

Grand Duchy of Luxembourg

Fourth Progress Report

under Article 22 of Directive 2009/28/EC

on the promotion of the use of energy from renewable sources

Changes to titles of relevant legislation and ministries/authorities responsible

In general terms, it should be noted that the titles of various pieces of relevant legislation and of various ministries/authorities have changed since the NREAP was drawn up in 2010. Areas of responsibility delegated to ministries/authorities may also have been restructured. We would point out, however, that these changes to titles of legislation and/or ministries/authorities and any restructuring of areas of responsibility among ministries/authorities have no impact on the measures described in the NREAP. The changed titles of legislation were noted in principle in the first, second, third or the present (fourth) progress report in accordance with Article 22 of Directive 2009/28/EC on the promotion of the use of energy from renewable sources (hereinafter: first, second or third progress report), without this being indicated on each occasion in the NREAP.

1. Sectoral and overall shares and actual consumption of energy from renewable sources in the preceding two years (2015 and 2016) (Article 22(1)(a) of Directive 2009/28/EC)

Table 1: Sectoral (heating and cooling, electricity and transport) and overall shares of energy from renewable sources¹

	2015	2016
RES-H&C ² (%)	7.08 %	7.33 %
RES-E ³ (%)	6.19 %	6.68 %
RES-T ⁴ (%)	6.49 %	5.92 %
Overall RES share ⁵ (%)	5.04 %	5.44 %
Of which from cooperation mechanism ⁶ (%)		
Surplus for cooperation mechanism ⁷ (%)		

The figures for energy from renewable sources in Luxembourg for 2015 and 2016 are based on statistics from the SHARES model.

By continuously increasing the share of renewables in the electricity, heating and cooling sector in 2016, the Grand Duchy of Luxembourg reached the indicative trajectory for the year 2016.

¹ Facilitates comparison with Table 3 and Table 4a in the NREAP

² Share of renewable energy in heating and cooling: Gross final consumption of energy from renewable sources for heating and cooling (as defined in Article 5(1)(b) and Article 5(4) of Directive 2009/28/EC) divided by gross final consumption of energy for heating and cooling. The same methodology as in Table 3 of the NREAP applies

³ Share of renewable energy in the electricity sector: Gross final consumption of energy from renewable sources for electricity (as defined in Article 5(1)(a) and Article 5(3) of Directive 2009/28/EC) divided by total gross final consumption of electricity. The same methodology as in Table 3 of the NREAP applies.

⁴ Share of renewable energy in the transport sector: Final consumption of energy from renewable sources in transport (cf. Article 5(1)(c) and Article 5(5) of Directive 2009/28/EC) divided by the consumption in the transport sector of 1) petrol; 2) diesel; 3) biofuels used in road and rail transport; and 4) electricity used in land transport (cf. row 3 of Table 1). The same methodology as in Table 3 of the NREAP applies.

⁵ Share of renewable energy in the gross final consumption of energy. The same methodology as in Table 3 of the NREAP applies.

⁶ As percentage of overall RES share.

⁷ As percentage of overall RES share.

Table 1a: Calculation table for the renewable energy contribution of each sector to final energy consumption (ktoe)⁸

	2015	2016
<i>A) Gross final consumption of RES for heating and</i>	74.9	80.1
<i>B) Gross final consumption of electricity from RES</i>	34.2	37.1
<i>C) Gross final consumption of energy from RES in</i>	83.7	90.6
<i>D) Gross total RES consumption⁹</i>	192.8	207.8
<i>E) Transfer of energy from RES to other Member</i>		
<i>F) Transfer of energy from RES from other Member</i>		
<i>G) RES consumption adjusted for target (D)-(E)+(F)</i>	192.8	207.8

The indicative target was reached in 2016 despite the fact that no energy from renewable sources was transferred from other Member States and third countries to Luxembourg.

Compared to the NREAP, the gross final consumption of energy from renewable sources for **heating and cooling** in the years 2015 and 2016 is still significantly above calculations.

In the area of renewable **electricity generation**, gross final consumption and percentage share have both increased. Compared to the NREAP however, this sector is still performing below expectations. More significant effects of recent projects (mainly in the area of wind power) can be expected from 2017 onwards.

The gross final consumption in the **transport sector** increased further and is now slightly below the calculations of the NREAP. The percentage share of the transportation target decreased slightly in 2016 against 2015. In 2015, very large amounts of biofuels were used which can be double-counted. Slightly more than half of the biofuels used could be double-counted in 2015; in 2016 these biofuels still made up about a quarter of the total biofuels. This continues to exceed the requirements under Directive 2015/1513/EU. The envisaged reference value has to correspond to 0.5 % of the transport target. This value was at 1.99 % in Luxembourg in the year 2016. Biofuels have a total share of 5.92 % in the transport sector.

⁸ Facilitates comparison with Table 4a in the NREAP.

⁹ According to Article 5(1) of Directive 2009/28/EC, gas, electricity and hydrogen from renewable energy sources shall only be considered once. No double counting is allowed.

Table 1b: Total actual contribution (installed capacity, gross electricity production) from each renewable energy technology in Luxembourg to meet the binding 2020 targets and indicative interim trajectories for the share of energy from renewable sources in electricity¹⁰

	2015		2016	
	MW	GWh	MW	GWh
hydro ¹¹ :	34	103.7	34	103.5
<i>non-pumped</i>	34	103.7	34	103.5
<1MW	2	5.6	2	5.7
1MW-10MW	32	98.1	32	97.8
>10MW	0	0	0	0
<i>pumped</i>	1 296	1 431.4	1 296	1 412.7
<i>mixed</i> ¹²	0	0	0	0
geothermal	0	0	0	0
solar:	116	103.7	122	100.3
<i>photovoltaic</i>	116	103.7	122	100.3
<i>concentrated</i>	0	0	0	0
tide, wave,	0	0	0	0
wind:	64	90.7	120	127.2
<i>onshore</i>	64	90.7	120	127.2
<i>offshore</i>	0	0	0	0
biomass ¹³ :	16	90.9	16	99.5
<i>solid biomass</i>	4	24.2	4	25.1
<i>biogas</i>	12	66.7	12	74.4
+ <i>bioliquids</i>	0	0	0	0
TOTAL	230	389	292	430.5
<i>of which CHP</i>		85.7		97.8

Overall, installed capacity for energy production from renewable energy sources in the electricity sector (2015 and 2016) rose in comparison to the third progress report (2013: 208 MW; 2014: 223 MW).

The installed capacity in the electricity sector was below the calculations of the NREAP in 2015, but almost reached those in 2016 at 292 MW (296 calculated).

The installed capacity and production of **wind energy** is lower than the values assumed in the NREAP for both 2015 and 2016. It has to be taken into account here that several wind turbines were completed in 2016, although only in the last trimester. The effect of the doubling of installed capacity from 2015 to 2016 was therefore not fully reflected in production. However, this will be the case in 2017, and the deficit should be reduced significantly in the coming years.

Growth in **photovoltaics**, a technology with low full load hours, was high in comparison, producing about 35 % more electricity in 2016 than the value assumed in the NREAP. Compared to the NREAP, the value for installed photovoltaic capacity for 2016 was also

¹⁰ Facilitates comparison with Table 10a in the NREAP.

¹¹ Normalised in accordance with Directive 2009/28/EC and Eurostat methodology.

¹² In accordance with new Eurostat methodology.

¹³ Only those complying with the applicable sustainability criteria (cf. Article 5(1) last subparagraph of Directive 2009/28/EC) are to be taken into account.

around 20 % higher.

Table 1c: Total actual contribution (final energy consumption¹⁴) from each renewable energy technology in Luxembourg to meet the binding 2020 targets and the indicative interim trajectories for the share of energy from renewable sources in heating and cooling (ktoe)¹⁵

	2015	2016
Geothermal (excluding low temperature geothermal heat in heat pump applications)	0	0
solar	1.9	2.0
biomass ¹⁶ :	69.5	74.0
<i>solid biomass</i>	60.2	63
<i>biogas</i>	9.3	11
<i>bioliquids</i>	0	0
Renewable energy from heat pumps:	3.5	4.1
- of which <i>aerothermal</i>	2.2	2.4
- of which <i>geothermal</i>	1.3	1.8
- of which <i>hydrothermal</i>		
TOTAL	74.9	80.1
<i>of which DH¹⁷</i>	13.0	13.3
<i>of which biomass in households¹⁸</i>	22.4	25.2

Total final energy consumption from renewable sources in the heating and cooling sector was higher in 2015 and 2016 than the values forecast in the NREAP.

This is due in particular to solid **biomass**. The increased final energy consumption in the heating and cooling sector from solid biomass in the years 2015 and 2016 is due to the presence of several large industrial undertakings which cover part of their heating requirement with solid biomass. At least one more large industrial project is in development.

From the year 2016, a further large project in the area of biomass use (pellets) has to be mentioned: since being put into service in 2001, a natural gas-CHP plant supplies the district heating network in the city of Luxembourg. The CHP plants which do not only generate heat, but also electricity, feed the generated electricity into the public power supply network. Due to the growth of Kirchberg in Luxembourg and the general rise in the demand for heating, the latest extension of the plant included an efficient and environmentally friendly technology. This decision on the use of renewable energy was enabled by public support instruments.

¹⁴ Direct use and district heat as defined in Article 5(4) of Directive 2009/28/EC.

¹⁵ Facilitates comparison with Table 11 in the NREAP.

¹⁶ Only those complying with the applicable sustainability criteria (cf. Article 5(1) last subparagraph of Directive 2009/28/EC) are to be taken into account.

¹⁷ District heating and/or cooling as share of total renewable heating and cooling consumption (RES-DH).

¹⁸ As share of total renewable heating and cooling consumption.

The pellets are burnt at a CHP plant and the heat generated covers the base load in the district heating network of Kirchberg. During consumption spikes, the existing natural gas-CHP engines and condensing boilers generate the additionally needed energy.

The new plant has an electrical output of 2.8 MW and a thermal output of 9.5 MW. Green heat production is 12 GWh per year higher than heat production from fossil fuels, so that more than 50 % of the heating of Kirchberg is covered from renewable energy sources. All connected buildings have a better primary energy balance now.

It should be mentioned that energy production from **solar** and **heat pumps** is rising continuously.

Moreover, in the heating and cooling sector, three **biogas plants have been connected to the public gas network** since 2011. Following completion of test phases in late 2011/ early 2012, these plants fed in 61.7 GWh (5.3 ktoe) in 2015 and 60.6 GWh (5.2 ktoe) in 2016.

More detailed information on the practical implementation of the corresponding regulation is contained in the report '*Rapport 2013 - Mise en oeuvre du règlement grand-ducal du 15 décembre 2011 relatif à la production, la rémunération et la commercialisation de biogaz*', and in the report '*Rapport 2014 - Mise en oeuvre du règlement grand-ducal du 15 décembre 2011 relatif à la production, la rémunération et la commercialisation de biogaz*', sent to the European Commission in July 2016 and in August 2017, respectively.

Table 1d: Total actual contribution from each renewable energy technology in Luxembourg to meet the binding 2020 targets and the indicative trajectories for the share of energy from renewable sources in the transport sector (ktoe)^{19,20}

	2015	2016
- bioethanol	7	9
- biodiesel (FAME)	75.6	81.1
- hydrogenated vegetable oils (HVO)	1.2	2.9
- biomethane	0	0
- Fischer-Tropsch diesel	0	0
- bio-ETBE	0	0
- bio-MTBE	0	0
- bio-DME	0	0
- bio-TAEE	0	0
biobutanol	0	0
- biomethanol	0	0
- pure vegetable oil	0	0
Total sustainable biofuels	81.04	87.02
Of which		
sustainable biofuels included in the list of raw materials in Annex IX Part A	0	0
other sustainable biofuels suitable as regards reaching the target under Article 3 Paragraph 4 Point e	0	0
sustainable biofuels included in the list of raw materials in Annex IX Part B	43.51	19.34
sustainable biofuels, the contribution of which to reaching the renewable energy target under Article 3 Paragraph 4 Point b is limited	37.53	66.89
Import from third countries	0	0
Hydrogen from renewables	0	0
Electricity from renewables	2.70	3.56
Of which		
road transport	0.02	0.02
rail transport	2.68	3.54
other transport sectors	0	0
Other (please specify)	0	0.79
Other (please specify)	0	0
TOTAL	83.74	90.59

The proportion of energy from renewable sources in the transport sector in 2015 and 2016 is very close to the values assumed in the NREAP. In order to reach this assumed share, Luxembourg can look to the mandatory increase in the percentage of biofuels blended in conventional fuels, which was 5.15 % in 2016 (before double-counting).

The contribution of biofuels made from wastes, residues, or cellulosic materials (Annex IX of Directive 2009/28/EC) is taken into account at twice the rate applicable to traditional biofuels. In the year 2016 the minimum share of sustainable biofuels after double-counting was 15 % out of the total consumption of biofuels.

¹⁹ Facilitates comparison with Table 12 in the NREAP.

²⁰ For biofuels, only those complying with the sustainability criteria, cf. Article 5(1) last subparagraph are to be taken into account.

2. Measures taken in the preceding two years and/or planned at national level to promote the growth of energy from renewable sources, taking into account the indicative trajectory for achieving the national RES targets as outlined in the NREAP (Article 22(1)(a) of Directive 2009/28/EC)

Table 2: Overview of all policies and measures

Policies and measures are only listed where changes compared to the NREAP have occurred .

Name and reference of the measure ²¹	Type of measure*	Expected result**	Targeted group and/or activity***	Existing or planned	Start and end dates of the measure	Change compared with NREAP
5. A potential obligation to use renewable energies in buildings should be assessed.	Regulatory	Increase in installed capacity and energy production from RES	Consumers	Exists	Start: July 2012	<p>Following the measures published in 2012 and 2014 mentioned in the second and fourth progress report, the requirement <i>Nearly Zero Energy Building (NZEB)</i> applies to residential buildings from 1 January 2017. This is an implicit application obligation: The stipulated standards only apply to the use of renewable energies. In addition, it is possible to take photovoltaics into account in the calculation of the energy performance certificate.</p> <p>For non-residential (functional) buildings, a further tightening of the energy efficiency standard is in development, which will also foresee the more extensive use of renewable energies.</p>
7. Pioneering role of the state in new construction. In the planning of public buildings, the use of renewable energies is to be examined. Also 'plus energy houses' should be realised as demonstration projects.	Infrastructural	Increase in installed capacity and energy production from RES	Public administration	Exists	Start: 2008	<p>Provision is made under the programme of the present government to build new public buildings in accordance with passive house standards as a minimum requirement. Since July 2015, the Nature and Forestry Department (Natur- und Forstverwaltung) has its seat in Diekirch in a plus energy building. A second public plus energy building (the secondary school for healthcare professions /Gymnasium für Gesundheitsberufe/) is under construction.</p> <p>There are currently 16 public buildings with photovoltaic systems, which have an installed capacity of 2.1 MW. Further 40 buildings (of a potential capacity of approx. 9.3 MW) are currently under evaluation in relation to</p>

²¹ Measure reference numbers are taken from the NREAP.

						photovoltaic systems.
8. Pioneering role of the state in existing construction. The possible use of renewable energies should be looked at for each building.	Infrastructural	Increase in installed capacity and energy production from RES	Public administration	Exists	Start: 2008	An ambitious modernisation programme is a stated aim of the government programme: a target of modernising 3 % of the entire built area of public buildings was agreed upon. Out of 26 000 m ² of building space to be renovated in the period 2014 to 2020, 13 900 m ² were already renovated/modernised, including the use of renewable energy.
10. Myenergy <i>strives</i> to build up a comprehensive network of 'infopoints' so that every citizen in Luxembourg has local access to a point of contact for questions about energy efficiency and renewable energy.	Informative	Change in attitude Increase in installed capacity and energy production from RES	Citizens	Exists with almost complete coverage	Start: January 2009	The establishment of the nationwide network of 'infopoints' is almost complete. The number of municipalities connected to the network was 100 (out of a possible 105) at the end of 2016.
13. Individual municipalities and associations of municipal authorities regularly organise information and awareness-raising campaigns on climate protection and associated topics such as saving energy and using renewable energy sources. Myenergy is to increase its cooperation with the local authorities in this respect.	Informative	Change in attitude		Exists	Start: 2009	See also measure 39 (climate pact) The climate pact's catalogue of measures envisages that the municipalities regularly organise information and awareness-raising campaigns on climate protection and associated topics, such as saving energy and using renewable energy sources.
14. Every year the Chamber of Skilled Trades (<i>Chambre des Métiers</i>) holds a further education course for tradespeople where, on successful completion, they receive two quality labels in the areas of renewable energy and energy efficiency, the <i>Energie fir d'Zukunft+</i> label and the certified passive house technician (zertifizierter Passivhaushandwerker) label.	Further training, informative	Increase in installed capacity and energy production from RES	Skilled workers in the craft trades	Exists	Start: 2001	The <i>Energie fir d'Zukunft+</i> label has been combined with the 'zertifizierter Passivhaushandwerker' label. These labels are accompanied by practical further training and can be acquired in a joint course. The <i>Energie fir d'Zukunft</i> label still exists, but has been replaced by the more rigorous labels mentioned above. Other training on energy performance certificates and funding programmes in the residential building sector are provided for tradespeople.
15. The professional organisation of architects and consulting engineers (OAI) organises the	Further training, informative	Increase in installed capacity and energy production from RES	Planners	Exists	Start: 2003	The professional association reorganised its training offer. The content provided in the 'Building and Energy' training cycle has been retained and supplemented. In

training programme Building and energy (Bauen und Energie).						general, topics including renewable energies and energy-efficient buildings are offered.
18. The first intelligent meters have already been installed by various network operators.	Organisational, infrastructural regulatory	Change in attitude	Network operators	Exists in part	Start: 2009	In addition to the information provided in the second and third progress report (network operators in the electricity and gas sector have come together to form a financial interest group called <i>luxmetering GIE</i> in order to jointly organise the national rollout of smart meters; a Grand Duchy regulation laid down the methods for measuring energy consumption and the technical properties of the meters), it has to be noted in this fourth progress report that a study on smart networks and meters was concluded, and the first smart meters have been installed at the customers since mid-2016. The complete change to smart meters in the electricity and gas sector is to be concluded by 2020.
19. 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	Network operators	Being constructed in part, being planned in part	Exists	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.
29. Feed-in tariffs for electricity from renewable energy sources. The amount and structure of feed-in tariffs have to be revised if necessary within the framework of implementing this plan.	Financial, regulatory	Increase in installed capacity and energy production from RES	Plant operators	Exists	Start: 1994	A revised regulation was published in August 2014 in <i>Règlement grand-ducal du 1er août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables</i> (http://lesilux.public.lu/eli/etat/lee/red/2014/08/01/n1/io). The revision was based extensively on the development trajectories pursued in the NREAP for the relevant renewable energy sources. The regulation was revised in July 2016 (and later once more in April 2017): Feed-in tariffs for electricity from photovoltaic plants were adjusted by including energy cooperatives and civil law associations. Also the

						regulatory basis was created for tendering in the photovoltaic sector at national and European level.
30. Mandatory blending currently applies to all diesel and petrol fuels in order to increase the use of energy from renewable sources in the transport sector. Mandatory blending, which was supplemented by the sustainability criteria laid down in Directive 2009/28/EC in 2011, was increased.	Regulatory	Increase in energy production from RES	Mineral oil companies	Exists	Start: 2007	Mandatory blending, which was supplemented by the sustainability criteria in 2011 laid down in Directive 2009/28/EC, was 5.40 % in 2015 and 5.15 % in 2016 (before double-counting).
32. It was examined how the use of old and scrap wood can be improved and whether the incentives, especially investment assistance and feed-in payments, are adequate for biomass projects based on old and scrap wood.	Cooperative, informative, financial	Change in attitude	Waste syndicates, companies	Exists	Start: January 2011 End: December 2015	Measures were taken to use green prunings from forestry and hedge trimming, and plant care in orchards and vineyards in the biogas incineration process. After studies in the year 2016, the project entered the pilot phase in 2017.
34. It is foreseen to support biogas production and supply into the gas network.	Financial, regulatory	Increase in installed capacity and energy production from RES	Investors	Exists	Start: 2011	In addition to the information provided in the second and third progress report, it has to be mentioned that the feed-in tariffs in ' <i>Règlement grand- ducal modifié du 15 décembre 2011 relatif à la production, la rémunération et la commercialisation de biogaz</i> ' (http://leelux.public.lu/eli/etat/lee/red/2011/12/15/n5/jo) were adjusted upwards for all plant categories, so that their operation remains economical The adjustment was implemented in the form of ' <i>Règlement grand- ducal du 4 mars 2016 modifiant le règlement grand- ducal modifié du 15 décembre 2011 relatif à la production, la rémunération et la commercialisation de biogaz</i> ' (http://legilux.public.lu/eli/etat/lee/red/2016/03/04/n1/1o).
New 35. Forest mobilisation	Financial, cooperative, infrastructural	Increase in installed capacity and energy production from RES	Private forest owners, companies, local authorities	Exists	Start: 2016	A new project for the use of biomass (wood, solid biomass) was initiated: The CLUSTER project ' <i>BESCH AN HOLZ</i> ' was concluded in 2016 based on the preparatory work of the forestry and nature protection administration (Forst- und Naturschutzverwaltung). The government decided to establish the <i>LUXINNOVATION cluster</i> under the name ' <i>Wood Cluster</i> '.

						The creation of the ' <i>Holzclusters</i> ' is part of the effort to offer their members a framework, which promotes the realisation of projects in support of Luxembourg's wood sector.
New 38. It is being examined whether a feed-in tariff for heat generated from biomass is practical.	Financial, regulatory	Increase in installed capacity and energy production from RES	Investors	Exists	Start: September 2013	Analyses regarding the structure of feed-in tariffs in this area have been concluded. The introduction of such a tariff has not been decided yet.
New 39. A 'climate pact' was introduced for municipalities.	Financial, regulatory	Increase in installed capacity and energy production from RES	Local authorities	Exists	Start: 2013 End: 2020	The Act published in 2012 ' <i>Loi du 13 septembre 2012 portant création d'un pacte climat avec les communes</i> ' (http://lesilux.public.lu/eli/etat/lee/loi/2016/03/29/n7/lo) envisages financial assistance from 1 January 2013 for municipalities taking part in the climate pact. By signing the climate pact with the state as the contracting partner, member municipalities can benefit from technical assistance and financial support and take on an active role in combating climate change. All municipalities are by now participating in the pact.
New 40. An obligation to carry out a feasibility study in relation to renewable energy systems was introduced for all new residential and functional buildings.	Regulatory, financial	Increase in installed capacity and energy production from RES	Consumers	Exists	Start: 2014	A feasibility study of this kind must be undertaken for every new residential and functional building. The technical, ecological and financial feasibility of renewable energy systems etc. is to be systematically examined.
New 41. Update to potential study for renewable energies. The coalition programme of the Luxembourg government (from 2013) states that 'the Government will update the potential study on renewable energies, with the aim of improving the framework for the promotion of renewable energies'. A preliminary study into this was concluded.	Informative	Analysis of the potential of renewable energies	Public bodies	Exists already in part	Start: 2014 End: 2016	The aim of the project overall is to update the potential study on renewable energies in Luxembourg from 2007 (ISI/EEG/BSR). The areas in which an update is necessary and practical are being examined. To this end, data on the costs and the potential of renewable energy technologies from the 2007 study are to be subjected to scrutiny. Assumptions and framework conditions that have been subject to particularly dynamic change are to be identified, which could have a significant impact on realisable potential. Once the need for a significant update has been identified, the ramifications for the relevant technologies and substantive changes in the framework conditions are to be subject to a partially quantitative examination.
New 42. Expansion of infrastructure for electromobility.	Regulatory	Change in attitude, priority for energy production from RES	Distribution system operators	Exists already in part	Start: 2012 End: 2020	A regulation on the development and management of a national electromobility infrastructure entered into force in 2015: ' <i>Règlement grand-ducal du 3 décembre 2015 relatif à l'infrastructure publique liée à la mobilité électrique</i> '.

						http://legilux.public.lu/eli/etat/leg/rgd/2015/12/03/n 2/jo Technical specifications for charging station infrastructure, among other things, are to be regulated in this respect. An amendment to the Electricity Market Act (Strommarktgesetz) in 2012 imposes an obligation on distribution system operators to set up this national charging infrastructure. 800 such charging stations should be available by the end of 2020. There are currently around 100.
New 43. Future debate ' <i>The Third Industrial Revolution</i> '	Informative	Change in attitude, priority for energy production from RES, increase in installed capacity and energy production from RES, analysis of the potential of renewable energies	All	Exists	Start: 2015	With the help of US economist Jeremy Rifkin, the Luxembourg government initiated a wide future debate under the title ' <i>The Third Industrial Revolution</i> '. Two of the nine 'pillars' of the strategic study are energy and mobility; important cornerstones are the use of self-generated electricity, digitisation or decentralised energy production.
New 44. Transposition of Directive 2015/1513/EU	Regulatory	Sustainability of biofuels	All	Exists	Start: 2015	In 2016, the draft regulation ' <i>Règlement grand-ducal du 28 février 2017 modifiant le règlement grand-ducal du 27 février 2011 fixant les critères de durabilité pour les biocarburants et bioliquides</i> ' http://legilux.public.lu/eli/etat/leg/rgd/2017/02/28/a 246/jo was introduced as part of the regulatory process for the modification of certain provisions, in particular as regards <ul style="list-style-type: none"> – the addition of certain definitions; – changing the values for the reduction of CO₂ emissions, which have to be met in relation to the production of biofuels and bioliquids; – changing the rules on the calculation of the greenhouse effect of biofuels, bioliquids and fossil reference fuels.

* Please indicate whether the measure is (predominantly) regulatory, financial or soft (e.g. information campaign).

** Is the expected result a change in behaviour, installed capacity (MW; t/year), energy production (ktoe)?

*** Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? Or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.?

**** Does this measure replace or complement measures contained in Table 5 of the NREAP

2.a) Please describe the progress made in evaluating and improving administrative procedures to remove regulatory and non-regulatory barriers to the development of renewable energy (Article 22(1)(e) of Directive 2009/28/EC).

With regard to the progress made in evaluating and improving administrative procedures to remove regulatory and non-regulatory barriers to the development of renewable energy, there have been no major regulatory changes compared with the third progress report.

A block of the potential for wind energy in the north of the country (due to a planned additional radar for aviation safety) was resolved as already reported in the third progress report. The development of wind power could therefore again be pursued more intensively, which is what happened. This nearly doubled installed capacities (64 MW in 2015, 120 MW in 2016). The effects of this on production do not manifest in the numbers for now, as almost all new turbines were put into operation only in the last trimester of 2016.

2. b) Please describe the measures in ensuring the transmission and distribution of electricity produced from renewable energy sources and in improving the framework or rules for bearing and sharing of costs related to grid connections and grid reinforcements (Article 22(1)(f) of Directive 2009/28/EC).

With regard to measures in ensuring the transmission and distribution of electricity produced from renewable energy sources and in improving the framework or rules for bearing and sharing of costs related to grid connections and grid reinforcements, nothing has changed compared with the third progress report.

3. Please describe the support schemes and other measures currently in place that are applied to promote energy from renewable sources and report on any developments in the measures used with respect to those set out in the NREAP (Article 22(1)(b) of Directive 2009/28/EC).

The following figures refer to plants, which were connected to the power grid in 2016. The feed-in tariff/market premium is established for a term of 15 years, which starts upon the conclusion of a contract between the producer and the network operator.

The operational fees for existing plants are established for a term of 10 years and may be discussed with the network operator following the initial term of the tariff (15 or 20 years). These fees apply to hydroelectric and biogas plants.

Biogas and biomass plants may also receive an additional heat bonus for the waste heat they feed into the network. This heat bonus is also established for 15 years and may contain a rest-feed-in tariff even after this term expires.

New biogas plants, which can feed biogas into the natural gas network may receive a fee. The relevant Grand Duchy regulations are described in detail in this progress report.

It is noted that all fees and tariffs were approved by decisions of the Directorate-General for Competition of the European Commission:

- *Aide d'Etat SA.37232 (2014/NN) - Luxembourg*
Tarifs d'injection pour la production d'électricité basée sur les sources d'énergie

renouvelables et autres mesures de soutien

- *Aide d'État SA. 43128 (2015/N) - Luxembourg Modification du soutien aux SER au Luxembourg*
- *Aide d'Etat n° SA.31319 (2011/N) - Luxembourg Aide d'Etat en faveur des producteurs de biogaz*
- *Aide d'Etat SA. 40010 (2014/N) - Luxembourg Modification du règlement grand-ducal sur le biogaz*

Table 3: Support measures for renewable energy

Support measures for renewable energy in 2015/2016		Support per unit	Total (million EUR)*
[(Sub-) Category of the technology or fuel] - wind, photovoltaic, hydro, biogas, gas from waste water treatment plants, biomass/scrap wood,			
Instrument (if any, please explain)	Obligation/quota (%) Biofuels in the transport sector: 5.15 %		
	Sanction/Buy-out option/Buy-out price (EUR/unit)		
	average certificate price		
	Tax exemption/tax refund		
	Investment support (capital grants or loans) (EUR/unit)		
	Investment support for the production of energy from renewable sources	Percentage of eligible costs	Support granted
	Small enterprises Medium-sized enterprises Large enterprises	65 55 45	2015: EUR 25.4 million 2016: EUR 18.3 million
Production incentives/Feed-in premiums			
1	New plants Feed-in tariff/Market premium Electricity sector 15 years Wind Solar up to 30 kW up to 100 kW up to 200 kW hydro up to 300 kW up to 1 MW up to 6 MW Biogas up to 150 kW up to 300 kW up to 500 k up to 2500 kW Sewage gas Excl. municipalities for municipalities Old and scrap wood up to 1 MW	For 2016 – EUR/MWh 91.54 192.72 160.00 153.00 179.10 149.25 124.38 191.04 180.10 170.15 152.24 119.40 64.68 137.31	

		up to 10 MW	117.41	
		Biomass up to 1 MW	162.19	
		up to 10 MW	142.29	
		Tendering		
	2	New plants	For 2016 –	
		Heat bonus	EUR/MWh	
		Heat sector		
		15 years		
		Biogas up to 150 kW	30.00	
		up to 300 kW	30.00	
		up to 500 kW	30.00	
		up to 2500 kW	30.00	
		Sewage gas Excl. municipalities	30.00	
		Old and scrap wood up to 1 MW	30.00	
		up to 10 MW	30.00	
		Biomass up to 1 MW	30.00	
		up to 10 MW	30.00	
	3	Existing plants Feed-in tariff/market premium	For 2016 –	
		Electricity sector	EUR/MWh	
		10 years		
		Hydro up to 300 kW	105.00	
		up to 1 MW	105.00	
		up to 6 MW	65.00	
		Biogas up to 150 kW	118.00	
		up to 300 kW	118.00	
		up to 500 kW	118.00	
		up to 2500 kW	98.00	
	4	Existing plants	For 2016 –	
		Heat bonus	EUR/MWh	
		Heat sector		Points 1 - 4: Net production costs
		10 years		2015:
		Biogas up to 150 kW	30.00	EUR 43 million
		up to 300 kW	30.00	(of which EUR 2.2 million for heat bonus)
		up to 500 kW	30.00	2016:
		up to 2500 kW	30.00	EUR 44.5 million (of which EUR 2.6 million for heat bonus)

	5	New plants Biogas plants feeding into the gas network private actors public actors	For 2016 – EUR/MWh 80.00 72.00	Point 5: Net production costs 2015: EUR 2.3 million 2016: EUR 2.7 million
		Estimated total annual support in the electricity sector		
		Estimated total annual support in the heating sector		
		Estimated total annual support in the transport sector		

* The supported number of energy units is an indicator for the efficiency of support in relation to the individual technologies.

- Re.: Point 4.2.3.(c) of the NREAP: Buildings

The gradual tightening of national regulations concerning total energy efficiency and thermal insulation – as described in the second and third progress report – resulted as planned in a regulation, according to which newly built residential buildings have to meet the standards for nearly zero-energy buildings from 1 January 2017 in accordance with Directive 2010/31/EU. This corresponds to an implicit obligation to use renewable energies: the stipulated standards only have to be applied, if the remaining energy consumption of the building is covered in part from renewable energies. In addition, the calculation method was extended and it has been possible since 2016 to take into account photovoltaic plants in the calculation.

A timetable for the tightening of energy efficiency requirements for residential buildings and the first step towards the tightening of requirements for non-residential buildings were stipulated in 2012 and 2014, respectively.

In the year 2017, the last stage of the tightening of requirements for new residential buildings entered into force. This measure introduced '*nearly zero energy buildings*' as a standard.

A new measure entered into force for non-residential buildings in 2015 and is aimed at tightening the requirements for energy efficiency moving towards 'nearly zero-energy non-residential buildings'.

In 2016, Luxembourg transposed the following important aspects for residential buildings in the form of '*Règlement grand-ducal du 23 juillet 2016 modifiant le règlement grand-ducal modifié du 30 novembre 2007 concernant la performance énergétique des bâtiments d'habitation*' (<http://data.legilux.public.lu/file/eli-etat-leg-memorial-2016-146-fr-pdf.pdf>), which also involve the implicit use of renewable energies:

- Definition of the standard 'nearly zero energy building', as a new standard from 1 January 2017;
- Possibility to partially take into account photovoltaic electricity;
- Change in the calculation methodology of global requirements (primary energy consumption and heating energy consumption) with the aim of implementing the procedure with the reference building;
- etc.

Studies and analyses were initiated in 2016 in order to make it possible for certain 'new technologies' to be taken into account in the calculation methodology of the energy efficiency of residential and functional buildings in the future.

- Re.: Point 4.2.3.(e) of the NREAP: Buildings

See point 4.2.3.(c).

- Re.: Point 4.2.3.(g) of the NREAP: Buildings

See point 4.2.3.(c).

- Re.: Point 4.2.3.(h) of the NREAP: Buildings

Public buildings - New construction: By way of supplement to the explanations already provided, the current government programme makes provision for new public buildings to be built in accordance with passive house standards. Primary energy use in these buildings is therefore reduced.

Public buildings - Existing structures: An ambitious modernisation programme is a stated aim of the government programme. With regard to Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, a target of modernising 3 % of the entire area of public buildings was agreed upon. Modernisation undertaken in this context is also to focus on a switch to renewable energies. Out of 26 000 m² of building space to be renovated in the period 2014 to 2020, 13 900 m² were already renovated/modernised by the end of 2016.

Public buildings – as models: Since July 2015, the Nature and Forestry Department (*Natur- und Forstverwaltung*) has its seat in Diekirch in a plus energy building. This building has received an excellent rating in a sustainability certification process. It is equipped with a water-water heat pump, a rain water utilisation system, a LED lighting system, a photovoltaic plant and an energy management system. The calculated annual heating energy consumption of the building is 26.4 kWh/m² and the annual primary energy consumption is 70.6 kWh/m². In 2016, this building produced a surplus of 22 900 kWh (measured). A second public 'plus energy building' (the secondary school for healthcare professions /Gymnasium für Gesundheitsberufe/) is under construction. In Schiffingen, also an existing building (built in 1950) is to be converted into a 'plus energy building' in a pilot project.

There are currently 16 public buildings with photovoltaic systems, which have an installed capacity of 2.1 MW. Further 40 buildings (of a potential capacity of approx. 9.3 MW) are currently under evaluation in relation to photovoltaic systems. Above all, secondary schools have so far been converted to wood chip or pellet heating, or newly built including such. Geothermal energy is used in the European quarter in Kirchberg in the new national library building and the Konrad Adenauer Building of the European Commission.

(Links and further information and several examples related to this point are provided in Table 2, Points 7 and 8)

- Re.: Point 4.2.4.(c) of the NREAP: Provision of information

2. The number of myenergy *Infopoints* has been increased. At the end of 2016, myenergy had advice desks in 100 municipalities (out of 105) in Luxembourg.
5. Cooperation with the municipalities has been intensified by means of the climate pact measure (Start: 1 January 2013). In the meanwhile, all 105 municipalities are participating in the climate pact. Myenergy is responsible for managing the climate pact and supports the municipalities to implement it using technical instruments, e.g. guidelines on energy-efficient

municipal planning. Myenergy is also the point of contact for the municipalities on the climate pact and on specific topics in the area of renewable energy and energy efficiency. The municipalities can find all measures and several examples for 'best practices' on the website of the climate pact .

6. Myenergy is pursuing closer cooperation with the business sector. Various tasks relating to the provision of advisory services and information, and the organisation of events concerning renewable energy were delegated to myenergy in a voluntary agreement, which was signed by the Luxembourg Government and the Luxembourg Business Federation (*Fedil*) for the period 2011 to 2016. Upon a request of the members of the business federation, the agreement was extended beyond the year 2016.

- Re.: Point 4.2.4.(d) of the NREAP: Provision of information

It is worth noting in relation to the third progress report that the '*Energie fir d'Zukunft+*' label of the Chamber of Skilled Trades ('*Chambre des Métiers*') was combined with the label 'certified passive house technician' (zertifizierter Passivhaushandwerker) with view to the 1 January 2017 deadline (when nearly zero-energy buildings become compulsory), in order to prepare craftsmen for the new standard in the best possible way.

As mentioned in the third progress report, also the professional association of architects and consulting engineers (OAI) reorganised its training provision. The seminar 'Sustainable construction and energy' remains a part of this further training. One module of the seminar deals exclusively with so called 'plus energy houses'.

Additional information can be found on the website www.oai.lu/formation.

- Re.: Point 4.2.4.(f) of the NREAP: Provision of information

See Point 4.2.4.(d).

- Re.: Point 4.2.4.(g) of the NREAP: Provision of information

'*The Third Industrial Revolution*' (TIR) is a joint project, which was launched in September 2015 by the Ministry for Economy (Ministerium für Wirtschaft), the Chamber of Commerce of the Grand Duchy of Luxembourg and IMS Luxemburg (*Inspiring More Sustainability* - the network of companies in Luxembourg active in the area *Corporate Social Responsibility (CSR)*) in close cooperation with American economist Jeremy Rifkin and his team of international experts. The TIR process deals with the question of the shift to a new economic model sustainable in the long run, which is particularly determined by the combination of information technologies, renewable energies and intelligent transport networks. Luxembourg made progress on all these levels in recent years, in particular by way of its economic diversification policy, investments in its digital infrastructure or its various action plans for energy efficiency and the support of renewable energies.

The aim of this strategic study was therefore also to build on the existing dynamics and develop

them further, in order to make the existing economic model more sustainable and more integrated for future generations: The socio-economic characteristics of the country will be taken into account in the process, and in particular the convergence of the sectors information and communication technologies (ICT), and energy and transport will be processed in an intelligent network. Luxembourg intends to prepare itself more intensively for new technologies and the partly disruptive developments with this process. The TIR study therefore also contributes to awareness-raising in relation to the imminent changes and 'megatrends' as regards the effects on the economy and society at the level of the actors involved.

The strategic study was developed using a 'bottom-up' approach, which was implemented in nine working groups:

- energy,
- mobility,
- construction,
- food,
- industry,
- finance,
- *Smart Economy*,
- *circular economy* and
- *prosumer* and social model.

This approach enabled the various socio-economic actors to participate in the development of the strategic study and make use of possible feed-back. Using a constructive and participatory approach, the strategic study identified opportunities, priorities and challenges, and also operative aspects associated with the shift to a sustainable and interconnected economy.

The results of the TIR study were published in November 2016, and can be summarised as follows:

- a comprehensive and detailed study, which takes into account the socio-economic characteristics of the country, and proposes specific measures and instruments including numerous strategic measures and projects, in order to prepare the country, its society and economy for the 'megatrends' and imminent changes;
- a summary of the study consisting of an introduction, which describes the most important challenges of the TIR and its economic implications for the country and society, and also summaries of the nine thematic chapters, which in particular contain the gist of the identified strategic measures considered to be the most important.

Two of the nine 'pillars' of the strategic study are energy and mobility; important cornerstones are the use of self-generated electricity, digitisation or decentralised energy production.

The Governing Council (Regierungsrat) ruled at the end of 2016 that the summary of the strategic study shall serve as general orientation for the future development of the country. Accordingly, it

was decided specifically for the component 'energy' that the platform '*Energiezukunft Lëtzebuerg*' should be created, which covers all strategic aspects of the medium- and long-term energy revolution and also the establishment of the 'Internet of Energy' in Luxembourg. The goal of this platform is not only the shift to a sustainable energy system, but also using this transition for achieving energy savings, while intelligently linking technical and commercial innovations. The platform will also take in the account of the results of the pillars '*Building*', '*Mobility*' and '*Smart Economy*' of the strategic study '*The Third Industrial Revolution Strategy*'.

- Re.: Point 4.2.5.(a) of the NREAP: Certification of installers

The *LuxBuild2020* initiative introduced by the Chamber of Skilled Trades, the IFSB (training institute for the construction industry) and myenergy in 2012 was pursued further. Under a shared platform, many representatives from the construction sector accepted the consortium's invitation to jointly develop a national roadmap on how to prepare tradespeople for future challenges.

The training for passive house tradespeople organised by the Chamber of Skilled Trades since 2012 was expanded to all trades under the *LuxBuild2020* initiative and joint courses on cross-trade topics have been developed. A coaching system under which experienced employees in a trade are trained up to become quality managers is currently in the test phase and the concept for *Train the Trainer* sessions is being developed. The Chamber of Skilled Trades developed didactically adapted teaching material for target group of *blue collar workers*, with an increased focus on conveying course content in a visual and practical manner.

At the beginning of 2017, after the study on the third industrial revolution was concluded, it was decided that the future challenges of the construction sector should be managed by ***Conseil National pour la Construction Durable (CNCD)***, a non-profit organisation, which supports a more sustainable future and ensuring the competitiveness of the construction sector of Luxembourg by developing its competence in the area of sustainable construction. The *LuxBuild2020* initiative was therefore integrated into the working group '*Formations et qualifications*' of the CNCD. The objective of this sub-group is to establish the demand for training in relation to the construction of sustainable housing, as defined by LENOZ, and to compile an inventory of existing training, and also to create an indicator for the importance of training in different topics.

- Re.: Point 4.2.6.(c) of the NREAP: Development of electricity infrastructure

A study on smart networks and meters was completed in 2011. Since then, network operators together with the regulatory authority and the Ministry for Economy have been working on the further development of intelligent networks and intelligent meters at national level. The targets for smart meters are laid down in the Electricity Market Act. Network operators in the electricity and gas sector have formed a financial interest group *Luxmetering GIE* to jointly organise the national rollout of smart meters. A Grand Duchy regulation '*Règlement grand-ducal du 27 août 2014 relatif aux modalités du comptage de l'énergie électrique et du gaz naturel*' (<http://legilux.public.lu/eli/etat/leg/rgd/2014/08/27/n8/jo>) lays down the methods for measuring

energy consumption and the technical properties of the meters.

In the year 2016, gas and electricity network operators started to introduce the nationwide use of *smart meters* in Luxembourg. Since 1 July 2016, network operators have started to install a smart meter for each new network connection and to gradually replace existing meters with such smart meters. At least 95 % of the installed electricity meters have to be replaced with smart meters by 31 December 2019.

- Re.: Point 4.2.6.(d) of the NREAP: Development of electricity infrastructure

As described in the last progress report, efforts were made to connect Luxembourg to Belgium's transportation network.

The phase shifter in Schifflange, which connects the electricity network of Elia and Creos was put into operation in October 2017. This *interconnector* is intended to connect the networks of Belgium, Germany and Luxembourg. This will improve access to new markets and thus integration in the European network, which will also benefit the European development of renewable energies and contribute to the security of supply.

With view to the security of supply and the increasing electricity consumption at national level, the so called 'Luxring' was put into operation by transmission system operator Creos in the fourth quarter of 2017 at 220 kV. This new infrastructure primarily serves the supply in the middle and the south of the country.

- Re.: Point 4.2.10. of the NREAP: Biofuels and other bioliquids - sustainability criteria and verification of compliance

As mentioned in the second and third progress report, the sustainability criteria were introduced for biofuels and other bioliquids in 2011, in the form of a national regulation.

In 2016, the draft of a Grand Duchy regulation modifying the regulation of 27 February 2011 on determining sustainability criteria for biofuels and bioliquids was entered into the regulatory process.

This draft foresees the transposition of different aspects of 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. The amendments include in particular:

- the addition of certain definitions;
- changing the values for the reduction of CO₂ emissions, which have to be met in relation to the production of biofuels and bioliquids;
- changing the rules on the calculation of the greenhouse effect of biofuels, bioliquids and fossil reference fuels.

In 2017, the Grand Duchy regulation then entered into effect (*Règlement grand-ducal du 28 février 2017 modifiant le règlement grand-ducal du 27 février 2011 fixant les critères de durabilité pour les biocarburants et bioliquides*). (<http://legilux.public.lu/eli/etat/leg/rgd/2017/02/28/a246/jo>).

The Act '*Loi modifiée du 17 décembre 2010 fixant les droits d'accise et les taxes assimilées sur les produits énergétiques, l'électricité, les produits de tabacs manufacturés, l'alcool et les boissons alcooliques*' (<http://legilux.public.lu/eli/etat/leg/loi/2010/12/17/n2/jo>) lays down mandatory blending of biofuels for all diesel and petrol fuels. Accordingly, biofuels had to make up at least 5.40 % of all fuels in 2015 and 5.15 % in 2016, calculated on the basis of the fuel's energy content.

The method for the calculation of the percentage of biofuels was changed in 2016 in order to ensure a minimal physical presence of biofuels in the transport sector. Against the previous year, the total consumption of renewable energies rose in the transport sector in 2016.

The contribution of biofuels made from wastes, residues, or cellulosic materials (Annex IX of Directive 2009/28/EC) is taken into account at twice the rate applicable to traditional biofuels. In 2016, the minimum percentage of biofuels produced from wastes, residues, or cellulosic materials for consumption was at least 15 % after double-counting in ratio of the total biofuel consumption.

- Re.: Point 4.3., 4.4. and 4.5. of the NREAP: Support schemes to promote the use of energy from renewable sources (electricity sector, heating and cooling sector, transport sector) - Financial support (new measure)

The so called 'climate pact' was introduced for municipalities (www.pacteclimat.lu). Municipalities taking part in the climate pact are able to receive financial support from 1 January 2013 to 31 December 2020. The Ministry for Sustainable Development and Infrastructure has tasked myenergy with organising and managing the climate pact.

The pact is a voluntary measure under which municipalities commit to implementing the international quality management and certification system *European Energy Award (EEA)*. In 2015, four municipalities received the *European Energy Award® Gold*.

The energy efficiency criteria set out in this context are also applied to Luxembourg. In return, the municipalities are guaranteed financial support from the state and technical support from myenergy. The availability of adequate funding is ensured through the *Fonds pour la protection de l'environnement*. The maximum system sizes from the aforementioned measure similarly apply under the climate pact.

The scheme is based on a catalogue of 79 measures, sub-divided into six areas, which are described in detail in the third progress report:

- Re.: Point 4.3. of the NREAP: Support schemes to promote the use of energy from renewable sources in the electricity sector - Financial support - Investment assistance for companies (1)

The investment assistance for companies under the '*Régimes d'aides à la protection de*

l'environnement et à l'utilisation des ressources naturelles' was prolonged ('Loi du 18 février 2010 relative à un régime d'aides à la protection de l'environnement et à l'utilisation rationnelle des ressources naturelles' (<http://legilux.public.lu/eli/etat/leg/loi/2010/02/18/n2/jo>).

It has to be mentioned that at the end of 2017, a new revised Act entered into force based on the European *block exemption* in order to regulate investment grants i.e. for renewable energies ('Loi du 15 décembre 2017 relative à un régime d'aides à la protection de l'environnement et modifiant 1. la loi du 17 mai 2017 relative à la promotion de la recherche, du développement et de l'innovation; 2. la loi du 20 juillet 2017 ayant pour objet la mise en place d'un régime d'aide à l'investissement à finalité régionale.' (<http://legilux.public.lu/eli/etat/leg/loi/2017/12/15/a1108/jo>).

- Re.: Point 4.3. of the NREAP: Support schemes to promote the use of energy from renewable sources in the electricity sector - Financial support - Feed-in tariff for electricity from renewable sources

Feed-in tariffs for electricity from renewable energy sources were changed by a new regulation, which entered into force in 2014. Feed-in tariffs were generally adjusted upwards.

Based on the new guidelines of the European Commission for environmental state aid and energy subsidies for the period 2014 - 2020, Luxembourg had to adjust its support instruments for the development of renewable energies. For this purpose „*Règlement grand-ducal du 23 juillet 2016 modifiant le règlement grand-ducal du 1^{er} août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables et le Règlement grand-ducal modifié du 31 mars 2010 relatif au mécanisme de compensation dans le cadre de l'organisation du marché de l'électricité*“ (<http://legilux.public.lu/eli/etat/leg/rgd/2016/07/23/n4/jo>) entered into force on 2 August 2016.

The regulation establishes new **tariffs for larger photovoltaic plants** (nominal output: 30-200 kW). The new feed-in tariffs are as follows:

Output class	Tariff
Electricity peak output >30 kW _p and ≤100 kW _p	160 • X • (1-(n-2016) • 6/100) EUR/MWh
Electricity peak output >100 kW _p and ≤200 kW _p	153 • X • (1-(n-2016) • 6/100) EUR/MWh

n: official year of first feed-in

X: $1 \geq X \geq 0.7$; reduction factor, which can be stipulated by the minister.

Plants must be installed on a sealed surfaces. The new feed-in tariff can also apply to extensions of photovoltaic plants under certain conditions.

In order to benefit from the intended tariff, the energy producer has to have the legal form of a cooperative (Genossenschaft) or civil society (bürgerliche Gesellschaft) consisting of at least seven persons, who can be natural persons, non-profit associations or foundations.

In addition, this regulation also adjusted the operating aid for new plants for the production of electricity from renewable resources with a nominal output higher than 500 kW or 3 MW, or more than three production units for wind energy.

These new plants will not receive support in the form of feed-in tariffs, but rather **market premiums**, which will be added to the market price. In addition, different regulations apply to these plants in relation to balancing energy and a new framework intended to prevent electricity production when market prices are negative.

This new system of fees in the form of a market premium also represents a state aid approved by the European Commission. However, the European Commission ordered Luxembourg in its decisions from 16 September 2014 and 26 August 2016 to further adjust its regulations on electricity production based on renewable energy sources, in order to fully comply with the requirements of the directives. This change request contains provisions on the prevention of discrimination of imported green electricity by promoting a closer cooperation between the member states.

In November 2016, **a further draft of a Grand Duchy regulation** for the amendment of '*Règlement grand-ducal modifié du 1^{er} août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables*' (<http://legilux.public.lu/eli/etat/leg/rgd/2014/08/01/n1/jo>) was entered into the regulatory process.

The aim of this draft is to create the regulatory basis for the planned tendering procedure for photovoltaic plants. This project makes national and also transnational tendering procedures possible. It has to be mentioned that this Grand Duchy regulation entered into force in 2017. '*Règlement grand-ducal du 24 avril 2017 modifiant 1. le règlement grand-ducal modifié du 1^{er} août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables; 2. le règlement grand-ducal modifié du 31 mars 2010 relatif au mécanisme de compensation dans le cadre de l'organisation du marché de l'électricité*'. (<http://legilux.public.lu/eli/etat/leg/rgd/2017/04/24/a481/jo>)

In the area of financial incentives, a new regulation was entered into the regulatory procedure in order to amend regulations on **investment grants for renewable energies in the area of housing construction** and to promote sustainable construction and renovation. (<http://legilux.public.lu/eli/etat/leg/rgd/2016/12/23/n42/jo>):

- „Loi du 23 décembre 2016 : 1. instituant un régime d'aides pour la promotion de la durabilité, de l'utilisation rationnelle de l'énergie et des énergies renouvelables dans le domaine du logement ; 2. modifiant la loi modifiée du 23 décembre 2004 établissant un système d'échange de quotas d'émission de gaz à effet de serre “
- „Règlement grand-ducal du 23 décembre 2016 fixant les mesures d'exécution de la loi du 23 décembre 2016 instituant un régime d'aides pour la promotion de la durabilité, de l'utilisation rationnelle de l'énergie et des énergies renouvelables dans le domaine du logement“.

The new package related to Climate Bank and sustainable living ('*KlimaBank nohalteg wunnen*'), is intended to promote sustainable construction, energy retrofitting and the preference for

renewable energies and was published at the end of 2016 in the 'Memorial', the official journal of Luxembourg.

From 1 January 2017, the package includes the following:

- a new central office (central portal for housing aid) for the selection of all state housing aids;
- a reform of the financial assistance programme 'PRIME House', with a focus on sustainable housing construction and sustainable energy retrofitting;
- the funding mechanism 'Climate Bank', which includes the climate loan with reduced interests and the interest-free climate loan, in order to further promote sustainable renovation and to avoid energy poverty;
- the sustainability certification system for LENOZ buildings.

The investment grants in the area of renewable energies for residential buildings were regulated as follows for the further development of renewable energies:

Technology	Grant (% of the costs)	Maximum amount	
		Single-family home	Multi-family building
Thermal solar plant			
Domestic hot water	50 %	EUR 2 500	EUR 2 500 per residential unit max. EUR 15 000
Domestic hot water with heating support	50 %	EUR 4 000	EUR 4 000 per residential unit max. EUR 20 000
Bonus for combination with wood heating or heat pump EUR 1 000			
Photovoltaic plant			
Plant on building envelope ≤ 30kW	20 %	EUR 500/kWp	
Heat pump			
Geothermal heat pump	50 %	EUR 8 000	EUR 6 000 per residential unit max. EUR 30 000
Air/water heat pump*	25 %	EUR 2 500	
Exhaust air/water heat pump*	25 %	EUR 2 500	
Wood heating			
Pellet and wood-chip boiler	40 %	EUR 5 000	EUR 4 000 per residential unit max. EUR 24 000
30 % bonus for the replacement of existing heating by improving the heating system			
15 % bonus for a buffer tank			
Log boiler or a combination of logs/pellets	25 %	EUR 2 500	EUR 2 500
Pellet stove	30 %	EUR 2 500	
District heating network			

Connection to a district heating network	-	EUR 50/kW max. 15 kW	EUR 15/kW max. 8 kW per residential unit
Establishment of a district heating network	30 %	EUR 7 500	

* only single-family homes built in accordance with nearly zero-energy building standards.

** only single-family homes built in accordance with nearly zero-energy building standards and equipped with a mechanical ventilation system.

- Re.: Point 4.4. of the NREAP: Promoting the use of energy from renewable sources in the heating and cooling sector - Financial support - Investment assistance for companies (1)

See Point 4.3. of the NREAP on investment assistance for companies (1).

- Re.: Point 4.5.(g) of the NREAP: Promoting the use of energy from renewable sources in the transport sector

The mandatory blending percentages for all diesel and petrol fuels were adjusted to 5.40 % in 2015 and 5.15 % in 2016 (before double-counting). An explanation is given in Chapter 1 under Table 1d).

- Re.: Point 4.5.(b) of the NREAP: Promoting the use of energy from renewable sources in the transport sector

A regulation on the development and management of a national **electromobility** recharging infrastructure entered into force in 2015. Technical specifications for charging station infrastructure, among other things, are to be regulated in this respect. An amendment to the Electricity Market Act in 2012 imposes an obligation on distribution utilities to set up this national charging infrastructure.

By 2020, 800 public charging stations for electric and plug-in hybrid vehicles are to be created. These are to be distributed throughout Luxembourg. 400 stations will be installed in Park+Ride car parks, the remaining charging stations in public car parks and in the municipalities of Luxembourg. Each station will have two charging points. A total of 1 600 parking spaces for charging vehicles will therefore be available. The charging infrastructure must allow the power/service supplier to be chosen freely and must have a uniform payment system across the entire country. The identification and the charging available subject to that is based on the so called MKaart, which may be applied for at the National Transport Association (Verkehrsverbund). At the same time, a central data transmission system between the charging stations and the power suppliers will be set up. Each station will have a smart meter, so that electric vehicles can be integrated as an integral part into an intelligent system, enabling a better management of electricity networks in the future. The network of 800 charging stations will therefore become part of the technical network infrastructure in Luxembourg.

The Grand Duchy regulation of 3 December 2015 on public infrastructure in the area of electromobility (*„Règlement grand-ducal du 3 décembre 2015 relatif à l'infrastructure publique liée à la mobilité électrique“* <http://legilux.public.lu/eli/etat/leg/rgd/2015/12/03/n2/jo>), stipulates the functions, the technical specifications, and the number of charging stations to be installed, and also the timetable and general organisation of the project. The geographical distribution of the charging infrastructure for electric vehicles in Luxembourg was stipulated by the Minister for Economy and the Minister for Sustainable Development and Infrastructure in the form of a *Règlement ministériel* of 5 February 2016. On the one hand, this plan defines the number of charging stations, which should be available at P&R facilities, and on the other, the number of charging stations, which are allocated to public car parks in each municipality. In November 2016, the first public charging stations for electric vehicles were created. The gradual installation of 800 public charging stations is planned by 2020. The first approximately 100 charging stations in

public areas were put into operation 2017.

- Re.: Point 4.5.(c) of the NREAP: Promoting the use of energy from renewable sources in the transport, sector - Legislation

See Point 4.5.(a).

- Re.: Point 4.5.(l) of the NREAP: Promoting the use of energy from renewable sources in the transport sector - Financial support - Investment assistance for companies (1)

See Point 4.3. of the NREAP on investment assistance for companies (1).

- Re.: Point 4.6.2.(e) of the NREAP: Measures to increase the availability of biomass - Mobilisation of new biomass sources

As already mentioned in the second progress report, a Grand Duchy regulation came into force in 2011, which promotes the **production of biogas, its treatment and supply into the natural gas grid** by means of a feed-in tariff.

The amount of the tariff for new plants was adjusted upwards in 2014 (*Règlement grand-ducal du 1er août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables*). (<http://legilux.public.lu/eli/etat/leg/rgd/2014/08/01/n1/jo>)

In addition, the existing plants received a tariff raise in order to ensure that the plants remain economical in the coming years.

This currently affects the three active producers in Luxembourg: the cooperative 'Naturgas-Kielen' in Kehlen, the producer 'BaKoNa' in Itzig and the producer 'Minett-Kompost' in Mondercange. The draft of the Grand Duchy regulation, which takes into account the findings of the profitability analysis of these existing plants, was approved by the European Commission at the end of 2015.

The adjustment was implemented in the form of „*Règlement grand-ducal du 4 mars 2016 modifiant le règlement grand-ducal modifié du 15 décembre 2011 relatif à la production, la rémunération et la commercialisation de biogaz*“ (<http://legilux.public.lu/eli/etat/leg/rgd/2016/03/04/n1/io>) . Accordingly, this Grand Duchy regulation has the aim to adjust the tariffs and to precisely define the technical parameters of biogas facilities.

An initiative for the promotion of **biomass use** (wood, solid biomass) was also established:

The Cluster project '*Bësch an Holz*' was launched in 2016 based on the preparatory work of the forestry and nature protection administration (Forst- und Naturschutzverwaltung). The creation of the 'Holzclusters' is part of the effort to offer their members a framework, which promotes the realisation of projects in support of Luxembourg's wood sector.

Forest mobilisation, in particular in private forests should be improved. Specific activities and analyses have been initiated in relation to this with the association of private forest owners. Plants using solid biomass (wood) are in planning.

Also, work on a new brochure entitled '*Jo fir d'Énergie aus eise Bescher*' was concluded in April 2016. Several application for the construction of wood-chip warehouses were processed along with the planning of incineration facilities for wood-chips.

A nationwide potential study commissioned by the environmental administration was concluded in May 2017 as regards the use of biomass for energy production. (see <http://www.environnement.public.lu/dechets/dossiers/Gestion-des-dechets-de-verdure/Etude-de-potentiel/Potentialstudie-Biomasse-IGLux.pdf>).

3.1. Please provide information on how supported electricity is allocated to final customers for the purposes of Article 3(6) of Directive 2003/54/EC (Article 22(1)(b) of Directive 2009/28/EC).

The Grand Duchy resolution on feed-in tariffs for electricity from renewable sources was already replaced by a new, completely revised version in 2014 ('*Règlement grand-ducal modifié du 1^{er} août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables*') (<http://legilux.public.lu/eli/etat/leg/rgd/2014/08/01/n1/jo>). This was published in Mémorial A n° 154 of 8 August 2014 and regulates the feed-in tariff for electricity produced from renewable sources.

In general, almost all feed-in tariffs were adjusted upwards in 2014. There has been no change to the principle for allocating supported electricity to final customers.

In addition, by way of a new Grand Duchy regulation of 23 July 2016, which amends certain points of the above mentioned regulation, larger photovoltaic plants were also included in the feed-in tariff.

4. Please provide information on how, where applicable, the support schemes have been structured to take into account RES applications that give additional benefits, but may also have higher costs, (including biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material) (Article 22(1)(c) of Directive 2009/28/EC).

The plant for producing biofuels from used fats mentioned in the second and third progress report had to cease production for financial reasons. Otherwise, there has been no change since the previous progress report.

5. Please provide information on the functioning of the system of guarantees of origin for electricity and heating and cooling from RES, and the measures taken to ensure reliability and protection against fraud of the system (Article 22(1)(d) of Directive 2009/28/EC).

The Grand Duchy regulation '*Règlement grand-ducal du 1^{er} août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables*'

(<http://legilux.public.lu/eli/etat/leg/rgd/2014/08/01/n1/jo>) stipulates a certificate of origin system in Chapter II.

The regulatory authority (*Institut Luxembourgeois de Régulation*) relies on the EECS system („*European Energy Certificate Scheme*“). The EECS system corresponds to a national standard. The EECS rules ensure that the various registers of the member organisations of AIB (*Association of Issuing Bodies*) are compatible. The regulatory authority, which is a member of the AIB, allows operators to participate in the electronic certificate of origin system by opening an account in the Luxembourg register via the *'Grexel Systems'* IT platform. Upon request, the regulatory authority then issues the certificates of origin. Certificates of origin may only be used once. Any further use is therefore ruled out.

6. Please describe the developments in the preceding two years in the availability and use of biomass resources for energy purposes (*Article 22(1)(g) of Directive 2009/28/EC*).

Table 4: Availability of biomass for energy production

	Amount of domestic raw material (*)		Primary energy in domestic raw material (ktoe)		Amount of imported raw material from the EU (*)		Primary energy in imported raw material from EU (ktoe)		Amount of imported raw material from non-EU countries (*)		Primary energy in imported raw material from non-EU (ktoe)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
<i>Biomass supply. for heating and electricity</i>												
Direct supply of wood biomass from forests and other wooded land for energy generation (fellings etc.) * *												
Indirect supply of wood biomass (residues and co-products from wood industry)												
Energy crops (grasses, etc.) and short rotation	14 088	13 606	3.26	3.25	-	-	-	-	-	-	-	-

trees (please specify) Main types: silage maize, Miscanthus, grass sorghum, whole crop silage. No data for industrial												
Agricultural by-products/processed residues and fishery by-products **												
Biomass from waste (municipal, industrial, etc.) **												
Other (please specify)												
Biomass supply for transport:												
Common agricultural crops for biofuels (please specify main types) Main type: Industrial rape	No data	No specific statistic.										
Energy crops (grasses, etc.) and short rotation trees for biofuels (please specify main types)												
Other (please specify)												

* Please specify the amount of raw materials if possible **for biomass from forestry in m³ and for biomass from agriculture and fisheries, and from wastes in t.**

** For the definition of this biomass category see Table 7 of Part 4.6.1 of the decision of the Commission C(2009) 5174 establishing a template for National Renewable Energy Action Plans under Directive 2009/28/EC.

Compared with the available data on which the NREAP was based, there has been no fundamental change in the data available on biomass in Luxembourg.

Table 4a Current domestic agricultural land use for production of crops dedicated to energy production (ha)

Land Use	Area (ha)	
	2015	2016
1. Land used for common arable crops (wheat, sugar beet, etc.) and oil seeds (rapeseed, sunflower, etc.) (please specify main types) Main type: Silage maize, whole crop silage	932	848
2. Land used for short rotation trees (willows, poplars) (please specify main types)	No specific statistics	No specific statistics
3. Land used for other energy crops such as grasses (reed canary grass, switch grass, Miscanthus) and sorghum (please specify main types) Main types: Miscanthus, grass sorghum, green fodder	215	211

7. Please provide information on any changes in commodity prices and land use within your Member State in the preceding two years, associated with increased use of biomass and other forms of energy from renewable sources. Please provide where available references to relevant documentation on these impacts in your country (Article 22(1)(h) of Directive 2009/28/EC).

According to 'Recensement agricole', the land used for energy purposes decreased slightly in 2017 compared to 2016. However, this is probably not part of a general trend. The size of areas used for energy purposes fluctuated over the years between 700 ha and 1 150 ha, with a relatively constant five-year average of around 915 ha.

Most plant types used for energy purposes (silage maize, whole crop silage, green fodder) are also used for basic fodder production in farms that keep livestock. But these products are only transported over larger distances (>25 km) relatively infrequently compared to grain for example (world market). These products are also traded outside the farm relatively infrequently, because farms keeping livestock have sufficient land dedicated to fodder in order to feed their animals and to reuse the organic fertiliser produced. The proportion of these plants that is used for energy purposes is sometimes traded between farms, but in Luxembourg the majority is used on the farm in the biogas plant, which is attached to the farm (in almost all cases).

No robust data on market prices is available for miscanthus and grass sorghum since only very small amounts of these are grown.

For the reasons outlined above, no robust data is available on raw material prices because there is essentially no real market (and the quantities that are traded only represent a small fraction of total production, the prices for which cannot be used to value total production). Nevertheless, production costs (raw material costs: fertiliser, seeds, plant protection agents...) for growing these products (silage maize, whole crop silage, green fodder...) have increased in recent years, and thus the costs of operating biogas plants have also increased. This prompted adjustments to the feed-in

tariff for electricity produced by biogas plants and for biogas fed into the grid directly.

8. Please describe the development and share of biofuels made from wastes, residues, non-food cellulosic material and ligno-cellulosic material (Article 22(1)(i) of Directive 2009/28/EC).

It should be mentioned that small quantities of used fats are currently collected in Luxembourg to produce biofuels. However, blending is currently carried out in neighbouring countries and therefore the **mandatory blending requirement** is met entirely by means of imported biofuels.

The proportion of biofuels made from wastes, residues, non-food cellulosic material and ligno-cellulosic material decreased from 2015 to 2016. In the year 2016 mainly used cooking oil was used.

There are no **plants for producing biofuels** in Luxembourg. All biofuels have to be imported. In addition, there are no mixing plants in Luxembourg which means that all biofuels are introduced as additives in blended products.

Luxembourg's **control system** therefore relies on voluntary national and international schemes for verification of compliance with sustainability criteria, as provided for in Article 18(4) of the Directive. The control system was described in detail in the third progress report.

Table 5: Development of biofuels
Please specify the amount of biofuels, which are produced using the raw materials listed in Annex IX of the Directive 2009/28/EC (ktoe)

<i>Raw materials in accordance with Annex IX Part A of Directive 2009/28/EC</i>	2015	2016
<i>a) Algae if cultivated on land in ponds or photobioreactors</i>	0	0
<i>b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under point (a) of Article 11(2) of Directive 2008/98/EC</i>	0	0
<i>c) Bio-waste as defined in Article 3(4) of Directive 2008/98/EC from private households subject to separate collection as defined in Article 3(11) of that Directive</i>	0	0
<i>d) Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, and excluding feedstocks listed in part B of this Annex</i>	0	0
<i>e) Straw</i>	0	0
<i>f) Animal manure and sewage sludge</i>	0	0
<i>g) Palm oil mill effluent and empty palm fruit bunches</i>	0	0
<i>h) Tall oil pitch</i>	0	0
<i>i) Crude glycerine</i>	0	0
<i>j) Bagasse</i>	0	0
<i>k) Grape marcs and wine lees</i>	0	0
<i>l) Nut shells</i>	0	0
<i>m) Husks</i>	0	0

<i>n) Cobs cleaned of kernels of corn</i>	0	0
<i>o) Biomass fraction of wastes and residues from forestry and forest-based industries, i.e. bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil</i>	0	0
<i>p) Other non-food cellulosic material as defined in point (s) of the second paragraph of Article 2</i>	0	0
<i>q) Other ligno-cellulosic material as defined in point (r) of the second paragraph of Article 2 except saw logs and veneer logs</i>	0	0
Raw materials in accordance with Annex IX Part B of Directive 2009/28/EC	2015	2016
<i>a) used cooking oil</i>	32.26	19.22
<i>b) Animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009 of the European Parliament and of the Council</i>	11.25	0.12

9. Please provide information on the estimated impacts of the production of biofuels and bioliquids on biodiversity, water resources, water quality and soil quality within your country in the preceding two years. Please provide information on how these impacts were assessed, with references to relevant documentation (*Article 22(1)(j) of Directive 2009/28/EC*).

Compared to the third progress report, there has been no change to information on the expected impacts of the production of biofuels and bioliquids on biodiversity, water resources, water quality and soil quality.

10. Please estimate the net greenhouse gas emission savings due to the use of energy from renewable sources (*Article 22(1)(k) of Directive 2009/28/EC*).

Table 6: Estimated GHG emission savings from the use of renewable energy (t CO₂-eq)

Environmental aspects	2015	2016
Total estimated net GHG emission savings from using renewable energy²²	677 984	721 264
- Estimated net GHG emission savings from the use of renewable electricity	421 092	446 589
- Estimated net GHG emission savings from the use of renewable energy in heating and cooling		
- Estimated net GHG emission savings from the use of renewable energy in transport	256 892	274 675

Source: the Environment Agency's 'Inventaire des émissions de gaz à effet de serre'.

11. Please report on (for the preceding two years) and estimate (for the following years up to 2020) the excess/deficit production of energy from renewable sources compared to the indicative trajectory which could be transferred to/imported from other Member States and/or third countries, as well as estimated potential for joint projects until 2020. (*Article 22(1)(l) and (m) of Directive 2009/28/EC*).

Table 7: Actual and estimated excess and/or deficit (-) production of renewable energy compared to the indicative trajectory which could be transferred to/from other Member States and/or third countries in Luxembourg (ktoe)²³²⁴

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Actual/estimated excess or deficit production (Please distinguish per type of renewable energy and per origin/destination of import/export)	0	0	0	0	0	0	0	0	0	-50	N/A	-120

In Table 7, the figures up to 2016 have been replaced with actual figures. The figures from 2017 have been readjusted.

²² The contribution of gas, electricity and hydrogen from renewable energy sources should be reported depending on the final use (electricity, heating and cooling or transport) and only be counted once towards the total estimated net GHG savings.

²³ Please use actual figures to report on the excess production in the two years preceding submission of the report, and estimates for the following years up 2020. In each report Member States may correct the data of the previous reports.

²⁴ When filling in the table, for deficit production please mark the shortage of production using negative numbers (e.g. -x ktoe).

11.1 Please provide details of statistical transfers, joint projects and joint support scheme decision rules.

As stated in the NREAP, Luxembourg needs to take recourse to the cooperation mechanism under Directive 2009/28/EC in order to achieve its targets. Luxembourg has made various efforts to sound out and enter into cooperation with various countries. Due to difficulties encountered by various countries in accurately predicting possible surplus production of energy from renewable sources in and up to 2020, the various talks are progressing slowly. Talks have been held with a large number of countries. Luxembourg has also participated in various committees (such as *Concerted Action RES*) and other workshops and has consistently highlighted its efforts and willingness to use cooperation mechanisms. After targeted talks have continued in more detail with various countries, two agreements for statistic transfer could be concluded in 2017 with Lithuania and Estonia. The agreements which still need to be ratified by the national Parliament stipulate that Luxembourg will provide statistic transfers for the period 2018 - 2020 in order to meet its target under Directive 2009/28/EC.

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 the NREAP.

It should also be noted that Luxembourg is the first country, which uses the cooperation mechanism in order to meet its national targets and send a clear signal in the interest of closer European cooperation in the area of renewable energies.

12. Please provide information on how the share for biodegradable waste in waste used for producing energy has been estimated, and what steps have been taken to improve and verify such estimates (Article 22(1)(n) of Directive 2009/28/EC)

Compared to the third progress report, there has been no change regarding the estimation of the share of biodegradable waste in waste used for producing energy and the steps taken to improve and verify such estimates.

13. Please specify the amount of biofuels and bioliquids in energy units (ktoe) in accordance with the categories of raw material groups listed in Annex VIII Part A, which are taken into account by the member state for the purpose of meeting the targets under Article 3(1) and (2) and Article 3(4) subparagraph 1.

Raw material group	2015	2016
Cereals and other starch-rich crops	not applicable	9.04*
Sugar	not applicable	
Oil plants	not applicable	59.42

*Cereals and sugar were recorded together

14. Conclusions as regards the compliance with the indicative trajectory 2015-2016 and further efforts for meeting targets in 2020

The Grand Duchy of Luxembourg is on the right path to meet its targets set for the year 2020. The share of Luxembourg out of the gross final consumption of renewable energies in the year 2016 was 5.44 %, as opposed to 5.04 % in 2015, and 4.51 % in 2014. This means that Luxembourg

continuously increased its share of renewable energies in the past years and is on the indicative trajectory.

The gross final consumption of energy from renewable sources in Luxembourg was 400.6 ktoe in the period 2015-2016 (2015: 192.8 and 2016: 207.8).

This means that the development of total renewable energy consumption in Luxembourg is slightly above the expectations of the NREAP (excl. strategic transfers).