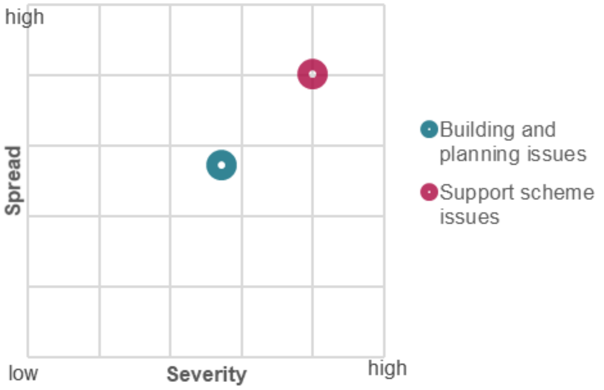


Chart 139. Average severity and spread per topic in the RES-T sector for 2018

The heat map shows a stagnation in the barrier indices regarding support scheme issues and for building and planning issues, the situation even slightly deteriorated. This can be linked to the growth of electric vehicles which makes the lack of infrastructure more noticeable. The situation is expected to improve in the following years considering that the government has recently launched a support scheme in form of grants for developing the charging infrastructure for electric cars.

The scatter plot provides a snapshot of the severityand extent of Romanian stakeholders’ issues with RES-T in 2018. The support scheme remains the main issue, seriously limiting the growth potential of the sector and affecting the very dominant share of RES-T applications. Building and planning issues have also a negative impact yet at a lower level.

Slovenia

Table 53. Progress of Slovenia on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Lengthy administrative procedures
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Difficult RES-integration process in spatial and environmental planning
	Online application for permit?	☐		
	Maximum time limit for procedures?	☑		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☒		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑	At least 50% of the heat must be from RES	
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	Min. 25% of the total final energy used for the building's energy systems' operation must be covered by RES	
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Negative public perception on wind energy projects
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		
	Priority of RES connection to the grid? (Art. 16 (1))	☑		
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑	Energy Act (EZ-1)	
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	⌛	The current support scheme expires in 2019. A future measure for the support of the use of renewable energy sources is planned for 2020.	**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Low level of additional capacities for PV due to unstable support scheme
				Missing support for small- and medium-sized RES producers
				Lack of mid- and long-term political goals

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

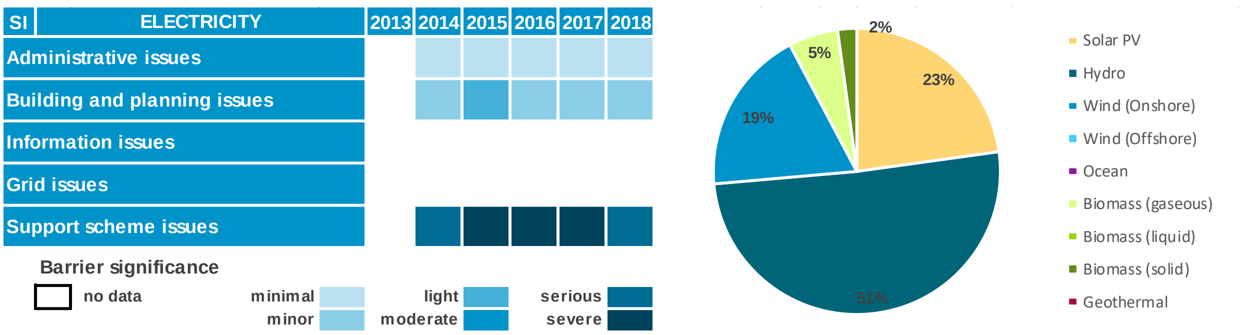


Chart 140. Heat map of the barrier indices per topic in the RES-E sector in Slovenia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Slovenia is mainly hindered by significant barriers dealing with support scheme issues. As visualised by the pie chart above, hydro power is by far the most significant RES technology for the achievement of the planned 2020 trajectory for the Slovenian electricity sector, followed by solar PV and onshore wind.

The dominant issues related to the support scheme in Slovenia for RES-E over the analysed five years involve the lack of mid- and long-term political RES targets as well as the unstable support framework, particularly for solar PV. Regarding the mid- and long-term goals, the Slovenian government has presented the Energy Concept for Slovenia 2050, which is currently in parliament for approval. Yet, this Concept only outlines a broad strategy. Concrete measures are missing and require for by-laws, which need to be developed still. To this end, stakeholders remain sceptical about the Concept’s impact in achieving 2020 targets. In addition, developers and investors have been reluctant to invest because of the unstable/unclear support framework. To overcome these issues, a new PV tender scheme was announced in 2016, following the suspension of FIT for solar PV suspended in 2014. However, the new scheme was only implemented in March 2017.

The heat map indicates the stagnation of barrier indices at a serious high level over the past years, mirroring the persistence of the obstacle.

The scatter plot provides a snapshot of the severityand extent of Slovenian stakeholders’ issues with RES-E in 2018. It shows the dominance of the unclear support framework and vision compared to the other barriers. A dominant share of installations is affected by the unclear support situation and their development is seriously affected. That is, higher realisation costs and longer realisation periods limit the attractiveness of the Slovenian market.

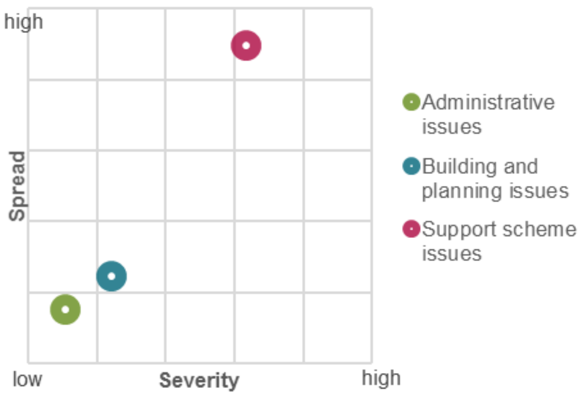


Chart 141. Average severity and spread per topic in the RES-E sector for 2018

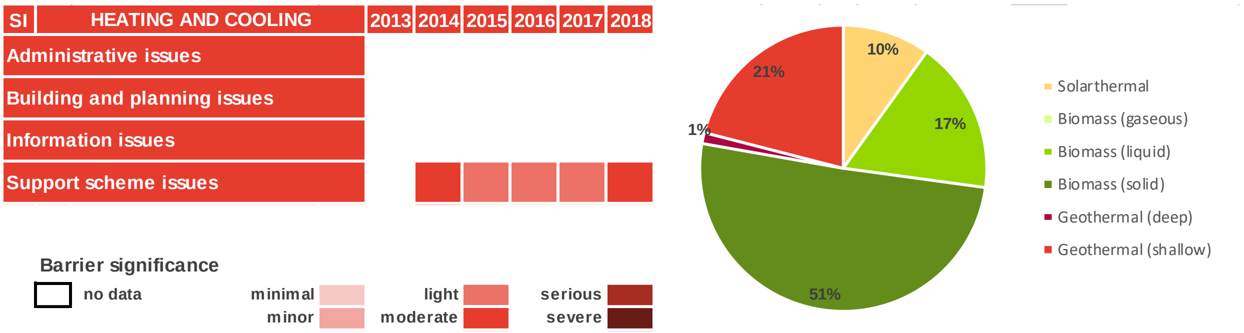


Chart 142. Heat map of the barrier indices per topic in the RES-H&C sector in Slovenia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Slovenia is characterised by light to moderate barriers related to support scheme issues. As visualised by the pie chart above, solid biomass is by far the most dominant RES technology for the achievement of the planned 2020 trajectory for the Slovenian H&C sector, followed by shallow geothermal and gaseous biomass.

The central barriers related to the support schemes in Slovenia for RES-H&C over the analysed five years are similar to those of the electricity sector. The lack of mid- and long-term political targets as well as the design of the support scheme for small and medium-size RES producers poses the greatest impediment. The lack of concrete measures in the Energy Concept for Slovenia 2050 also affects the H&C sector negatively. In addition, RES producers, particularly small and medium-size ones, are facing important issues regarding the financing of the pre-operation costs of the installations. Costs of the plants' design and the planning phases are not covered by the current support scheme, leading to a situation where developers refrain from installing additional heating systems. The heat map shows a mixed picture in the development of barrier indices for support scheme issues. In 2014, stakeholders particularly flagged the suspension of the support scheme as a central barrier. With the discussion on the Energy Concept for Slovenia 2050 potential for RES support increased, reflected by a lower urgency of the issue. Yet, with concrete measures missing and the requirement of by-laws defining the specific design of the technology's support the outlook remains vague and unclear, leading to the indices increasing severity in 2018.The scatter plot provides a snapshot of the severity and extent of Slovenian stakeholders' issues with RES-H&C in 2018. It shows the above-described perception of obstacles. The missing and unclear support framework remains the sole weighty issue for sectoral growth. Half of all installations are affected by the situation and their development is moderately hindered, leading to extra costs and longer realisation periods for developers.

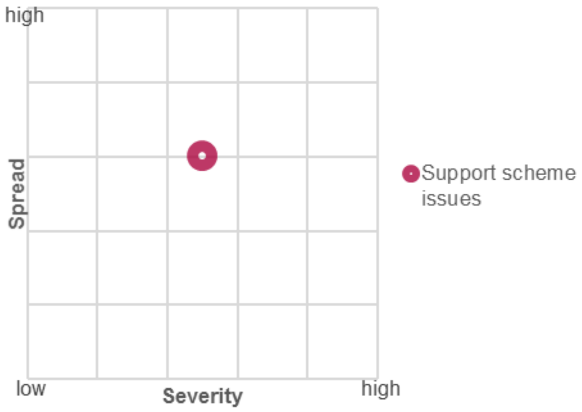


Chart 143. Average severity and spread per topic in the RES-H&C sector for 2018

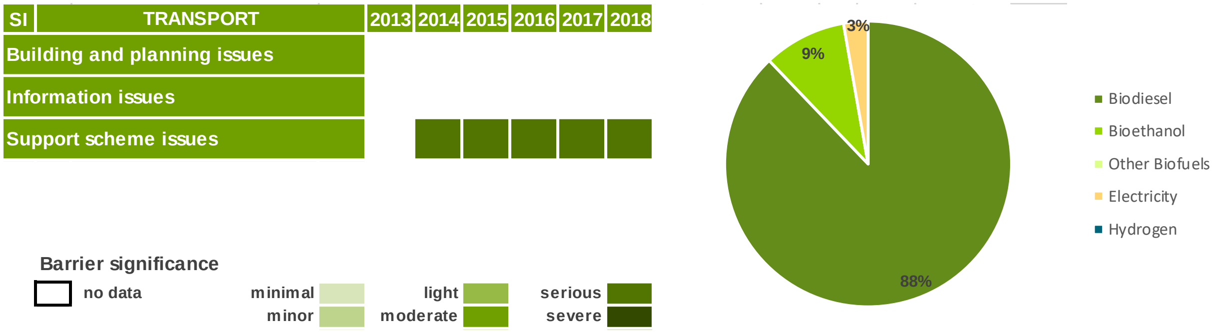


Chart 144. Heat map of the barrier indices per topic in the RES-T sector in Slovenia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Slovenian RES-T sector, development is seriously limited by issues related to the support schemes. As visualised by the pie chart above, biodiesel is the by far the central RES technology for the achievement of the planned 2020 trajectory for the Slovenian transport sector, followed by bioethanol and a small share of e-mobility.

The main challenges for RES-T in Slovenia over the last five years include the lack of public discourse and strategy for RES-T as well as the lack of political will to back biofuels. Stakeholders pointed out that there is no long-term goal for the sector and different approaches are not under discussion. The missing political commitment weighs on biofuel developments, including political support to fund pilot or research projects, which is of utmost importance for the achievement of the 2020 target. There is no comprehensive support framework, only a tax regulation, which appears to be an insufficient market stimulant. To this end, no industry or major producers have been established in Slovenia.

The heat map visualises that the barrier indices regarding the support scheme issues have stagnated at a high level. The lack of a support framework and political guidance as well as missing long-term vision have hindered the sectoral development since 2014.

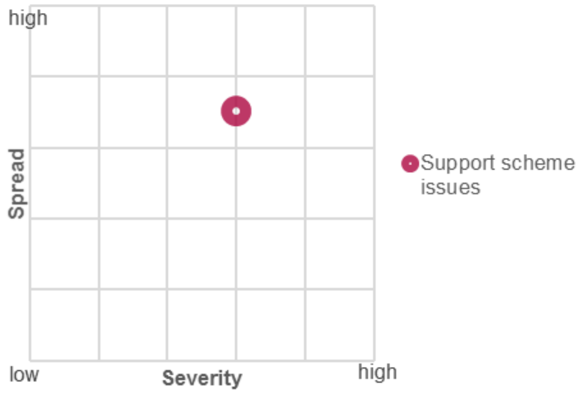


Chart 145. Average severity and spread per topic in the RES-T sector for 2018

The scatter plot provides a snapshot of the severity and extent of Slovenian stakeholders’ issues with RES-T in 2018. A very dominant share of RES-T technologies is hindered by the missing support framework, resulting in substantial additional costs and prolonged delays in project realisations. The fact that no industry and production has developed is a clear consequence of the situation.

Slovakia

Table 54. Progress of Slovakia on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☐		Requirement of full environmental impact assessment in case of small wind power systems
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Requirement of the consent by the ministry of economy for installations larger than 1 MW
	Online application for permit?	☐		Excessive technical and commercial conditions for small-scale RES installations from the regional grid operator
	Maximum time limit for procedures?	☐		No certified installers of wind plants
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☐		
	Facilitated procedures for small scale projects	☑	In 2013-2014, administrative procedures for installations with an installed capacity up to 10 kW have been simplified.	
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Lack of agreement on the management and protection of water flows hinders the development of hydroelectric power plants
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	⌛		
	Obligation to use RES in public buildings? (Art. 13 (5))	⌛		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑	A certification scheme has been introduced to the Slovak legislative system since 2011.	**Barriers due to information issues**
				Lack of independent regulatory body
				Insufficient professional capacity and lack of communication
Grid issues	Grid usage fee?	☐		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		DSOs have announced a connection moratorium (so-called "Freeze Status")
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Although declared unconstitutional, DSOs continue to charge retroactive fee for the access and connection to the distribution grid
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		DSOs operate at the edge of the law
	Priority of RES connection to the grid? (Art. 16 (1))	☐		
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑	The distribution of costs associated with the connection and expansion of the system is determined by the legislation issued by an independent regulator (Regulatory Office for Network Industries). Associated rules are also part of operating rules of TSOs and DSOs.	
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☑		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Very little support for renewable heating
				Insecure investment environment due to frequent legislative changes
				Slow development of alternative mobility
				Negative reputation of RES (especially PV)

☑ YES ☒ NO ⌛ In Planning ☐ Information not available in the progress report

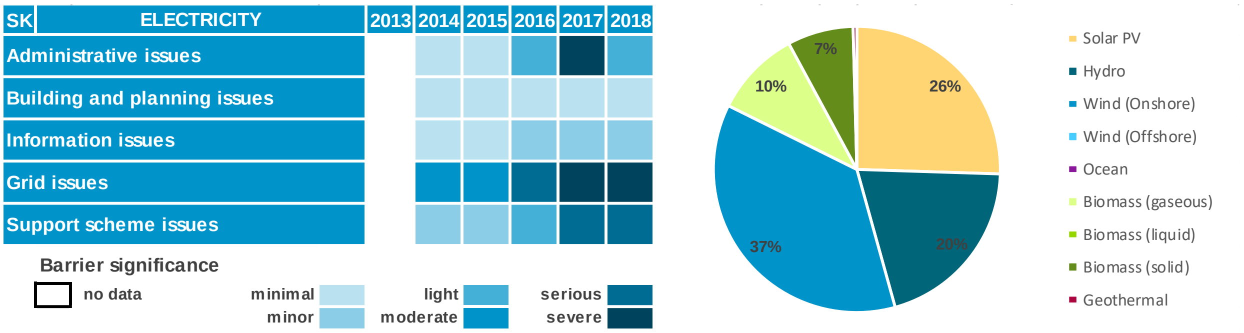


Chart 147. Heat map of the barrier indices per topic in the RES-E sector in Slovakia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Slovakia is mainly hindered by important barriers related to grid and support scheme issues (especially the so-called 'G-Component' or RES support via the so-called 'TPS') as well as obstacles in the administrative procedures. As visualised by the pie chart above, onshore wind, solar PV and hydro power are the most significant RES technologies for the achievement of the planned 2020 trajectory in the Slovakian electricity sector.

The main barrier dealing with grid issues is the highly controversial 'G-Component' (payment for access and connection to the distribution system, or grid fee) which was introduced in 2014 and is applicable through the grid connection agreement between the plant operator and the competent DSO. Only RES installations below 10 kW as well as hydro power plants below 5 MW are excluded from the 'G-component'. The fee was declared unconstitutional by the Slovak Constitutional Court; yet, DSOs ignore the ruling and still apply the fee. The core issue is a difference in understanding of an installation’s connection to the grid, which may or may not include feeding-in electricity. However, the grid fee will be in accordance with the law from 1 January 2019 since the major amendment (No. 309/2018 Coll.) reflects the judgement of the Constitutional Court of the Slovak Republic.

Moreover, the decision of regional DSOs to impose a connection moratorium for new RES plants since 2013 has been an issue of growing prominence. Although the so-called 'Freeze Status' has been blocking further sectoral development for a few years, the major reform of the RES Act should boost RES deployment in the country in 2019 again. As far as support schemes are concerned, the main barriers over the analysed five years involve the expected reduction of the RES support, the instability of the regulatory framework for RES, caused by frequent and unexpected changes (which are believed to be stabilised under the new Act entering into force on 1 January 2019), as well as the RES support via Tariff for System Operation (so-called 'TPS'). Regarding the future of the support scheme, the major reform of RES Act (No. 309/2018 Coll.) was approved by the National Council of the Slovak Republic (NR SR) in October 2018. Under the new legislation, RES support should be lowered in upcoming years and the current FIT will be replaced solely by a feed-in premium model - based on an auction mechanism for RES over 500 kW of installed capacity from 2019. As of 1 January 2019, the feed-in tariff will apply only to RES-E installations, i.e. hydropower, geothermal, biogas, landfill gas or gas from sewage treatment plant gas (except for solar or wind plants), with an installed capacity up to 500 kW

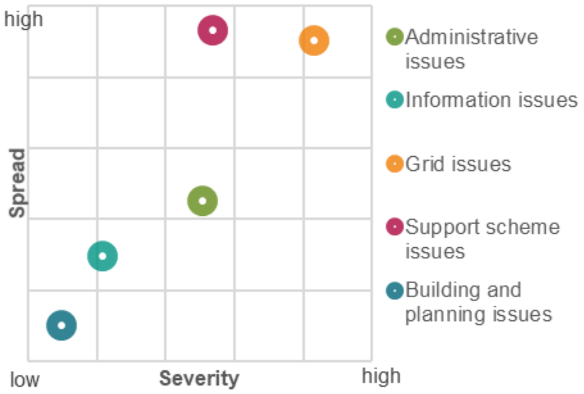


Chart 146. Average severity and spread per topic in the RES-E sector for 2018

included, and high-efficiency CHP up to and including 1 MW. In addition to the aforementioned legislative changes, prosumers should be promoted through the concept of the so-called 'Local Energy Source'. It is defined as a RES up to and including 500 kW of installed capacity which is used solely for self-consumption and is not obliged to pay the 'TPS'. Taking the numerous legislative changes into account, stakeholders also flagged that they have increased investors’ reluctance to sink money into projects. They hope that the upcoming reform of the RES Act, which comes into effect on 1 January 2019, might add certainty to the sector. Finally, administrative issues arise from excessive waiting times for FIT agreements, which is attributed to DSO’s claiming that they are overburdened.

In 2018, grid and support scheme issues limit sectoral growth. Particularly grid issues hinder half of all installations, causing substantial extra costs and delays.

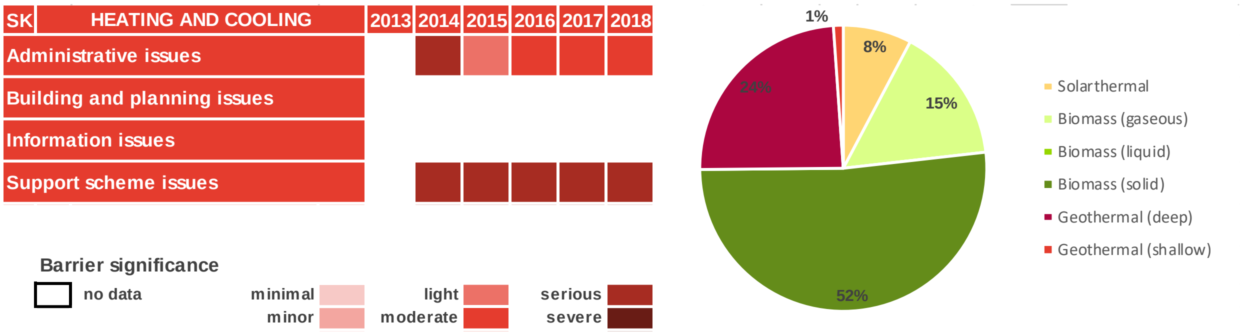


Chart 148. Heat map of the barrier indices per topic in the RES-H&C sector in Slovakia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Slovakia is characterised by moderate to serious barriers related to the administrative framework and the support scheme. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory in the Slovakian H&C sector, followed by deep geothermal and gaseous biomass. According to the latest working version of the Slovak National Energy and Climate Plan (NECP), the contribution of biomass in the RES-H&C sector is estimated at 680 ktoe (approx. 28.5 TJ) in 2030.

The central barriers related to the support scheme in Slovak RES-H&C over the analysed five years include the low support given to H&C installations and limited funds for CHP plants, the missing political will as well as limitations faced by individual heating systems after the reform of the Thermal Energy Act. The Act has severely worsened and de facto even prevented consumers from disconnecting from the systems of centralised heat suppliers. If an apartment owner wants to secure his own heat supply, he has to tackle the obstacles that are difficult to overcome. Considering low support levels for RES heating installations, which also requires the installation of CHP systems, market stimulation is low, further aggravated by missing political will.

The heat map demonstrates barrier indices' quasi-stagnation at a moderately high level for administrative and support scheme issues. The administrative framework's slight deterioration since 2016 is also explained by the complex and lengthy administrative procedures for RES-H&C installations, which stakeholders perceive as a growing issue - even overshadowing support scheme challenges.

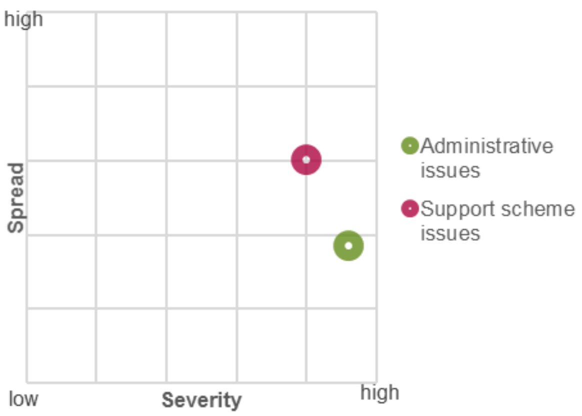


Chart 149. Average severity and spread per topic in the RES-H&C sector for 2018

This picture becomes even more obvious, when looking at the 2018 situation on the related scatter plot, providing a snapshot of the severity and extent of today's issues for RES-H&C as reported by stakeholders in Slovakia. While the lack of support schemes affects more installations in comparison to the administrative issues, the latter has an even higher effect on the development of installations and is making their realisation almost impossible. Rapid development of the sector is not to be expected in this investment climate.

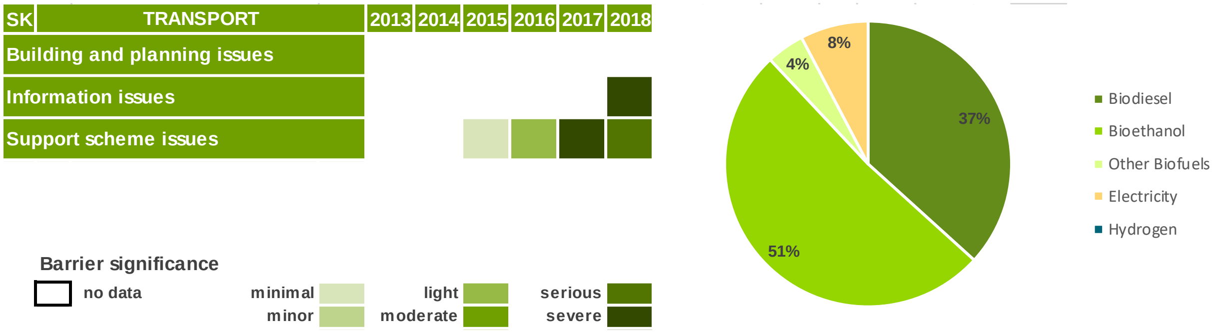


Chart 150. Heat map of the barrier indices per topic in the RES-T sector in Slovakia 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the RES-T sector in Slovakia, progress is hampered by large issues related to the support scheme and information exchange. As visualised by the pie chart above, bioethanol and biodiesel are by far the two most dominant RES technologies for the achievement of the planned 2020 trajectory for the Slovakian transport sector.

The main challenge for RES-T in Slovakia regarding information issues is the lack of qualified state officials to meet the needs of the RES-T sector. Stakeholders flagged this problem only in 2018; however, with a serious severity. The incompetence of officials limits sectoral development, because the legal documents and administrative guidelines drafted often lack clarity and stringency. Also, stakeholders note the lack of stimulation for knowledge sharing or constructive discussions among sector policy makers and experts. As far as the support scheme is concerned, the main issue lies in the incorrect transposition of the Directive 2014/94/EU on the deployment of alternative fuels infrastructure. In fact, the government approved the National Policy for the Implementation of Alternative Fuel Infrastructure in the Slovak Republic as well as the National Political Framework for the Development of Alternative Fuels Market in November 2016 in the form of the government resolutions. Yet according to the lawyers, the transpositions should be implemented into the national legal framework through legally binding normative acts, and the government resolution is not one of them. This unclear framework for RES creates uncertainty among investors and project developers.

The heat map visualises the sudden appearance and urgency of the information issue in 2018 as well as the growing concerns over the support scheme.

The scatter plot provides a snapshot of the severity and extent of Slovakian stakeholders' issues with RES-T in 2018. Both aforementioned issues affect all RES-T technologies. Nevertheless, information issues affect individual project development more importantly, by increasing realisation costs and lead times.

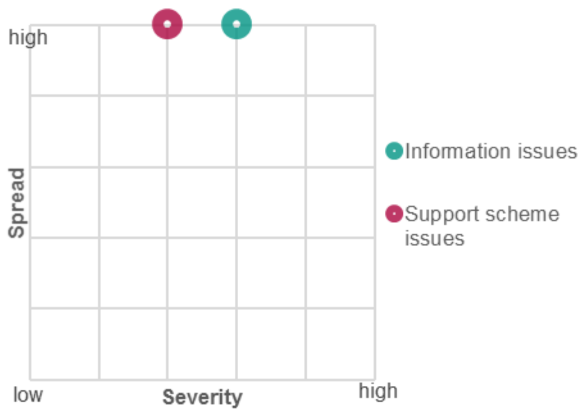


Chart 151. Average severity and spread per topic in the RES-T sector for 2018

Finland

Table 55. Progress of Estonia on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Lack of harmonised administrative processes for building permits among municipalities
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Long assessment procedures of Finnish Air Forces related to radar systems security
	Online application for permit?	☐		Overlapping planning and permitting processes affect the good development of wind energy projects
	Maximum time limit for procedures?	☐		
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☑		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑	As shown in table 1d about RE contribution for heat and cooling	Connection to district heating network varies depending on the location
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Inefficient smart meters prevent own consumption of RES
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑		**Barriers due to information issues**
				Too low revenue from the guarantees of origin (GO)
				Lack of statistics on distribution of RES installations
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		Different processes for grid access permits
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Limited grid access affects project development
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑	Facilitated procedures for the grid connection of small scale generation	Unsubstantial appeals by third parties leading to delays or higher costs in project development
	Priority of RES connection to the grid? (Art. 16 (1))	☒		Lack of transparency of grid connection costs
	Clear legal obligation for the system operator to reinforce the grid?	☑		Lack of regulation impedes the access to heating network for RES-HC producers
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☒	Grid development covered by transmission fees; Grid expansion and reinforcement covered by connection fees.	
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☒		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	⌛	Working group that studies the promotion of elasticity of demand by improving the choice for customers.	
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☐		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Limited scope of energy investment aid
				Lack of political will by government
				Farmers deem the upfront investment in RES plants as too risky
				Limited scope of Price Premium support scheme for small scale installations
				Modest level of support in new support scheme

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**

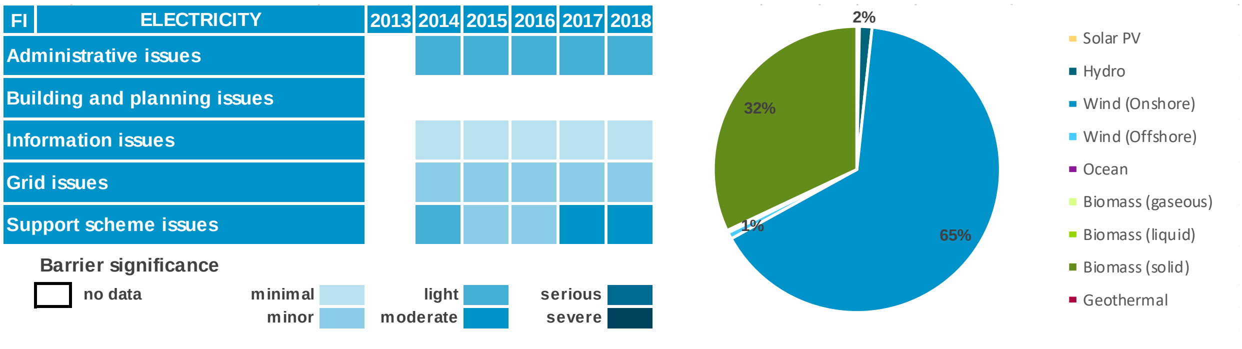


Chart 152. Heat map of the barrier indices per topic in the RES-E sector in Finland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Finland is mainly hindered by moderate barriers dealing with administrative issues, minor to light obstacles for grid and information issues and more serious barriers affecting the support scheme. As visualised by the pie chart above, onshore wind power and solid biomass are by far the most significant RES technologies for the achievement of the planned 2020 trajectory for the electricity sector in Finland.

The dominant issues related to administrative matters over the analysed six years involve challenges that are typical for young, fast growing markets, such as the lacking harmonisation of procedures, problematic compatibility assessments by the Finnish air forces or conflicts with neighbours. The barriers connected to support schemes concern small installations, mostly PV or hydro. They are excluded from the main support scheme, and the support schemes they are eligible to remain insufficient. In addition, installations which are eligible to the main support scheme have to cope with insecurities that come from the changed design of the current support scheme to a tendering system. Grid issues are caused by overloaded grids that require costly reinforcement.

The heat map indicates an overall stagnation of the barrier indices since 2014. The situation for support issues, however, has deteriorated in the past two years. This is mainly rooted in the 2018 reform of the support scheme which first caused anxiety about the upcoming change of the policy framework and currently raises concerns about the concrete implementation of these changes. In the future, grid issues may worsen because of the increased RES-E capacity challenging grid operators.

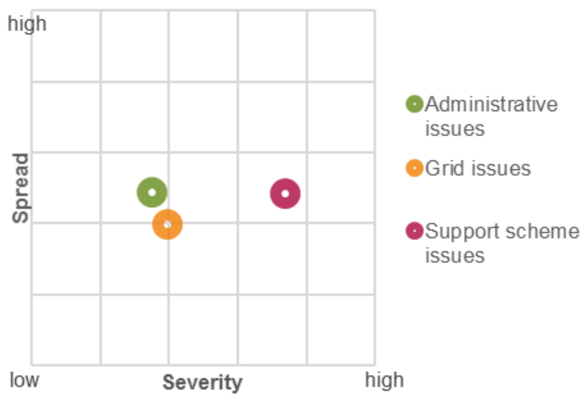


Chart 153. Average severity and spread per topic in the RES-E sector for 2018

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today's issues for RES-E as reported by stakeholders in Finland. Support scheme issues are having the strongest impact with a negative impact on whole groups of technologies. Administrative issues are also widespread but their effect is less significant on the individual scale, which results in a more moderate final result.

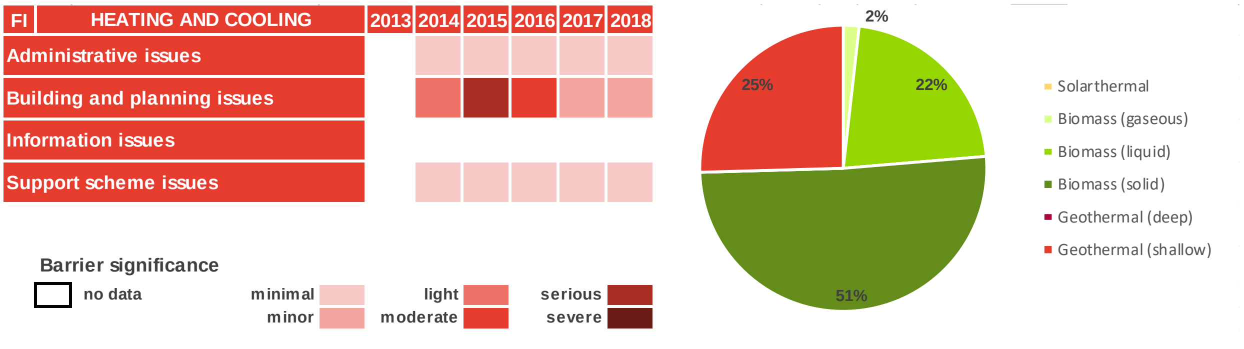


Chart 155. Heat map of the barrier indices per topic in the RES-H&C sector in Finland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Finland is quite positive but it is nevertheless characterised by moderate and light barriers related to building and planning issues, administrative issues and support scheme issues. As visualised by the pie chart above, solid and gaseous biomass, as well as shallow geothermal are the most dominant RES technologies for the achievement of the planned 2020 trajectory for the H&C sector. The central barrier related to the building and planning issues for RES-H&C over the analysed six years involves the limited access to district heating networks for all RES-H&C technologies, which represents a challenge for project developers, all the more since grid access varies depending on the individual attitude by local grid operators. However, grid access has slightly improved over the years, as shown by the heat map for 2017 and 2018.

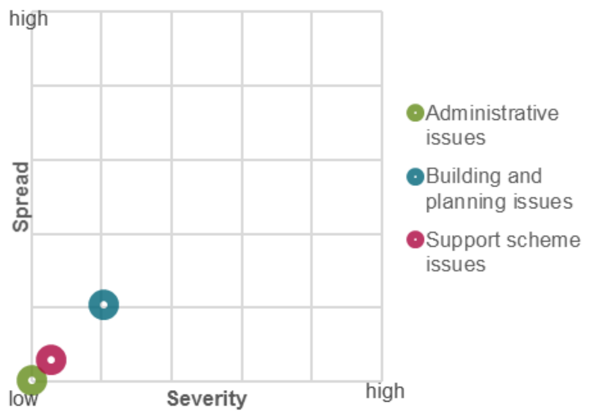


Chart 154. Average severity and spread per topic in the RES-H&C sector for 2018

With regards to support scheme issues, the available support programmes are insufficiently funded for private households. Moreover, private households lack awareness on these support schemes, which further reduces their efficacy. The heat map shows that support scheme issues have been stagnating since the funds for the respective support programmes have not been increased. Administrative issues involve a lack of harmonised procedures in different municipalities and other authorities at local level. In this regard, measures have been taken to increase the harmonisation of some of the administrative procedures in question, but their effect is not visible in the heat map yet.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today's issues for RES-H&C as reported by stakeholders in Finland. Building and planning issues are the dominant obstacles albeit at a moderate level since only a limited number of technologies are affected and then only to a rather limited degree of severity. Administrative and support issues show much lower ratings in terms of their spread and severity. This is also due to the fact that the technologies which are affected are not relevant for reaching the 2020 trajectory as defined in the Finnish NREAP.

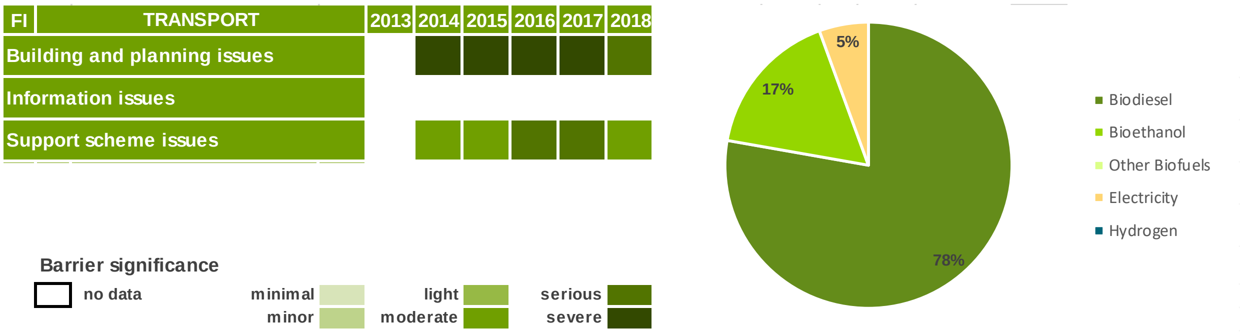


Chart 156. Heat map of the barrier indices per topic in the RES-T sector in Finland 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

In the Finnish RES-T sector, progress is hindered by serious barriers related to building and planning issues and moderate barriers related to support schemes. As visualised by the pie chart above, biodiesel is the main RES source for the achievement of the planned 2020 trajectory for the transport sector. Bioethanol and electricity are playing a less dominant role.

The main challenges for RES-T particularly until 2017 involve the lack of an appropriate infrastructure for e-mobility as well as for biodiesel and biogas. In this regard, charging stations for e-vehicles do not provide 100% RES electricity but only the blended electricity mix that contains electricity from nuclear and other sources as well. New charging stations for e-mobility are currently being installed but there is still a need of more public charging stations, particularly in Central and Northern Finland. The issue is the same for cars running on 100% bioethanol and biodiesel, the distribution of 100% biofuel is limited in Finland, most commonly biofuel is mixed with conventional petrol or diesel. Biogas is available at 100% RES, however, the supply of gas vehicle fuelling stations is limited as well. As far as support schemes are concerned, the Finnish government seems to lack the will to develop support instruments to overcome these challenges. This is particularly negative for farmers, which represent the key investors for RES-T in Finland.

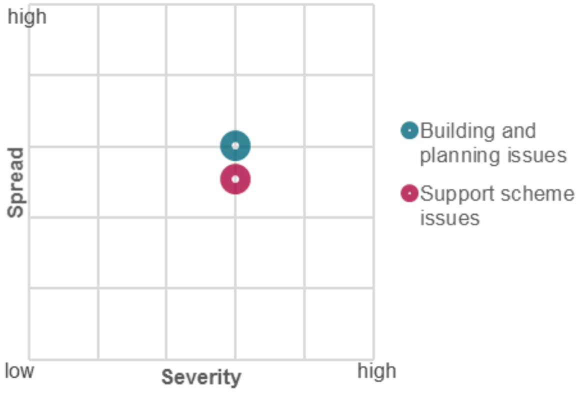


Chart 157. Average severity and spread per topic in the RES-T sector for 2018

The heat map visualises a slight improvement for 2018, both regarding building and planning as well as support scheme issues. This can be explained one the one hand by the infrastructural investments that have been made in recent years. On the other hand, investment subsidies have recently allowed the establishment of several biofuel refineries. Nevertheless, the overall situation has to be improved to achieve the 2020 target.

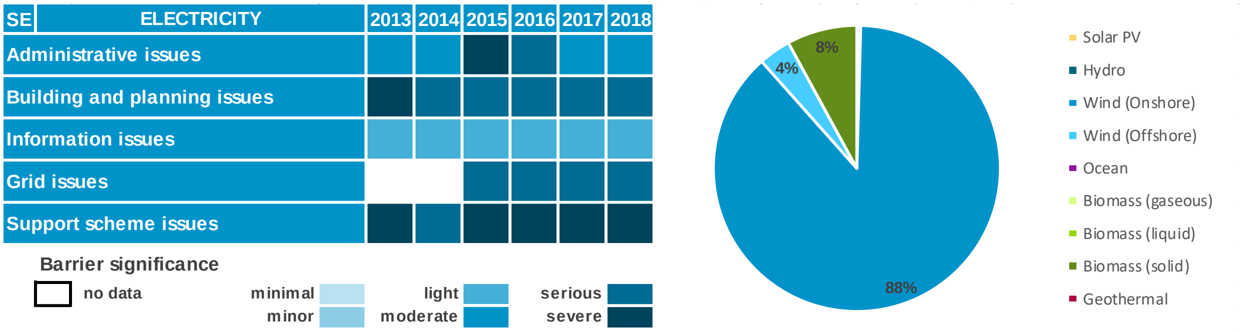
As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severityand extent of today’s issues for RES-T as reported by stakeholders in Finland. The building and planning issues (i.e. the lacking infrastructural development) remains the main issues as it shows a higher spread than the identified issues related to support schemes, which are equally important but affect a smaller amount of cases.

Sweden

Table 56. Progress of Sweden on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	Progress Report	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Unnecessary costs for small-scale electricity producers
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Complicated administrative procedures for small hydro due to broad interpretation of European Water Directive
	Online application for permit?	☐		Right of Swedish Armed Forces to withdraw permissions and dismantle wind turbines creates significant insecurity
	Maximum time limit for procedures?	☐		Environmental certificate criteria discriminating district heating
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		
	Increased cooperation between institutions/streamlining of permit procedures?	☑	The processes subject to the Planning and Building Act have been made more simple and efficient, introducing a standard procedure.	
	Facilitated procedures for small scale projects	☐		
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐		Military resistance to wind turbines
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Municipal veto against the establishment of larger wind projects
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Small wind turbines do not meet the legal requirements
Grid issues	Grid usage fee?	☑	Micro-scale producers of electricity are exempt from electricity grid fees. The exemption only applies if the electricity consumer has used more electricity from the electricity grid than has been fed in. Larger producers of (renewable) energy pay the grid fees.	**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐		Differences in level of grid tariffs discriminate RES producer in Northern Sweden
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☐		Not sufficient grid infrastructure in Sweden
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐		Insufficient transmission capacity to neighbouring countries
	Priority of RES connection to the grid? (Art. 16 (1))	☐		Usage of heat pumps instead of district heating lowers the efficiency of district heating
	Clear legal obligation for the system operator to reinforce the grid?	☑		
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☐		
	Shallow cost structure? (Art. 16 (5) and (6))	☐		
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☐		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐		
	RES-E considered in the national network development plan?	☑		
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Inefficient Certificate System
				Too low price of electricity from renewable energy due to surplus of electricity
				Legal and political uncertainty concerning RES in transport sector
				Low prices of electricity and of Green Certificates put business model of CHP plants at risk
				No clarity on further development of national policy

☑ **YES** ☒ **NO** ⌛ **In Planning** ☐ **Information not available in the progress report**



SE	ELECTRICITY	2013	2014	2015	2016	2017	2018
	Administrative issues	moderate	moderate	severe	serious	moderate	moderate
	Building and planning issues	severe	serious	serious	serious	serious	serious
	Information issues	light	light	light	light	light	light
	Grid issues	no data	no data	serious	serious	serious	serious
	Support scheme issues	severe	serious	severe	severe	severe	severe

Chart 158. Heat map of the barrier indices per topic in the RES-E sector in Sweden 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The development of RES-E in Sweden is mainly hindered by serious barriers dealing with support issues, building and planning issues and grid issues. As visualised by the pie chart above, onshore wind power is by far the most significant RES technology for the achievement of the planned 2020 trajectory for the electricity sector. Solid biomass and offshore wind power play a less significant role.

The dominant issue related to the Swedish support scheme over the analysed six years is that the support scheme design is not sufficient to allow for a sustainable business model for RES investors. There is an oversupply of electricity which results in too low electricity prices. The current green quota support scheme is not able to balance out the low electricity prices because due to an oversupply of green certificates the certificate prices are also too low. The main barriers regarding grid issues result from insufficient grid capacities, which particularly hamper the development of wind power projects. Regarding building and planning issues, wind power projects are seriously blocked by the Swedish Army which considers about 50% of Sweden's land area as non-fitting for wind power investments.

The heat map indicates a stable development of most issues at a relatively serious level. The only positive example is administrative issues, which slightly improved over past years. This is mainly due to an increased maturity of the Swedish wind power market and the gained experience of project developers with administrative procedures.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today's issues for RES-E as reported by stakeholders in Sweden. Support schemes issues are affecting almost all installations and that to a very serious degree. Building and planning issues are even more hindering for single cases, but they affect a smaller amount of installations in general. Grid, administrative and information issues are less grave in terms of spread and severity.

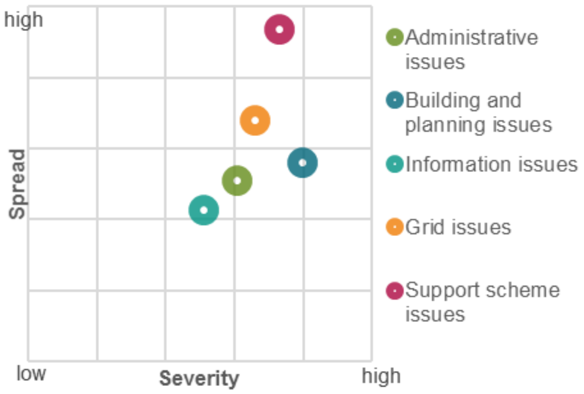


Chart 159. Average severity and spread per topic in the RES-E sector for 2018

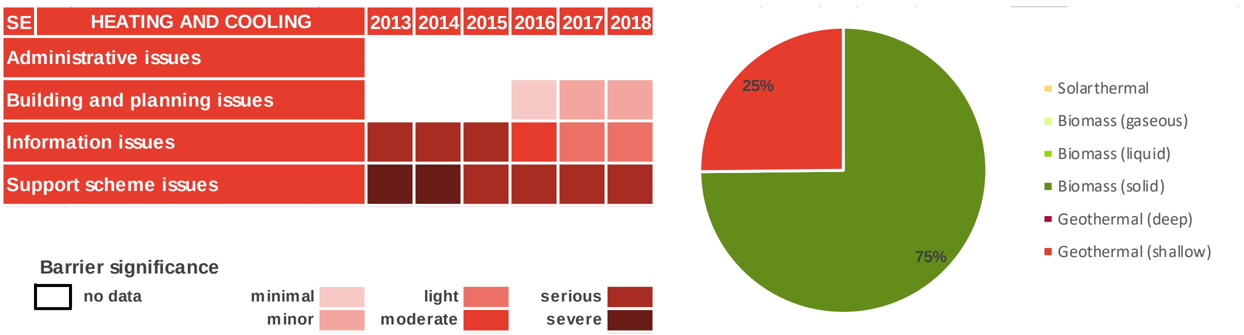


Chart 160. Heat map of the barrier indices per topic in the RES-H&C sector in Sweden 2014-2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP

The RES-H&C sector in Sweden is characterised by serious barriers related to support scheme issues as well as moderate information issues. As visualised by the pie chart above, solid biomass is the most dominant RES technology for the achievement of the planned 2020 trajectory for the Swedish H&C sector, followed by solar thermal energy.

The central barrier related to the support scheme for RES-H&C over the analysed six years is connected to the weaknesses of the electricity support scheme. Since many district heating plants are combined heat and power plants the price of electricity and of electricity certificates is one of the major factors of feasibility to produce heat at a competitive price. Revenue from the sale of electricity is therefore very important for the profitability of these CHP plants. As a consequence, one of the most significant barriers, also for RES-H&C purposes, are the low prices of electricity and of the electricity certificates. The information issues are connected to the lack of awareness of the benefits of RES in the public discussion. The building and planning issues stem from the conflicts between single house RES-H&C installations on the one hand and district heating applications on the other.

The heat map however indicates a slight improvement of support schemes issues and information issues over the past years. Regarding the latter, the insufficient knowledge of the benefits and potentials of renewables heating solutions has been constantly addressed which seems to be reflected in the public discussion. The building and planning issues have become a bit worse over the years. This might result from the increased use of single house RES-H&C installations that further aggravate the conflict with district heating applications.

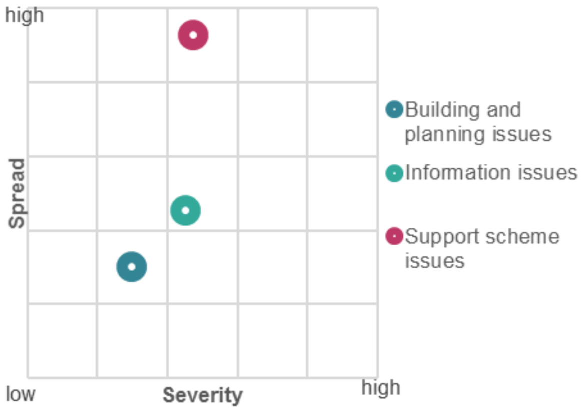


Chart 161. Average severity and spread per topic in the RES-H&C sector for 2018.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today's issues for RES-H&C as reported by stakeholders in Sweden. The above outlined support scheme issues are the dominant obstacle for a large share of installations.

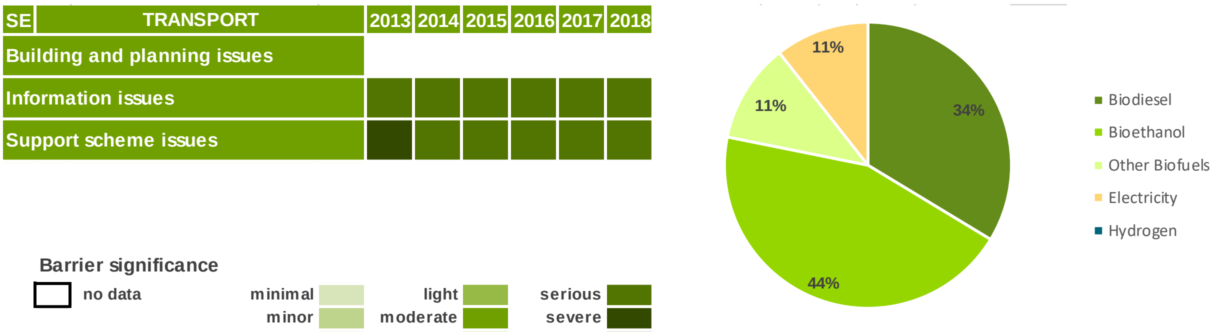


Chart 162. Heat map of the barrier indices per topic in the RES-T sector in Sweden 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP.

In the RES-T sector in Sweden, progress is hindered by issues related to the support scheme and information on the sector. As visualised by the pie chart above, bioethanol and biodiesel are the two dominant RES technologies for the achievement of the planned 2020 trajectory for the transport sector but also other biofuels and electricity shall play a sizeable role.

The main challenges for RES-T in Sweden over the last 6 years involve insufficient policy instruments to support the use of RES fuels in the transport sector. Whole sectors such as shipping and aviation are completely excluded. The discussions on introducing new support schemes have taken a lot of time without a tangible outcome. The information issues concern the lack of knowledge on RES technologies and their benefits which makes the public discussion more difficult.

The heat map visualises a stable development of the barrier indices regarding the support scheme and information issues. It seems that there has been no major development despite the ongoing discussions.

As far as the current situation in 2018 is concerned, the scatter plot provides a snapshot of the severity and extent of today’s issues for RES-T as reported by stakeholders in Sweden. The support scheme issues and information issues are about the same. Barriers related to the support schemes affect more stakeholders but are a bit less significant. With information issues, it is just the opposite. Both barriers do not fully prevent the development of the overall sector, but they are relevant enough to hinder a faster development.

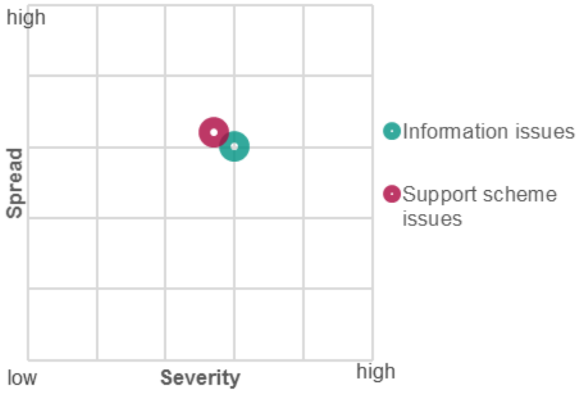


Chart 163. Average severity and spread per topic in the RES-T sector for 2018.

United Kingdom

Table 57. Progress of United Kingdom on the implementation of legal indicators from the RES Directive. Source: 4th national Progress Report

Topic	Indicators	P R	Comments	TOP Barriers from the REveal Database
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑		**Barriers due to administrative issues**
	Overall assessment of administrative procedure?	☑		Obtaining a connection offer is sometimes a challenge
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐		Local authorities do not have knowledge of new H/C technologies
	Online application for permit?	☑		Barriers to subsidy free projects
	Maximum time limit for procedures?	☐		Complex administrative processes for certain RES
	Automatic permission after deadline passed? (Art. 22(3)b))	☐		Slow pace of planning procedures
	Increased cooperation between institutions/streamlining of permit procedures?	☑		
	Facilitated procedures for small scale projects	☑		
Building and planning	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☑		**Barriers due to building & planning issues**
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☑		Offshore wind sites difficult to obtain
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☐		Strict planning restriction surrounding onshore wind
	Obligation to use RES in public buildings? (Art. 13 (5))	☐		Planning guidelines may put restrictions on RES development
				Spatial planning leads to delays of RES realisation
Information issues	Certification schemes for installers ? (Art. 14 (3))	☐		**Barriers due to information issues**
				Decreased interest for biomass training
				No interaction between industry and government stakeholders
				Lack of communication between Distribution Network Operators (DNOs) and TSO
				Lack of recognition of certification schemes from other EU Member States
Grid issues	Grid usage fee?	☑		**Barriers due to grid issues**
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☑		PPAs will not suffice for the reaching of carbon reduction goals
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑		Expected increase of grid curtailment
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☑		Increased costs of grid connection
	Priority of RES connection to the grid? (Art. 16 (1))	☒		Unharmonised technical practices between DSOs
	Clear legal obligation for the system operator to reinforce the grid?	☒		Uncertain connection costs
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☑		
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	☑		
	Shallow cost structure? (Art. 16 (5) and (6))	☑		
Support scheme issues	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑		
	RES-priority in dispatch? (Art. 16 (1))	☐		
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☑		
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☑		
	RES-E considered in the national network development plan?	☑		
	Support scheme promoting the use of RES? (Art. 3 (3)).	☑		**Barriers due to support scheme issues**
	Retroactive measures affecting the support scheme for RES?	☐		Questions on the future of biomethane support
				Closure of Feed-In Tariff support
				Lack of effective carbon price
				Policy gap in RES deployment

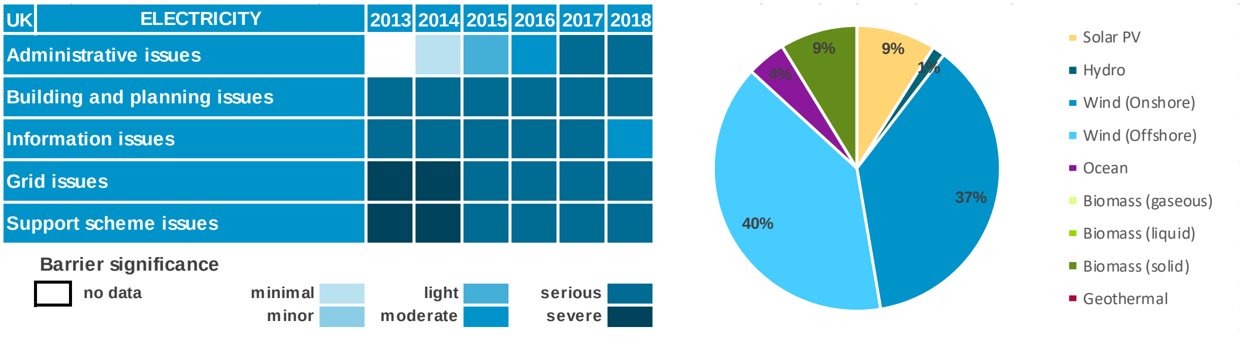


Chart 164. Heat map of the barrier indices per topic in the RES-E sector in the United Kingdom 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP.

The development of RES-E in the UK is hindered by serious barriers in all barrier topics with the only exception of information issues. As visualised by the pie chart above, on- and offshore wind power are by far the most significant RES technologies for the achievement of the planned 2020 trajectory in the British electricity sector. Solid biomass and solar PV are only a marginally represented. The dominant issues related to the support scheme in the UK for RES-E over the analysed 6 years involve the concerns regarding the new government's willingness to pursue the general support to RES and the lack of long-term time schedule for the next CfD rounds. However, as the UK leaves the EU, the ongoing discussion on the conformity of the British CfD model with the state aid guidelines is no longer perceived as an issue by stakeholders and project developers perceive the regained future national competency in this field as a higher planning security. Several barriers apply only to certain regions such as the insufficient grid capacity in Wales or the non-existent support scheme for RES in Northern Ireland, but limit here decisively the development of RES technologies.

The heat map indicates a slight improvement over the course of the years, with the exception of building and planning issues, where barriers remained on a constant level and administrative issues, where the barrier level gradually increased. In fact, the issue of long administrative procedures has worsened over the years in all four regions of the MS. Barriers regarding the grid have decreased thanks to an improved planning for the grid connection of remote and island-based installations. Since 2013, information issues mainly involved a lack of dialogue between the industry and legislators, particularly in Northern Ireland. However, the recent attention of the industry to the topic of public perception has led to a better inclusion of civil society in the project planning process, which explains the improvement of the barrier indices in this topic in 2018. The scatter plot provides a snapshot of the severity and extent of British stakeholders' issues with RES-E in 2018. Support schemes and most notably the CfD show the highest severity as well as spread over all RES technologies, which is due to the fact of the relative large share of on- and offshore wind capacity to be tendered in CfD. Administrative issues are ranked second in severity and slightly less widespread due to their regional difference.

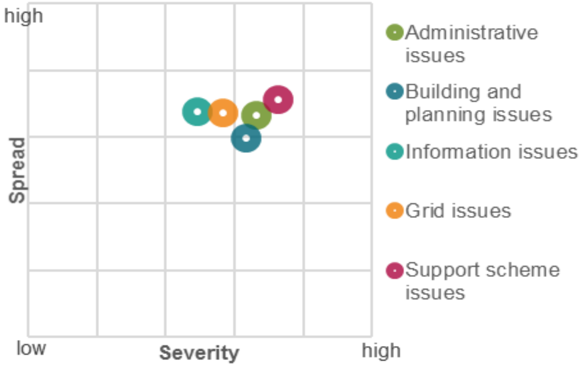


Chart 165. Average severity and spread per topic in the RES-E sector for 2018

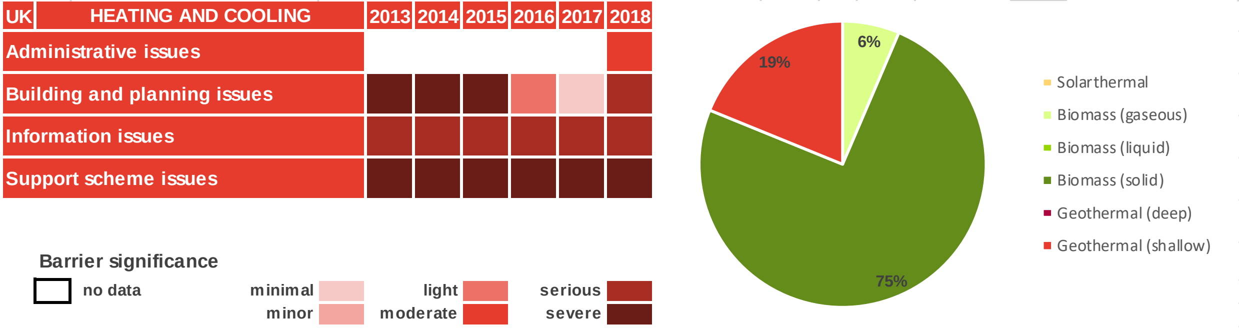


Chart 166. Heat map of the barrier indices per topic in the RES-H&C sector in the United Kingdom 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP.

The RES-H&C sector in the UK is characterised by important barriers related to information issues, building and planning issues and support schemes. As visualised by the pie chart above, solid biomass is the predominant RES technology for the achievement of the planned 2020 trajectory in the British H&C sector, followed by shallow geothermal and gaseous biomass.

Central RES-H&C barriers related to the British support scheme during the 6 years analysed, involve the policy risk with regard to the support programme duration and budget. This creates further uncertainty for potential investors and adds to the already existing price risk for strongly fluctuating prices for renewable gas. Furthermore, no substantial progress has been made in the abolishment of these barriers.

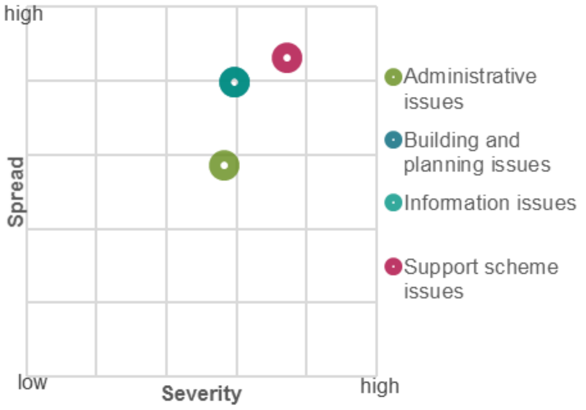


Chart 167. Average severity and spread per topic in the RES-H&C sector for 2018.

The heat map indicates a diverse picture regarding the development of barrier indices for the different topics. While the indices for information and support scheme issues remained constant, building and planning issues were slightly reduced in 2016 and 2017 and were again perceived as serious in 2018. This may be due to the fact that the issue of renewable heating systems has become more important for cities, which puts more light on the lack of expertise of municipal authorities regarding the management of renewable heating networks. Finally, new administrative issues arose in 2018 due the increased penetration of renewable heating systems in the UK. This especially concerns shallow geothermal power stations in remote areas, where the costly installation of heating networks are not profitable.

The scatter plot provides a snapshot of the severityand extent of British stakeholders' issues with RES-H&C in 2018. The missing and unreliable support schemes are considered as the major barriers, concerning almost all relevant RES installations. This is followed by information issues and by building and planning issues, being mainly found on a municipal level. In the scatter plot, the average severity and spread values for information and building and planning issues are identic. As a result, both spots are overlapping on the scatter plot.

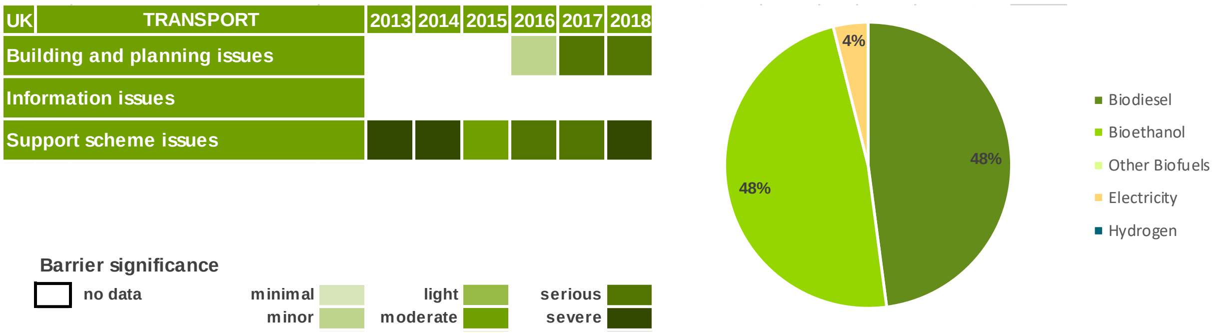


Chart 168. Heat map of the barrier indices per topic in the RES-T sector in the United Kingdom 2014- 2018 and weighting of RES technologies in the index, based on planned RES deployment 2010-2020 as set out in the NREAP.

In the British RES-T sector, support schemes and building and planning issues represent the most hindering issues for renewable energy technologies. Most relevant are biodiesel and bioethanol comprising both almost 50% of the countries' planned 2020 trajectory for the British transport sector. Electricity only plays a marginal role in the planned 2020 trajectory.

The main challenges for RES-T in the UK over the last 6 years involve the large policy risk and uncertainty. Also lacking support schemes for the creation of an infrastructure for refuelling and charging stations is further hindering the larger deployment of biofuel- and electric-driven vehicles. The UK's blending cap of 2% for 1st generation biofuels is considerably lower to the EU's cap of 7%, which additionally impedes the transition to a renewable transport system.

The heat map visualises the serious situation in terms of support scheme issues and the growing barriers resulting from building and planning issues. For support schemes, the conditions for financing have been steadily improved over the years, while the lack of concrete and reliable support programmes for biofuels have worsened over the years. Therefore, the overall situation has started to ease in 2015. Building and planning issues include the growing demand for adequate infrastructure, which is not addressed in current planning procedures.

The scatter plot provides a snapshot of the severity and extent of British stakeholders' issues with RES-T in 2018. The support scheme remains the central issue, seriously limiting the growth potential of the sector and affecting all types RES-T installations. This is closely followed by building and planning issues, which are a result of the lacking infrastructure for the vast majority of RES-T technologies.

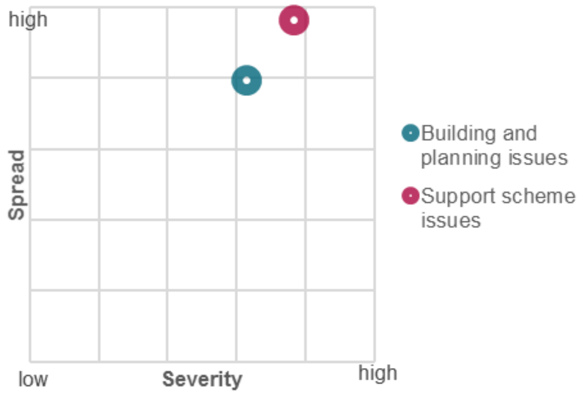


Chart 169. Average severity and spread per topic in the RES-T sector for 2018

Summary of Annex C at EU-level

Annex C provides an assessment of the progress of non-economic barriers between 2013 and 2018 at Member State level. The RES progress of each Member State is analysed on the basis of five main topics highlighted in the tender specifications and in the RES Directive. For each of these five topics, matching barrier categories from the REveal database were identified, as shown in Table 28.

The following paragraphs aim at synthesising the results from Annex C at EU-level, taking each of the five topics into consideration.

Results of the REveal Database

Topic I: Administrative issues

In the RES-E sector, barriers related to administrative matters have roughly improved between 2013 and 2018, mainly thanks to the learning process made by administrations and applicants over the years. As a result of the gained experience, the increased know-how of administrations has allowed for a better design of administrative procedures, which became less long and complex. In addition, facilitated administrative procedures for small-scale projects also tend to reduce the barrier perception by stakeholders. We observe a correlation in certain MS between the introduction of a one-stop shop and the decrease of barrier severity. This is the case for example in Bulgaria, France, and Italy.

As far as the RES-H&C sector is concerned, administrative procedures are less perceived as problematic for the development of RES projects than in the RES-E sector. This can be explained among others by the smaller visibility of RES-H&C stakeholders at EU-level. There are less experience values reported, which in turn result in a lower awareness of issues. MS with a high amount of RES-H&C installations also report a higher barrier incidence. This is the case for instance in Austria, Germany, Croatia and Hungary. Here, the lack of harmonised guidelines at national level, the high number of involved authorities, and the long duration of the permitting process often constitute the main barriers hindering the development of RES projects.

As far as RES-T is concerned, stakeholders report almost no barriers dealing with administrative issues in the 28 MS. This can be explained by the fact that the RES-T sector is mostly supported by tax incentives and quota systems, which require less administrative procedures.

Topic II: Building and planning issues

Overall, barriers dealing with building and planning issues have increased between 2013 and 2018 in all sectors. In the electricity sector, the higher occurrence of barriers can be explained among others by the higher amount of tenders for renewable energy plants implemented in the Member States as a result of the state aid Guidelines of the European Commission applicable from July 2014. In fact, tenders often call for large projects, which often need to be installed in open spaces, thus involving an increase of barriers arising from the integration of RES projects in spatial and environmental planning. This for example the case in Estonia, where the excessive creation of conservation areas by groups opposed to RES deployment is a growing concern. In other MS, barriers are due to the burdensome environmental licencing requirements, such as for example in Portugal. Finally, the poor identification and inclusion of favourable RES locations in the spatial panning also represents an obstacle to the development of RES projects, as it is the case among others in Croatia.

As far the RES-H&C sector is concerned, barriers are mainly due to shortcomings in the district heating networks, such as the poor maintenance of the network e.g. in Romania. In other MS, it is the non-existence of district heating which hinders the development of the sector, such as in Croatia or in Ireland.

In the RES-T sector, barriers arise from the lack of adequate infrastructure both for biofuels and for electric cars, especially in Portugal, Romania, Finland and the UK. On the one hand, stakeholders report an insufficient number of LPG and CNG stations. On the other hand, the lack of charging stations hampers the deployment of electric vehicles across the MS.

Topic III: Information issues

Overall, barriers caused by information matters are reported in approximately half of the EU Member States and affect all RES sectors. In RES-E, RES-H&C and RES-T, the lack of coordination between agencies and ministries as well as the insufficient communication between the government and the market stakeholders are the persistent obstacles to project development reported by stakeholders in several MS, such as in Croatia, Cyprus, Hungary and the UK.

Topic IV: Grid issues

As highlighted in Table 28, the topic of grid issues encompasses only barriers from the RES-E sector. In this sector, almost all EU Member States have reported barriers dealing with grid issues. In addition, the barrier severity has been roughly stagnating in all MS since 2013-2014. The high occurrence of barriers in this topic shows that integrating increasing RES capacities into the electricity grid has been a persisting challenge for the majority of the Member States. More specifically, the barriers mainly arise from the high cost of grid connection as well as from the lack of predictability and transparency of the grid connection procedures.

Topic V: Support scheme issues

The evolution of barriers dealing with support scheme issues between 2013 and 2018 in the electricity, heating/cooling and transport sectors is twofold. On the one hand, the large majority of Member States report an improvement of their barrier situation. On the other, some MS still experience an aggravation of the barriers hindering the deployment of RES.

As far as RES-E is concerned, the barriers have improved in the majority of EU Member States. This is among others the result of a higher awareness of governments regarding the importance of support schemes for the achievement of the 2020 RES targets. In fact, almost all MS have implemented support schemes promoting the use of renewable energies over the period 2013-2018. In these MS, the stability of the support framework as well as the increased market maturity of certain technologies such as PV or onshore wind have contributed to the good development of the RES-E sector. Nevertheless, the barrier situation has worsened in a selection of MS, mostly due to the instability of the support scheme. In Slovakia and Finland, the insecurity of stakeholders is caused by the implemented or planned switch from the current support scheme to a tendering system. In Estonia and Croatia, uncertainties are rooted in the lack of defined legal framework for RES in the transition towards a new support scheme. Last but not least, the implementation of retroactive measures often correlates with a higher barrier severity, such as in Bulgaria, Spain, Italy or the Czech Republic, clearly showing the negative impact of such measures on the development of the RES-E sector.

Regarding RES-H&C and RES-T, barriers have also improved in the majority of the EU Member States between 2013 and 2018. Yet, all the MS reporting a higher barrier severity mention the same problem, namely the insufficient or even inexistent support scheme impeding the development of RES-H&C and RES-T technologies. For RES-H&C, this is especially the case in Germany, Greece, France, Croatia, Hungary, Portugal, Slovakia and Latvia. For RES-T: Belgium, the Czech Republic, Estonia, Spain, Croatia, Luxembourg, Latvia, Poland and Romania are particularly affected.

Overview of the Progress Reports

In addition to the barriers from the REveal database, Annex C also displays for each Member State an overview of the implementation status of several legal indicators emphasized in the RES Directive, as reported in the 4th national Progress Reports. The table below provides an overview of the Progress Reports' information for all MS.

As shown by the green cells in the overview below, a large share of the legal indicators highlighted in the RES Directive has been implemented by the MS. In this regard, the application of certain requirements is particularly well advanced, meaning that almost all MS have reported their implementation. This is especially the case for:

- Facilitated procedures for small-scale projects.
- The existence of a legal framework on the duties of the system operator to provide cost estimates and other necessary information (Art. 16 (3) (5)).
- The existence of a legal framework regulating the distribution of costs of grid development and grid connection of RES.
- The consideration of RES-E in the national network development plan.
- The existence of a support scheme promoting the use of RES (Art. 3 (3)).

As shown by the grey cells in the overview below, some requirements are not or very poorly reported in the 4th Progress Report by a majority of Member States. This is particularly the case for:

- The presence of a “One-Stop-Shop” (Art. 22(3)a)).
- The presence of an online application for permit.
- The presence of a maximum time limit for procedures.
- The presence of automatic permission after passed deadline.
- The presence of incentives promoting flexibility measures besides grid capacity expansion to accommodate RES (Art. 16 (1)).
- The existence of a framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems (Art. 16 (1)).

Table 58. Overview of the progress of the EU28 Member States on the implementation of legal indicators from the RES Directive (source: Progress Reports)

	Indicators of the progress reports	Countries																											
		BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Administrative issues	Evaluation of progress? (Art. 22(1) e)	☑	☐	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
	Overall assessment of administrative procedure?	☑	☐	☐	☑	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☐	☒	☑	☐	☑	☐	☑	☑	☑	☑	☐	☑	☑	☑
	"One Stop Shop" ? (Art. 22(3)a)) ?	☐	☑	☐	☑	☐	☐	☒	☐	☐	☑	☒	☑	☐	☒	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐
	Online application for permit?	☐	☑	☐	☐	☑	☐	☐	☐	☐	☑	☐	☐	☒	☒	☐	☐	☑	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑
	Maximum time limit for procedures?	☐	☑	☐	☐	☐	☐	☒	☐	☐	☐	☐	☑	☐	☑	☐	☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐
	Automatic permission after deadline passed? (Art. 22(3)b))	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☒	☑	☐	☒	☐	☐	☑	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐
	Increased cooperation between institutions/streamlining of permit procedures?	☑	☐	⌛	☐	☒	☑	☑	☑	☐	☑	☐	⌛	⌛	☒	☐	☐	☐	☐	☑	☑	☐	☐	☐	☐	☐	☑	☑	☑
	Facilitated procedures for small scale projects	☐	☑	☑	☐	☐	☐	☑	☑	⌛	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	⌛	☑	☐	☑	☒	☑	☑	☐	☑
Building and planning issues	Legal framework foreseeing geo. locations for RES in land-use planning and district heating? (Art. 22(3)c))	☐	☐	☐	☐	☑	☐	☑	☒	☐	☑	☒	☐	☑	☐	☐	☐	☐	☑	☐	☐	☒	☐	☐	☐	☐	☐	☐	☑
	District heating network using RES? (Art. 13 (3) and (4); 16 (11))	☐	☑	☑	☑	☑	☑	☒	☑	☐	☑	☐	☑	☐	☑	☐	☒	☐	☒	☐	☑	☐	☐	☐	☑	☐	☑	☐	☑
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	☑	☐	☑	☑	☑	☐	☑	☑	☐	☑	☐	☑	☑	☒	☐	☑	☑	☐	☑	☑	☐	☐	☐	☑	⌛	☐	☐	☐
	Obligation to use RES in public buildings? (Art. 13 (5))	☑	☑	☐	☐	☑	☐	☐	☑	☑	⌛	☐	☑	☑	☒	☐	☑	☒	☐	☐	☑	☐	☐	☐	☐	⌛	☐	☐	☐
Information issues	Certification schemes for installers ? (Art. 14 (3))	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☒	☑	☑	☐	☐	☑	☐	☐	⌛	☐	☐	☑	☑	☐	☐
Grid issues	Grid usage fee?	☑	☐	☐	☐	☐	☑	☑	☑	☐	☐	☒	☑	☑	☒	☐	☐	☑	☑	☑	☑	☐	☐	☐	☐	☐	☑	☑	☑
	Connection rights equally treating all power plants? (Art. 16 (1) (6) (7))	☐	☐	☐	☑	☐	☑	☑	☐	☐	☑	☐	☐	☑	☑	☐	☐	☑	☐	☑	☑	☑	☐	☒	☑	☐	☑	☐	☑
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	☑	☑	☑	☐	☑	☐	☐	☑	☐	☑	☑	☐	☒	☑	☐	☐	☑	☐	☑	☑	☐	☐	⌛	☑	☑	☑	☐	☑
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	☐	☑	☑	☑	☑	☐	☑	☒	☐	☑	☐	☐	☐	☑	☐	☐	☑	☑	☐	☐	☐	☐	☐	☐	☐	☑	☐	☑
	Priority of RES connection to the grid? (Art. 16 (1))	☑	☑	☑	☑	☐	☒	☑	☐	☐	☒	☐	☑	☑	☒	☐	☐	☑	☑	☑	☐	☑	☐	☑	☑	☐	☒	☐	☒
	Clear legal obligation for the system operator to reinforce the grid?	☐	☐	☑	☐	☑	☐	☐	☐	☑	☑	☑	☐	☒	☑	☑	☐	☑	☒	☑	☐	☐	☐	☑	☑	☑	☑	☑	☒
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	☐	☑	☑	☑	☐	☑	☑	☐	☑	☑	☐	☑	☑	☑	☑	☐	☑	☑	☐	☑	☐	☐	☑	☑	☑	☑	☐	☑
	Grid interconnection and interoperability with other MS? (Art. 16 (1))	⌛	☒	☒	☑	☑	☐	☑	☐	☑	☐	☑	⌛	☐	☑	☐	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑
	Shallow cost structure? (Art. 16 (5) and (6))	☑	☑	☒	☑	☑	☐	☐	☐	☐	☒	☒	☑	☑	☑	☒	☐	☑	☐	☐	☑	☐	☐	☐	☑	☑	☒	☐	☑
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5) (6))	☑	☑	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☑	☐	☐	☑	☑	☑	☑	☐	☑
	RES-priority in dispatch? (Art. 16 (1))	☐	☑	☑	☑	☐	☒	☐	☐	☐	☐	☐	☑	☑	☒	☑	☐	☑	☑	☐	☐	☐	☐	☑	☑	☑	☒	☐	☐
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	☐	☐	☑	☑	☑	☐	☑	☐	☐	☐	☐	⌛	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☑	☐	⌛	☐	☑
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	☐	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☑	☐	☑	☐	☑	☑	☐	☐	☐	☑	☐	☐	☐	☑
	RES-E considered in the national network development plan?	☑	☐	☑	☐	☑	☐	☑	☑	☑	☑	☑	☑	☑	☐	☐	☐	☑	☐	☑	☐	☐	☑	⌛	☐	☑	☐	☑	☑
Support Scheme issues	Support scheme promoting the use of RES? (Art. 3 (3)).	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	⌛	☑	☑	☑	☑
	Retroactive measures affecting the support scheme for RES?	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

☑	YES
☒	NO
⌛	In Planning
☐	Information not available in the progress report

Calculation Methodology for the Barrier Index

The barrier index indicates how strongly a technology/sector/MS is affected by barriers. To this end, the expertise of national stakeholders on barriers is set in relation with official RES deployment figures. The combination of these two aspects ensures on the one hand that various expert assessments are included in the barrier analysis. On the other hand, the barriers are put into perspective with the significance of the respective RES technologies in the sectoral renewable energy mix by 2020 as set out in the NREAPs.

The index is composed of values between 0 (good) and 1 (bad). It is calculated taking into account the product of three indicators, which can be clustered in two parts:

A. Technology-specific share in the planned RES deployment per sector 2010-2020 (based on NREAP).
B. Barriers hindering the development of RES (based on the REveal database from eclareon).

A. Technology-specific share in the planned RES deployment per MS and per sector 2010-2020

The indicator A is based on the following data for the years 2010 and 2020:

- Electricity sector: Installed capacity in MW per technology.
- Heating and transport sectors: Share of final energy consumption in ktoe.

INDICATOR I: Technology-specific contribution to the planned RES deployment per sector in the period between 2010 and 2020, as set out in the NREAP

This indicator serves to understand the significance of a specific technology in the achievement of the overall RES objectives in the corresponding sector. It takes into consideration the share of each RES technology in the overall RES deployment per sector and per MS between 2010 and 2020.

It calculates the ratio between the capacity increase of a specific RES technology between 2014 and 2020 and the overall capacity increase of the RES sector:

$$\textbf{Indicator I} = \frac{Technology - specific\ RES\ capacity\ increase\ between\ 2010\ and\ 2020}{Overall\ RES\ capacity\ increase\ of\ the\ RES\ sector\ between\ 2010\ and\ 2020}$$

The values resulting from the above-mentioned formula are between 0 (low) and 1 (high). Values less than zero are automatically set to zero and values greater than one are automatically set to one.

B. Barriers hindering the development of RES

The indicators from group B are calculated by taking into consideration the content from the REveal database, which is mainly based on expert assessments.

INDICATOR II: Average severity of barriers

This indicator provides an average value on the gravity of the barriers' impact on the development of RES projects. It is calculated by normalising the average technology-specific severity values of barriers from the REveal database:

$$\textbf{Indicator II} = \frac{Severity_{avg} - Severity_{min}}{Severity_{max-}Severity_{min}}$$

The minimum value for severity is one (less severe), the maximum value five (very severe). The normalisation formula allows to obtain values between zero (low) and one (high), which are comparable with the other indicators.

INDICATOR III: Average spread of barriers

This indicator provides an average value on the amount of installations from a specific RES technology which are affected by a specific barrier in a specific MS. It is calculated by normalising the average technology-specific spread values of barriers from the REveal database:

$$\textbf{Indicator III} = \frac{Spread_{avg} - Spread_{min}}{Spread_{max-}Spread_{min}}$$

The minimum value for spread is one (less common), the maximum value five (widespread). The normalisation formula allows to obtain values between zero (low) and one (high), which are comparable with the other indicators.

C. Calculation of the barrier index

After the calculation of each indicator, the indicators are weighted according to the following logic:

INDICATOR I is put in relation with the weighted arithmetic mean from **INDICATOR II** and **INDICATOR III**. In this regard, we consider that the spread of a single barrier is a more important value that the severity of a single barrier. In fact, a high spread value would mean that a high number of installations are affected by a barrier in a certain MS. This has a heavier consequence on the development of the concerned technology. Therefore, **INDICATOR III** weights 1.5 more than **INDICATOR II**.

The mean values of **INDICATOR I** and the weighted arithmetic mean of **INDICATORS II** and **III** are weighted in the ratio 1:1. As a result, the formula for calculating the barrier index is presented as follows:

$$\textbf{Barrier Index} = Indicator\ I * \frac{Indicator\ II + 1{,}5 * Indicator\ III}{2{,}5}$$

Assessment Methodology for the Spread and Severity Values of the REveal Database

The REveal database was created in 2016 by eclareon. It aims at identifying and assessing the barriers hindering the development of renewable energy technologies in the 28 EU Member States. It builds upon the results from earlier barrier researches conducted by eclareon, such as RES Integration and Keep-on-track! Therefore, some barriers can be traced back until 2011. The content of the database has been updated at least once a year since 2013.

The content of the database is based on desktop investigation and qualitative research interviews carried out by the eclareon research team in all national languages. The qualitative research interview was chosen as an approach in order to gather extensive and in-depth information on the barriers. The interviews are conducted informally, without predefined questions. This allows the discussion to remain open and flexible, by focusing on the interviewee’s priorities and concerns as the interview goes by. The interviewees are contacted on the basis of their professional expertise in the field of renewable energies, regardless of whether from the private or from the public sector, e.g.:

- Renewable energy associations
- Industry associations
- Energy Agencies
- Energy Regulatory Authorities
- Installers
- Ministries

On the one hand, the advantage of this approach is the broad spectrum of barriers potentially reported by stakeholders.

On the other hand, such an approach also implies that certain issues may be eclipsed by the overwhelming significance of some barriers. In fact, other national barriers may have been perceived as more important or more urgent and were therefore reported with priority. Therefore, it should be underlined that the non-identification of a barrier in a certain MS does not necessarily stand for its non-existence.

In addition, the inherent subjective nature of the information on barriers should be kept in mind when assessing the progress of the EU Member States.

Currently, the REveal database contains profiles on over 1200 barriers in the electricity (RES-E), the heating and cooling (RES-H&C) and the transport (RES-T) sectors, also identifying the affected RES technologies. Each barrier is rated thanks to spread and severity values on a scale from one to five, which can be defined as follows:

Severity	The severity level of the barrier represents the degree to which an individual barrier is hindering the development of a given installation
1	The identified barrier has minimal effects on the further development of RES installations. It causes no or negligible time loss and has no or negligible financial consequences.
2	The identified barrier has minor effects on the further development of RES installations. The completion of the installation may be slightly slowed down and financial consequences may (rarely) arise.
3	The identified barrier has moderate effects on the further development of RES installations, resulting into important time and financial losses.
4	The identified barrier has substantial effects on the further development of RES installations. The completion of the installation could be seriously jeopardized, resulting into substantial time and financial losses.
5	The identified barrier has severe effects on the further development of RES installations, leading to project abortion.

Spread	The spread level estimated the share of renewable energy installations which are affected by the barrier
1	The barrier impacts sporadic installations of the above-mentioned technologies.
2	The barrier affects a small fraction of installations of the above-mentioned technologies.
3	The barrier affects a moderate share of installations of the above-mentioned technologies.
4	The barrier affects a predominant share of installations of the above-mentioned technologies.
5	The barrier concerns almost all installations of the above-mentioned technologies.

Last but not least, the barriers are classified in five main categories and 38 subcategories, thus allowing to aggregate, compare and analyse the data at national and European level.

The content of the REveal database is the property of eclareon GmbH and is freely accessible online at: https://www.re-frame.eu

Appendix D Green-X Modelling – complementary information

Information on Planned Policy Initiatives (PPI) was collected from MS Progress Reports. Since MS reported on planned improvements in a non-homogenous manner, a comprehensive reassessment of the originally provided information was needed. As a first step, only information related to planned improvements was taken into account. In other words, existing measures as partly described by MS were not considered (since they are already incorporated in the CPI case). Planned financial support measures (e.g. planned auctions for renewable electricity capacities in the near future) were already considered in the CPI case if the available information was sufficiently detailed for the modelling purpose and the implementation of the measure was ensured. The small number of financial support mechanisms which were not detailed enough in the MS Progress Reports to enter the CPI scenario contribute to the mitigation of non-economic barriers in the CPI+PPI scenario.

Assessment for the Mitigation of Non-economic Barriers

Non-economic barriers affect the market penetration of new technologies. Technology diffusion is described in Figure 110. The curve describes penetration of the market by a new technology. At first diffusion for a new technology is very slow, increasing constantly till saturation effects enter so that the curve converges towards 100%. The shape of this curve is influenced by the non-cost barrier situation of the corresponding market. Barriers can be grouped into the following categories (Resch, 2005):

- Industry barriers: Growth rate of industry.
- Market barriers: Growth rate of industry.
- Administrative barriers: high bureaucracy.
- Resource availability.
- Social barriers: Social acceptance of additional RES-E generation.
- Technical barriers: Technical feasibility.

If barriers in the respective markets are strong, the shape of the S-curve correlates more with the blue-dashed graph beneath the blue graph in Figure 110. If non-cost barriers are mitigated by national authorities, the diffusion of new technologies will accelerate, and the shape of the S-curve will lie above the blue graph in Figure 110.

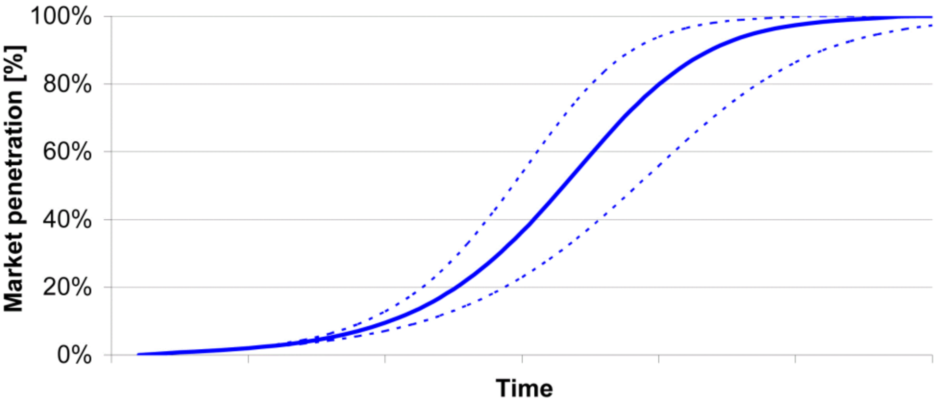


Figure 110. S-curve: Market penetration of new technologies. Source: Resch, 2005

In a first step, all measures were classified according to their sectoral coverage. In a second step, all measures in the MS Progress Reports were interpreted by their mode of action. On the one hand, measures can mitigate non-economic barriers of new technologies, and on the other hand facilitate a support mechanism in the form of financial aid to make the investment in new technologies more lucrative. As described above, the financial support mechanisms which were described not sufficiently in the MS Progress Reports to include in the CPI scenario are also listed in Table 60 and are evaluated in terms of their contribution to the mitigation of non-cost barriers. Table 59 shows the assessment of planned measures from all MS Progress Reports, which contribute to the mitigation of non-economic barriers. The positive changes in percent compared to the CPI scenario per technology category and MS are the result of the added-up values from the quality of mitigation column from Table 60. The column of Table 60 shows values from 0 to 4 for each mitigation measure, which equal from 0% to 100%. If for example a measure from Table 60 affects all energy sectors with a quality degree of one, all energy sectors in Table 59 show a positive change mitigating non-cost barriers compared to the CPI scenario of 25%. This step is repeated for all measures of Table 60 to add up all positive changes for each MS and energy sector in Table 59.

Table 59. Planned measures as of EU Member States Progress Reports for the mitigation of non-economic barriers per energy sector

Planed measures as of Memberstates Progress Reports mitigating non-cost barriers per energy sector

Energy sector / Country	Positive change in percent of non-cost barriers per energy sector compared to BAU scenario																										
	Austria	Belgium	Bulgaria	Cyprus	Croatia	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	United Kingdom
RES-E																												
Biogas	50	0	0	0	0	0	60	0	0	37.5	12.5	31	0	12.5	62.5	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Biomass																												
Forestry products	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Forestry residues	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Agricultural products	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Agricultural residues	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Biogenic fraction of waste	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	43.75	0	0
Geothermal electricity	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Hydro power																												
Small scale hydro power	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Large scale hydro power	50	0	0	0	0	0	60	0	0	0	12.5	50	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Landfill gas	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Sewage gas	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Solar																												
PV-decentral	50	0	0	0	0	0	97.5	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
PV-central	50	0	0	0	0	0	97.5	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Solar thermal	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Tidal	0	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Wave	0	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Wind																												
Wind onshore	50	0	0	0	0	0	60	0	0	0	12.5	31	0	30.25	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Wind offshore	0	0	0	0	0	0	60	0	0	0	12.5	31	0	68.75	50	0	0	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
RES-C																												
Biogas - CHP	50	0	0	0	0	0	60	0	0	37.5	12.5	31	0	12.5	62.5	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Biomass																												
Forestry products - CHP	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Forestry residues - CHP	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Agricultural products - CHP	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0
Agricultural residues - CHP	50	0	0	0	0	0	60	0	0	0	12.5	31	0	12.5	50	0	25	31.25	0	0	0	0	37.5	0	6.25	31.25	0	0

Planed measures as of Memberstates Progress Reports mitigating non-cost barriers per energy sector

Energy sector / Country	Positive change in percent of non-cost barriers per energy sector compared to BAU scenario																										
	Austria	Belgium	Bulgaria	Cyprus	Croatia	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	United Kingdom
Biogenic fraction of waste - CHP	50	0	0	0	0	0	60	0	0	0	13	31	0	13	50	0	25	31	0	0	0	0	37.5	0	6.25	43.75	0	0
Geothermal - CHP	50	0	0	0	0	0	60	0	0	0	13	31	0	13	50	0	0	31	0	0	0	0	37.5	0	6.25	31.25	0	0
Landfill gas - CHP	50	0	0	0	0	0	60	0	0	0	13	31	0	13	50	0	0	31	0	0	0	0	37.5	0	6.25	31.25	0	0
Sewage gas - CHP	50	0	0	0	0	0	60	0	0	0	13	31	0	13	50	0	0	31	0	0	0	0	37.5	0	6.25	31.25	0	0
RES-H																												
Grid connect heat																												
Biogas	50	8.1	19	0	0	0	0	0	0	94	31	0	0	0	38	31	25	0	0	0	0	0	0	0	18.75	0	0	10
Biomass																												
Forestry products	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	50	0	0	0	18.75	0	0	10
Forestry residues	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	50	0	0	0	18.75	0	0	10
Agricultural products	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	50	0	0	0	18.75	0	0	10
Agricultural residues	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	50	0	0	0	18.75	0	0	10
Biogenic fraction of waste	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	50	0	0	0	18.75	12.5	0	10
Geothermal heat	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	0	0	0	0	0	0	0	0	18.75	0	0	10
Landfill gas	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	0	0	0	0	18.75	0	0	10
Sewage gas	50	8.1	19	0	0	0	0	0	0	56	31	0	0	0	25	31	25	0	0	0	0	0	0	0	18.75	0	0	10
Non-Grid connected heat																												
Biomass small scale																												
Wood chips	50	8.1	0	0	0	0	0	0	0	69	31	0	0	0	0	31	0	0	0	0	50	0	0	0	18.75	0	0	10
Pellets	50	8.1	0	0	0	0	0	0	0	69	31	0	0	0	0	31	0	0	0	0	50	0	0	0	18.75	0	0	10
Log wood	50	8.1	0	0	0	0	0	0	0	69	31	0	0	0	0	31	0	0	0	0	50	0	0	0	18.75	0	0	10
Solar thermal heating	50	8.1	0	0	0	0	0	0	0	69	31	0	0	0	0	31	0	0	0	0	25	0	0	0	18.75	0	0	10
Heat pumps	50	8.1	0	0	0	0	0	0	0	69	31	0	0	0	0	31	0	0	0	0	25	0	0	0	18.75	0	0	10
RES-T																												
Bio fuel																												
Biodiesel	38	8.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.75	0	25	18.75	80	6.25
Bioethanol	38	8.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.75	0	25	18.75	80	6.25
Bioethanol Plus	38	8.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.75	0	25	18.75	80	6.25
Biomass to Liquid (BtL)	38	8.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.75	0	25	18.75	80	6.25
Biofuel - Import	38	8.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.75	0	25	18.75	80	6.25
Hydrogen	0	8.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	25

Table 60. All planned measures as of MS Progress Reports mitigating non-cost barriers

Measures Memberstates NREAP and Progress Reports					Assessment of non-cost barriers								
Country	Name and reference of the measure	Type of measure	Expected results	Targeted group and or activity	Progress Report 2017: Status	RES technologies covered	RES-E	RES-H	RES-T biof.	RES-T elec.	Start date of measure	End date of measure	Percent of mitigation
AT	Ecological tax reform	Legislative	Heavier taxation of resources and energy consumption	End users	EX-P	all RES technologies	yes	yes	yes	yes	in discussion	in discussion	25
AT	Structural provisions in provincial building regulations	Legislative	Preference for renewable energy systems in the construction sector	Developers	EX-P	RES-H		yes					12.5
AT	Further development of support criteria and instruments in the building sector	Financial	Stronger focus on support for thermal renovation of residential buildings and use of renewable energies for heating systems. Support for sustainable planning (housing density)	Federal government, provinces, end users	EX-P	RES-H		yes					12.5
AT	Amendment of the Fuel Regulation	Legislative	Amendment regarding use of sustainable biofuels to count towards 10 % target.	Marketer of fuels	EX-P	RES-T biof.			yes				12.5
AT	Development of Austrian transmission and distribution networks	Strategic (master plan 2009–2020)	Medium- and long-term creation of demand-driven grid infrastructure	Federal government, provinces, grid operators	EX-P	RES-E	yes						25
BE	Preparation of national policy framework for Directive 2014/94/EU on the deployment of alternative fuels infrastructure	Regulatory	Installed capacity (in MW)	Investors	P	RES-T biof.			yes				31.25
BE	Wallonia: Support for biogas injection via the green certificate mechanism and introduction of a guaranteed price	Financial/Regulatory	Installed capacity (in MW)	Investors/Public	P	RES-E	yes						0
BE	Brussels: Energy House	non-binding	Behavioural change/Installed capacity (in MW)	Investors/Public/Installers or Producers	EX-P	RES-H		yes					12.5
BE	Brussels: Introduction of certification for installers	Regulatory	Behavioural change	Installers or Producers	EX-P	RES-H		yes			2011		31.25
BE	Brussels: Introduction of a sustainable building labelling system (benchmark)	non-binding	Behavioural change/Installed capacity (in MW)	Investors/Public	EX-P	RES-H		yes					37.5
BG	Competition between RS for energy generation	Regulatory	Installed capacity, energy generation	Electricity companies, investors	P	RES-E	yes				Since 1 January 2016 all new producers of electricity from RS (with the exception of the energy sites under item 1 of Article 24 of the ZEVI) should sell their electricity on the free electricity market.		0
BG	Programme for Financial Incentives for the Use of Local Heating	Financial	ktoe	Investors	P	RES-H		yes			2013: permanent.	No deadline.	18.75

DE	Regulations on the operation of an electronic register of regional certificates	Regulatory	Implementation of Section 79a EEG 2017	Electricity market	P	RES-E	yes		Starts at the latest on 1 January 2019.		12.5
DE	Market incentive programme on the promotion of the use of renewable energy in the heating market [MAP]	Financial	investment in plants that use renewable energy sources for generation of heating or cooling and in heating networks and heat accumulators	Private households, undertakings, independent professionals, municipalities, other legal persons governed by private law	EX-P	RES-H		yes			31.25
DK	Tendering of offshore wind farms	Financial	Establishment of 1 350 MW of offshore wind turbines. 400 MW at Horns Rev, 600 MW at Kriegers Flak and 350 MW of inshore wind farms.	RE electricity generation, investors.	P	RES-E	yes		Contract for Horns Rev 3 was entered into in 2015 and contract for Kriegers Flak and the inshore wind farms was entered into in 2016.		0
DK	Flexible billing for electricity consumption	Regulatory	Promoting smart electricity consumption	Electricity consumers, grid enterprises and electricity trading companies	EX-P	RES-E	yes		2017	2020	30
DK	International electricity exchange capacity, establishing Viking Link and West Coast connection	Political approval	Promoting interconnection of electricity markets	Energinet DK (TCO)	P	RES-E	yes			Viking Link and West Coast connection put into operation in late 2022	30
DK	Tendering of solar photovoltaics (pilot tender)	Financial	Establishing 20 MW of solar photovoltaics	RE electricity generation, investors.	P	RES-E	yes			Contracts took effect in 2016, expected connection to the grid in 2018.	0
DK	Technology-neutral tenders (wind turbines on land, solar photovoltaics and offshore wind turbines under the participation scheme [åben-dør-ordning])	Financial	Expected electricity generation based on 8 TWh in the first 20 years of the plants' lifetime.	Wind turbines and solar photovoltaics	P	RES-E	yes		Tender expected in 2018/2019	Tender expected in 2018/2019	0
DK	Tender specifically for solar	Financial	Expected electricity generation based on 8 TWh in the first 20 years of the plants' lifetime.	Solar photovoltaics	P	RES-E	yes		Tender expected in 2018	Tender expected in 2018	37.5
ES	Further development of international interconnections	Soft	Increase security of supply, promote integration of more non-manageable renewable electricity and move away from Spain's current status as an energy island.	Electricity system operators, power plant operators and rights holders	EX-P	RES-E	yes				31.25
ES	Implementation of 'labelling of small-scale wind turbines'.	Information / Training	National procedure that, in accordance with existing international standards and recommendations, promotes the orderly growth of small-scale wind power in Spain while guaranteeing the engineering quality and features of the wind turbines installed.	Rights holders of small-scale wind plants	P	RES-E	yes		2015	2017	0

ES	Monitoring of national and international biomass markets.	Soft	Monitoring of and reaction to fluctuations in national and international markets.	All sector stakeholders	P	RES-E	yes				2016	2020	0
ES	Setting of sectoral energy-recovery targets for certain flows of waste with fully or partially renewable content.	Regulatory	Reduce the current high volume of waste and increase energy recovery.	Public authorities, waste management companies, potential corporate consumers	EX-P	RES-E, RES-H	yes	yes			2015	2015	12.5
ES	Draft of the royal decree establishing the calculation methodology and information requirements relating to the greenhouse-gas emissions intensity of fuels and energy used in transport, amending Royal Decree 1597/2011 of 4 November 2011 regulating the sustainability criteria applicable to biofuels and bioliquids, the national sustainability verification system and the double counting of certain biofuels and establishing an indicative target for sale and consumption of advanced biofuels.	Regulatory	In May 2017, in compliance with the public information and consultation procedures established, a draft royal decree was published on the website of the Ministry of Energy, Tourism and Digital Agenda. The object of this Royal decree included the following: · Adaptation of the sustainability criteria for biofuels and bioliquids to those laid down in Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources. · Modification of the national sustainability verification system for biofuels and bioliquids, progressing from the transitional system currently in effect to a definitive system.	Biofuel sector	P	RES-T biof.			yes				18.75
FR	Energy Transition Tax Credit (formerly the Sustainable Development Tax Credit)	Fiscal	Increase in the number and quality of energy performance works to have wood-fired heating installed in 9 million dwellings, heat pumps in 2 million dwellings and solar thermal equipment in 4 million dwellings by 2020. 15 % reduction in energy consumption of buildings by 2023. Renovate half of the 1.5 million dwellings 'leaking' energy inhabited by low-income owner-occupiers over a period of 5 years.	Individuals	EX-P	RES-H		yes			2005-2017, extended to 2018 by the 2018 Finance Act.	2005-2017, extended to 2018 by the 2018 Finance Act.	12.5
FR	National Housing Agency (ANAH) aid	Subsidies	The Building Energy Improvement Plan lays down an industrial policy for renovating dwellings 'leaking' energy. To this end, the ANAH's target has been increased from 50 000 to 75 000 energy improvements per year of homes occupied by low-income households ('Habiter Mieux' programme).	Individuals	EX-P	RES-H		yes			2007-2017	renewed for 2018-2020, ongoing.	12.5
FR	Social housing and public buildings renovation plan	Financial	The renovation of state and local authority building stock must contribute to the general objectives of the Climate Plan, i.e. a 15 % reduction in the energy consumption of buildings by 2023, as compared to 2010. Social housing stock: remove all dwellings 'leaking' energy from the stock of public rental properties.	Social housing managers, state and local authorities	EX-P	RES-H		yes			2009	2020	0
FR	Exemption from property tax on developed property	Regulatory	Incentive to ensure sound energy performance, use renewable energy and take account of environmental performance.	Social housing, lessors	P	RES-H		yes			2018	2018	18.75

FR	Public service for home energy performance (SPPEH)	Information/ awareness raising	Increase in the number and quality of energy-efficiency renovation works: wood-fired heating installed in 9 million dwellings, heat pumps in 2 million dwellings and solar thermal equipment in 4 million dwellings by 2020. Organisation of basic, understandable assistance and a real one-stop shop.	Individuals	P	RES-H		yes			Mid-2018	Mid-2018	25
FR	Calls for tender for biomethane production	Financial	Achievement of biomethane production targets.	Investors	P	RES-E, RES-H, RES-T biof.	yes	yes	yes		2018-		0
GR	Reinforcement of the interconnection capacity with neighbouring countries (increase of NTC on the existing interconnections + new interconnection with Turkey). Further actions and projects for the integration of theelectricity system into the European grid through western Balkans.	Technical		Investors, public administration, planners	EX-P	RES-E	yes				2010	2020	31.25
GR	Development of storage facilities in the interconnected system by exploiting hydro pumpong system at existing lare hydro plants and new installations (public consultation RAE)	Technical		Public administration, planners	P	RES-E	yes				2014	2020	18.75

HU	Balkans	financial	The purpose of the loan scheme is to increase the competitiveness of micro, small and medium-sized enterprises which have limited to no access to funding sources, to establish a basis for their advanced product and service development capacities and to support these capacities by improving access to external financing. The loan scheme supports financially viable and income-generating investments of micro, small and medium-sized enterprises which generate electricity for network production with the use of renewable energy sources (with the exception of wind energy).	Within the framework of the loan scheme, financially viable corporations, self-employed entrepreneurs, one-man firms, cooperatives or Hungarian branches of foreign enterprises with limited to no access to funding sources which are resident in Hungary and have a registered seat in Hungary or a registered seat in the European Economic Area and a branch office in Hungary and are classified as a micro, small or medium-sized enterprise under Annex I to Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty are eligible for the loan. Accordingly, the loan may be requested by an enterprise which is a micro, small or medium-sized enterprise within the meaning of Annex I to Commission Regulation (EU) No 651/2014 on the	P	RES-E	yes			Applications for loans under this scheme may be submitted since 28 February 2017. (the scheme is now **temporarily suspended** as the envelope has been exhausted)		0
HU	GINOP-4.1.1-8.4.4-16 Support for the improvement of the energy performance of buildings with the use of renewable energy through combined loan products	financial	This non-refundable aid and loan scheme contributes to the implementation of investments aiming at improving the energy conservation and energy efficiency of buildings with the utilisation of renewable energy sources. It simultaneously helps to strengthen environmentally-conscious economic competitiveness, reduce environmental load and the amount of primary energy used, reduce greenhouse gas emissions by increasing the utilisation of renewable energy sources, and alleviate the burden linked to the overhead costs of enterprises.	Aid applications may be submitted by small and medium-sized enterprises which fully comply with the eligibility criteria specified in the call for proposals. Aid applications may not be submitted under this call by consortia.	P	RES-H		yes		Aid applications may be submitted from 16 March 2017	to 8 January 2018, 12.00.	0
HU	GINOP-4.1.2-17 Support for the improvement of the energy performance of buildings with the use of renewable energy	financial	This non-refundable aid scheme contributes to the implementation of investments aiming at improving the energy conservation and energy efficiency of buildings with the utilisation of renewable energy sources. It simultaneously helps to strengthen environmentally-conscious economic competitiveness, reduce environmental load and the amount of primary energy used, reduce greenhouse gas emissions by increasing the utilisation of renewable energy sources, and alleviate the burden linked to the overhead costs of enterprises.	Aid applications may be submitted by small and medium-sized enterprises which fully comply with the eligibility criteria specified in the call for proposals. Aid applications may not be submitted under this scheme by consortia.	P	RES-H		yes		Aid applications may be submitted from 15 January 2018	to 28 June 2018, 12.00.	0

IE	GIS resources	Technical/Soft	Updated wind atlas available on the Sustainable Energy Authority of Ireland (SEAI) web site.	General Public, County Councils, Wind Energy Project Developers, Academic Researchers, Consultants and Government bodies.	P	RES-E	yes				Available since Q2, 2015.		18.75
IE	SFI programmes	SFI research programmes (suitable for recruitment, early/mid-career researchers, outstanding individuals, large scale centres, enterprise and industry, infrastruct-ure, international and networking & external engagement).	Research in the area of Energy builds research capacity, scientific expertise, and collaborative relationships between academia, international collaborators and industry.	Researchers in Irish Higher Education Institutions, collaborating industry partners, collaborating international academic partners.	EX-P	all RES technologies	yes	yes	yes	yes	ongoing	ongoing	0
IE	The continuing roll-out of EirGrid's grid development strategy	Infrastructural	EirGrid's grid development strategy "Your Grid Your Tomorrow" builds upon, and replaces, the original grid development strategy "Grid25". "Your Grid Your Tomorrow" provides the framework to improve grid which will help to facilitate the integration of increasing amounts of renewable generation EirGrid is engaging with communities around the country on the roll out of the programme	Generators of RES-Eenergy security and conventional generation	EX-P	RES-E	yes				"Your Grid Your Tomorrow" was published in January 2017. It builds upon, and replaces, the original grid development strategy "Grid25"		12.5
IE	Consent process for offshore renewable energy projects	Regulatory	The Minister for Planning intends to streamline and modernise the consent process for certain developments in the offshore environment, including offshore renewable energy projects such as wave, offshore wind and tidal technologies on a phased basis.	Generators of RES-E operating in the offshore environment	P	RES-E	yes				Drafting of the Maritime Area and Foreshore (Amendment) Bill was approved by Government in July 2013 pursuant to the General Scheme submitted. Drafting of the Bill is being progressed by DHPCLG as a priority business task.		37.5

IT	Aggregation of power generating installations and users (Legislative Decree No 102/2014)	Regulatory	Improve the efficiency of the electricity market by avoiding the interruption of RES electricity generation. Legislative Decree No 102/2014 introduced the possibility of setting up clusters of power generating installations and users for access to aggregate supply and to provide flexibility services, to be managed by operators guaranteeing efficient aggregation. The grid operators must establish the rules for organising the participation of these new clusters. AEEGSI has launched pilot projects that will make it possible to acquire useful elements for bringing dispatching up to speed, relating to the participation in the dispatching services market, including in aggregate form, of demand and the production units that have not yet been authorised, including production units using non-programmable renewable sources.	Producers/consumers/grid operators	P	RES-E	yes			July 2014	n/a	25
IT	Conditions for connecting biomethane installations to the natural gas grid (Article 20 of Legislative Decree No 28/2011)	Regulatory	Feeding of biomethane into the natural gas grid. By Decision 46/2015/R/gas of 12 February 2015, AEEGSI approved the rules for connecting biomethane installations to the natural gas grids, to which grid operators must adapt their grid codes, and the rules for determining the quantities of biomethane eligible for the incentive. Annex A to the Decision contains:- in Section I, the rules for biomethane, developed in line with the targets set out in Legislative Decree No 28/11 aimed at guaranteeing the safe and technically efficient operation of gas grids, establishing transparent and certain grid connection procedures and enabling affordable connection, to promote widespread use of biomethane; - in Section II, the provisions on the manners for measuring, calculating and certifying the quantity of biomethane eligible for the incentives pursuant to the Decree of 5 December 2013. By Decision 204/2016/R/gas of 28 April 2016, AEEGSI approved an amendment to the Transportation Grid Code of the company Snam Rete Gas S.p.A., aimed at transposing the Directives for connecting biomethane installations to the natural gas grids, in accordance with Decision 46/2015/R/gas. By Decision 299/2016/R/gas of 9 June 2016, AEEGSI approved a proposed update to the transportation grid code of the company Infrastrutture Trasporto Gas S.p.A. relating to biomethane, aimed at transposing the Directives for connecting biomethane installations to the natural gas grids, in accordance with Decision 46/2015/R/gas. By Decision 239/2017/R/gas of 13 April 2017, AEEGSI	Biomethane producers and natural gas grid operators	P	RES-E, RES-H	yes	yes		2011	n/a	12.5

IT	Rationalisation measures (Article 12 of Legislative Decree No 28/2011)	Regulatory - Financial	Rationalisation of procedures. Legislative Decree No 28/2011 provides for the adoption of simplification measures to reorganise economic and financial burdens and the different forms of guarantees required for the authorisation, installation, connection and operation of renewable energy installations and for the granting of incentives thereto.	Investors/end users	P	RES-E, RES-H	yes	yes		2013	n/a	25
LT	By reconstructing existing or constructing new cogeneration capacities, to ensure that the Kaunas district heating system is additionally equipped with installations with electricity generating capacity of up to 53 MW/ heat generating capacity of up to 130 MW using renewable and/or indigenous energy resources (municipal waste). Currently, Vilnius and Kaunas boast the most favourable conditions and possibilities for high-efficiency cogeneration due to a rather big basic heat demand. To satisfy that demand, it is possible to produce electricity that is competitive under market conditions. In Kaunas it is planned to build a new high-efficiency waste-fired cogeneration power plant with electrical capacity of around 24 MW and heat generating capacity of about 70 MW. Such capacity will enable the rational use of about 200 000 tonnes of municipal waste generating in the region after sorting and the production of	Regulatory	The Kaunas district heating system would be additionally equipped with installations with electrical capacity of up to 53 MW/ heat generating capacity of up to 130 MW using renewable and/or indigenous energy resources (municipal waste)	The State or State-owned companies own at least 51 % of shares in the enterprise implementing the project and respective voting rights	P	RES-E, RES-H				Since 2015		6.25

LT	By constructing new cogeneration capacities, to ensure that the district heating systems of other cities are additionally equipped with 43 MW electric capacity cogeneration installations powered by biofuels and/or biogas. The measure is aimed at reducing heating prices and environmental pollution by giving priority to renewable and/or indigenous energy sources in the fuel mix used for heat production. Articles 2 and 7 of the Law of the Republic of Lithuania on the Heat Sector. The 2015-2021 National Programme for heat sector development, as approved by Resolution No 284 of the Government of the Republic of Lithuania of 18 March 2015 approving the 2015-2021 National Programme for heat sector development.	Regulatory	District heating systems of other cities to be additionally equipped with biofuel and/or biogas cogeneration units with electrical capacity of 43 MW	Legal entities	P	RES-E. RES-T	yes	yes		As from 2015	18.75
LU	Within the framework of improving national security of supply and increasing Luxembourg's integration into the European power supply network, different approaches for connecting Luxembourg to the transportation networks of neighbouring countries are to be investigated, which would benefit the development of renewable energies in the power supply network.	Infrastructural	Increase in installed capacity and energy production from RES; The only transportation network operator of Luxembourg, Creos, strengthened the North-South link within Luxembourg and improved the coverage in the capital by completing the Luxring project in 2016/2017, while at the same time provided for the interconnectivity of the connections of Luxembourg with Germany and Belgium.	Network operators	P, EX-P	RES-E	yes			Exists	31.25

LV	Measures to increase the energy efficiency of industrial facilities and buildings (CM Regulation No. 38 of 16 January 2018 “Implementing rules for the second round of project application selection for specific aid objective No. 4.1.1 "To promote efficient use of energy resources, reduction of energy consumption and transition to RES in the processing industry sector” of the operational programme "Growth and Jobs"	Financial (Cohesion fund)	Increased energy efficiency of industrial buildings and equipment supporting the insulation of buildings, switching the utilities and heating systems to the use of RE for heat generation and switching the production facilities, thereby reducing the consumption of heat energy from industrial buildings and the amount of GHG emissions generated, as well as the energy consumption of production processes	Small, medium and large manufacturing enterprises registered in the Republic of Latvia.	P	RES-H		yes		February 2018	half of 2021	18.75
LV	Measures to increase energy efficiency and promote the use of RES technologies in public buildings (CM Regulation No. 13 of 4 January 2018, "Implementing rules for the second round of project application selection" for specific aid objective 4.2.1 "Promoting energy efficiency in residential and public housing" of the operational programme "Growth and Jobs" activity 4.2.1.2 "Promoting energy efficiency in residential and public housing".	Financial (ERDF aid, state aid)	Promoted the growth of RES technologies, increased energy efficiency of the building and reduced thermal energy consumption of the building, thus reducing the amount of GHG emissions	Owners and users of public buildings and engineering structures.	P	RES-H		yes		March 2018	31/10/2022	12.5
MT	Grant Scheme for Heat Pumps Water Heaters for domestic use	Financial	Increase in the use of renewable sources of energy in the domestic sector	Residential	P	RES-H		yes		2017	2017	0
NL	Energy label C obligation offices	Regulatory	Change in behaviour, installed capacity, energy-saving measures	Office owners	P	RES-H		yes		2023		0
PL	Create a national system for the registration of installers and small renewable systems for thermal purposes (solar thermal, heat pumps and biomass systems)	Regulatory	Better facilities, improved information for customers, establishment of a procedure for the collection of data for the NREAP.	Installers, End user, Portuguese State	P	RES-H		yes		2013	2020	25
PL	Promote the installation in buildings of more efficient environmentally friendly energy systems run on biomass for heating/air conditioning	Regulatory/Financial	153 354 tep in 2020	End user (Residential and Services)	P	RES-H		yes		2010	2020	25

RO	The development of transmission and distribution electric networks for ensuring that electricity from RES is taken over (Outlook Plan for the Electricity Transmission and Distribution Networks for 2019-2023 drawn up by CN Transelectrica SA, SC ENEL SA, SC CEZ SA, SC Electrica SA, SC DELGAZ Grid S.A.	Investments	Ensuring the transmission and distribution of electricity produced from RES, under safe operation of the National Power System	CN Transelectrica SA, SC ENEL SA, SC CEZ SA, SC Electrica SA, SC DELGAZ Grid SA, Producers of electricity using RES	P	RES-E	yes				2010	Estimated value: 2019-2023	37.5
RO	Establishing the share of biofuels in petrol and diesel placed on the market in 2013–2014 (Government Decision No 935/2011)	Regulatory	Increasing biofuel consumption	Fuel producers	P	RES-T biof.			yes		11 October 2011	Estimated value: 2020	6.25
RO	Placing on the market only biofuels and bioliquids obtained from raw material meeting the sustainability criteria defined and the obligation to check the compliance with such criteria (Government Decision No 935/2011)	Regulatory	Implementation of sustainable development principles	Fuel producers	P	RES-T biof.			yes		11 October 2011		12.5
RO	Establishing the share of biofuels in petrol and diesel placed on the market in 2013–2014 (Government Decision No 1121/2013 amending and supplementing GD No 935/2011 and GD No 928/2012)	Regulatory	Increasing biofuel consumption	Fuel producers	P	RES-T biof.			yes		Entered into force in 01 January 2014	Estimated value: 2020	0
RO	Certifying biofuels and bioliquids with regard to meeting the sustainability criteria, voluntary schemes recognised by the European Commission for proving the compliance with sustainability criteria pursuant to Directive 2009/28/EC (Order No 136/2012 of the Ministry of Economy and Business Environment)	Regulatory	Transposition of EU law	Fuel producers	P	RES-T biof.			yes				0

Reduction obligation	Financial, administrative	Reduced greenhouse gas emissions through the increased incorporation of biofuels in fossil fuels	Fuel sellers and professional users	P	RES-T biof.			yes		1 July 2018		37.5
Bonus malus system	Financial	Promotion of vehicles with low CO2 emissions per km	Vehicle owners	P	RES-T biof., RES-T elec.			yes	yes	1 July 2018		25
Information concerning fuels	Administrative	Increased climatic performance and sustainability of fuels	Fuel sellers	P	RES-T biof.			yes		2018		12.5
Fossil free transport solutions	Financial	Promotion of fossil free transport solutions	All activities	P	RES-T biof., RES-T elec.			yes	yes	2018	2023	18.75
Home charging	Financial	Improving the charging infrastructure for electric vehicles	Infrastructure	P	RES-T elec.				yes	2018	2020	37.5
Electric vehicle premium	Financial	Reduction of car journeys and the promotion of journeys using electric vehicles	Private individuals	P	RES-T elec.				yes	2018	2020	18.75
Project office for energy renovation of public buildings	Organisational measure	Promotion of use of RES in the scope of energy renovation of public buildings. Together with other measures (financial support, demonstration projects etc.), the measure will contribute to increased generation of heat and cooling energy from RES in the public sector buildings by 15 ktoe by 2020.	Public sector	P	RES-H		yes			2015	The funding of the office is ensured until 2023; otherwise, the end date of the measure is not defined.	12.5
Long-term Strategy for Mobilising Investments in the Energy Renovation of Buildings	Planning of national goals and measures	With the strategy, Slovenia sets itself the goal to achieve major improvements in energy efficiency	Buildings in all sectors, primarily in households and in public and private service	EX-P	RES-H		yes			2015	2030	0
Action Plan for Nearly-Zero Energy Buildings (AN sNES)	Planning of national goals and measures	The Action Plan promotes energy renovation of the existing building to transform them into nearly-zero energy buildings and construction of new nearly-zero energy buildings.	Buildings in all sectors, primarily in households and in public and private service sectors	EX-P	RES-H		yes			2015	2030	0
Decree on energy management in the public sector (Official Gazette of the RS No 52/2016)	Regulation	Establishment of the system of monitoring and planning energy use, including the use of RES in the public sector	Public sector	P	all RES technologies	yes	yes	yes	yes	The legal obligation was adopted in 2012. The measure has been implemented since 2016.	n/a	6.25
Strategy for alternative fuels	Planning of national goals and measures	Increased use of RES and reduced use of final energy in transport; achievement of the environmental goals in the area of greenhouse gas and pollutant emissions; reduction of greenhouse gas emissions in transport by 9 % in 2030 compared to 2020	Transport	EX-P	RES-T			yes	yes	The measure was adopted in 2017. The strategy proposes groups of measures for each alternative fuel, on the basis of which a detailed action plan for the 2018–2020 period will be prepared.		18.75

UK	Renewable Heat Incentive (RHI)	Financial	The programme provides payment for heat generated, by registered installations, from renewable sources. Objectives: · Contribute directly to decarbonisation of heating in the UK and to meeting Carbon Budgets· Contribute to renewable energy in order to help meet the UK's 2020 renewable energy target · Support growth of the renewable heat supply chain and challenge the market to deliver.	Non-domestic RHI: Non-domestic properties, industrial, commercial, public and district heating installers and manufacturers. Domestic RHI: Households, social and private landlords.	EX-P	RES-H		yes			Non-domestic RHI: opened in November 2011. Domestic RHI: opened in Spring 2014.	0
UK	Renewable Transport Fuel Obligation (RTFO)	Regulatory	Increase proportion of renewable fuel in road fuel and reduce emissions from GHG by regulating for the use of sustainable biofuel.	Fuel suppliers	EX-P	RES-T biof.			yes		The RTFO was launched in April 2008 and is currently ongoing. In September 2017 we published results of our consultation on what shape the RTFO should	6.25
UK	Hydrogen for Transport	Fiscal	Behaviour Change	End users	P	RES-T biof.			yes		2017	25
UK	Northern Ireland: Nearly Zero Ca	Regulatory	By 31st December (from 31st December 2019 for publi	New buildings	P	RES-H		yes			Staged approach – First stage started in October 2014. Next stage planned for March 2017. Implementation on certain public buildings from Jan 2019 and full implementation by 31st Dec 2020, to follow standards in England.	37.5

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