Grand Duchy of Luxembourg

Fifth progress report

(pursuant to 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

It should generally 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 changes to the titles of legislation were generally pointed out in the first, second, third, fourth or the present (fifth) 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, third or fourth 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 (2017 and 2018) (*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 sources[1]

	2017	2018
Renewable energy sources – heating and cooling[2] (%)	7.78 %	8.78 %
Renewable energy sources – electricity[3] (%)	8.05 %	9.13 %
Renewable energy sources – transport[4] (%)	6.44 %	6.54 %
Overall share of renewable energy sources[5] (%)	**6.29 %**	**9.06 %**
of which as a result of the cooperation mechanism[6] (%)	0.00 %	2.34 %
Surplus for the cooperation mechanism[7] (%)	0.00 %	0.00 %

The figures for energy from renewable sources in Luxembourg for 2017 and 2018 are based on statistics from the SHARES model.

By continuously increasing the share of renewables in the electricity, heating and cooling sector and deploying the cooperation mechanism, the Grand Duchy of Luxembourg has achieved the indicative trajectory for the years 2017-2018. For both electricity, which saw an increase from 2017 to 2018 of 1.08%, and heating and cooling, the share of which rose by 1.00%, Luxembourg has been able to increase the overall share in these sectors by a little under 11%. The overall share of renewables was 6.29% in 2017 and 6.72% in 2018 (without the cooperation mechanism). Cooperation with Lithuania and Estonia enabled the share to be increased to 9.06% in 2018, meaning that the indicative target for 2017-2018 was met.

1 Facilitates comparison with Tables 3 and 4a of 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 Articles 5(1)(b) and 5(4) of Directive 2009/28/EC), broken down by gross final consumption of energy for heating and cooling. The same methodology as in Table 3 of the NREAP is applicable.

3 Share of renewable energy in electricity: gross final consumption of energy from renewable sources for electricity (as defined in Articles 5(1)(a) and 5(3) of Directive 2009/28/EC), broken down by total gross final consumption of electricity. The same methodology as in Table 3 of the NREAP is applicable.

4 Share of renewable energy in the transport sector: final consumption of energy from renewable sources in the transport sector (see Article 5(1)(c) and 5(5)of Directive 2009/28/EC), broken down by the consumption in the transport sector of 1) petrol, 2) diesel, 3) biofuels used in road and rail transport and 4) electricity in land transport (see row 3 of Table 1). The same methodology as in Table 3 of the NREAP is applicable.

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

6 As percentage points of the overall RES share.

7 As percentage points of the overall RES share.

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

	2017	2018
A) Gross final consumption of RES for heating and cooling	86.4	96.9
B) Gross final consumption of electricity from RES	45.7	52.4
C) Gross final consumption of energy from RES in transport	113.6	122.9
D) Gross total RES consumption[9]	**208.3**	**272.2**
E) Transfer of RES to other Member States		
F) Transfer of RES from other Member States and third countries		94.6
G) RES consumption adjusted for target (D)-(E)+(F)	**208.3**	**366.8**

For 2017-2018, the indicative target was met partly because of the transfer of energy from renewable sources from the Member States of Lithuania and Estonia, which took place for the first time.

Compared to the NREAP, the gross final consumption of energy from renewable sources for heating and cooling in 2017 and 2018 was 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.

Gross final consumption in the transport sector increased further and is now slightly below the calculations of the NREAP. The percentage share of the transport target increased slightly in 2018 against 2017. The share of biofuels reached 6.54% in 2018.

[8] Facilitates comparison with Table 4a of the NREAP.

[9] In accordance with Article 5(1) of Directive 2009/28/EC gas, electricity and hydrogen from renewable energy sources is considered only once. No double counting is allowed.

Table 1b: Actual total contribution (installed capacity, gross electricity generation) made by each renewable energy technology in Luxembourg to meet the binding 2020 targets and the indicative trajectory for the share of energy from renewable resources in the electricity sector[10]

	2017		2018	
	MW	GWh	MW	GWh
Hydro[11]:	35	103.6	34	104.1
Non-pumped	35	103.6	34	104.1
<1MW	2	5.5	2	5.7
1MW–10MW	32	98.1	32	98.4
>10MW	0	0	0	0
Pumped	1 296	1 336	1 296	1 244
Mixed[12]	0	0	0	0
Geothermal	0	0	0	0
Solar:	128	108.5	131	119.7
Solar photovoltaic power.	128	108.5	131	119.7
Concentrated solar power	0	0	0	0
tide, wave, ocean	0	0	0	0
Wind[11]:	120	184.9	123	207.3
Onshore	120	184.9	123	207.3
Off-shore	0	0	0	0
Biomass[13]:	27	125	27	170.2
Solid biomass	15	52	15	95.2
Biogases	12	73	12	75.4
+ Bioliquids	0	0	0	0
Other renewable energy sources (waste)	19	48	19	48
TOTAL	**329**	**570**	**334**	**650**

Overall, installed capacity for energy production from RES in the electricity sector (2017 and 2018) rose in comparison to the fourth progress report (2015: 208 MW; 2016: 223 MW).

Installed capacity in the electricity sector was above the calculations of the NREAP in 2017 and 2018.

The installed capacity and production of wind energy is still slightly lower than the values assumed in the NREAP for both 2017 and 2018. However, this will change in the coming years, and the target for wind power should therefore be met in 2020. As far as installed capacity per 1 000 inhabitants is concerned, Luxembourg, with a figure of 196.4 kW, is still in 15th place in the European ranking (EurObserv'ER 2018) and is therefore not far behind countries with offshore potential, such as France (14th, 202.3), the Netherlands (11th, 250) or Belgium (10th, 250.6).

Growth in photovoltaics, a technology with few full load hours, was strong in comparison and remains well above the values assumed in the NREAP. A PV call for tenders for large installations was launched for the first time in Luxembourg in 2018. Luxembourg was in 7th

[10] Facilitates comparison with Table 10a of the NREAP.

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

[12] In accordance with new Eurostat methodology.

[13] Taking into account only those complying with the applicable sustainability criteria, cf. Article 5(1), last subparagraph, of Directive 2009/28/EC.

place in 2018 as far as installed PV capacity per inhabitant was concerned (EurObserv'ER). Capacity stood at 222 W/inhabitant in 2018 and 215 W/inhabitant in 2017.

Table 1c: Total actual contribution (final energy consumption[14]) from each renewable energy technology in Luxembourg to meet the binding 2020 targets and the indicative interim trajectory for the share of energy from RES in heating and cooling (ktoe).[15]

	2017	2018
Geothermal (excluding low-temperature geothermal heat in heat pump applications)	0	0
Solar	2.2	2.4
Biomass[16]:	79	88.5
Solid biomass	67.2	76.1
Biogases	11.8	12.4
Bioliquids	0.0	0.0
Renewable energy from heat pumps*:*	5.2	6
of which aerothermal	2.6	3
of which geothermal	2.6	3
of which hydrothermal		
TOTAL	86.4	96.9
of which district heating[17]		
of which biomass in households[18]	22.7	24.3

Total final energy consumption from RES in the heating and cooling sector was higher in 2017 and 2018 than the values forecast in the NREAP.

As in 2015 and 2016, this can be attributed in particular to biomass and to the presence of several large industrial undertakings which cover part of their heating requirement with solid biomass. This share should increase significantly in 2019 and 2020 as a result of more installations coming on stream.

It continues to be the case that energy production from solar and heat pumps is constantly rising.

[14] Direct use and district heating in accordance with Article 5(4) of Directive 2009/28/EC.
[15] Facilitates comparison with Table 11 of the NREAP.
[16] Taking into account only those complying with the applicable sustainability criteria, cf. Article 5(1), last subparagraph, of Directive 2009/28/EC.
[17] District heating and/or cooling from total renewable heating and cooling consumption (RES-DH).
[18] As a proportion of total renewable heating and cooling consumption.

Table 1d: Total actual contribution from each renewable energy technology in Luxembourg to meet the binding 2020 targets and the indicative interim trajectory for the share of energy from renewable resources in the transport sector(ktoe)[19][20]

	2017	2018
- bioethanol	6.71	9.9
- biodiesel (FAME)	106.63	112.83
- hydrated vegetable oil (HVO)	2	2
- 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	110.26	119.56
Of which		
sustainable biofuels from the raw materials referred to in part A of Annex IX	0	0
other sustainable biofuels suitable for meeting the targets set out in Article 3(4)(e)	0	0
sustainable biofuels from the raw materials referred to in part B of Annex IX	9.26	10.53
sustainable biofuels with a limited contribution to meeting the renewable energy target set out in Article 3(4)(d)	101	108.87
Imports from third countries	0	0
Hydrogen from RES	0	0
Electricity from RES	3.1	3.49
Of which		
in the road sector:	0.03	0.04
in the rail transport sector	3.31	3.45
in other transport sectors	0	0
Others (please specify)	0	0
Others (please specify)	0	0
TOTAL	**113.59**	**122.88**

The proportion of energy from renewable sources in the transport sector in 2017 and 2018 is below the values in the NREAP. The mandatory blending percentage for biofuels was 5.70% (before double-counting) in 2018.

In 2018 the minimum share of sustainable biofuels after double-counting was 15 % of the total consumption of biofuels.

[19] Facilitates comparison with Table 12 of the NREAP.

[20] For biofuels, taking into account only those compliant with the sustainability criteria, cf. Article 5(1) last subparagraph.

2. Measures taken in the preceding 2 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 strategies and measures

Only those strategies and measures which have changed as compared to the NREAP are listed.

Name and reference number of the measure[21]	Type of measure*	Expected result**	Targeted group and or activity***	Existing or planned	Start and end dates of the measure	Amendments to the NREAP
5. A possible obligation to use renewable energy in buildings should be examined.	Legislative	Increase in installed capacity and energy production from RES	Consumers	Existing	Beginning: July 2012	The Nearly Zero Energy Building (NZEB) standard has applied to residential buildings since 1 January 2017. This is an implicit obligation: the standards laid down have to be complied with solely by using renewable energy. It is also possible to include photovoltaics in the calculation of the energy performance certificate. For non-residential buildings (functional buildings), energy efficiency standards will continue to be tightened up, requiring renewable energy to be used more and introducing a NZEB standard from 1 January 2021.

[21] **The reference numbers of measures are taken from the NREAP.**

7. Pioneering role for the State in the case of new buildings The use of renewable energy is examined when public buildings are planned. 'Positive-energy' buildings are also to be created for demonstration purposes.	Infrastructure	Increase in installed capacity and energy production from RES	Public administration	Existing	Beginning: 2008	The Government programme requires new public buildings to be built at least in accordance with passive house standards. Since July 2015, the Nature and Forest Agency (*Naturverwaltung*) has been housed in a positive-energy building in Diekirch. A second public positive-energy building (a college for healthcare professions) is still being built (it is planned to enter into service at the beginning of the 2019-20 academic year): An existing building has also been upgraded to the positive-energy standard and was moved into in 2018 (*Maison d'enfants de l'Etat* in Schifflingen). The Public Building Administration's current project phase, which coincides with the reporting period, saw installed PV capacity on public (new and existing) buildings increase from around 2.1 MW to around 3.5 MW. The coming phases might see total installed capacity increase to 22.75 MW (2025).
8. Pioneering role for the State in the case of existing buildings The possible use of renewable energy should be examined for each building.	Infrastructure	Increase in installed capacity and energy production from RES	Public administration	Existing	Beginning: 2008	An ambitious modernisation programme is stated as an aim in the Government programme: a target of 3% for the renovation of the entire surface area of public buildings has been adopted. Out of 15 750 m^2 of building space (net) to be renovated in the period 2014-2020, 18 900 m^2 (net) had already been renovated/modernised by the end of 2018, including through the use of renewable energy. Luxembourg has therefore already exceeded its target in this area and expects to increase this figure to 23 000 m^2 (net) by 2020.
9. Myenergy is the contact point in Luxembourg, providing information and basic advice on energy efficiency and renewable energy sources. It intends to step up its awareness-raising and basic advice activities in the area of renewable energy.						Myenergy is constantly enhancing and expanding the services it offers. During this reporting period, a national online public awareness campaign focusing exclusively on photovoltaics, with its own specific portal, has been implemented (www.cleversolar.lu). The portal makes the existing support tools centrally available and is tailored to small installations for single and multi-dwelling buildings and for persons interested in participating in the energy transition as part of a cooperative. It contains model statutes and rental agreements for corresponding roof areas, etc., as a means of supporting the establishment of a cooperative PV installation (reserved categories for feed-in tariffs of 30-200 kW, and up to 500 kW from 2019).

10. Myenergy *is seeking* to develop a nationwide network of 'Infopoints' so that every citizen of Luxembourg has regional access to a contact point where they can ask questions on energy efficiency and renewable energy.	Informative	Behavioural change towards an increase in installed capacity and energy production from RES	Citizens	Existing nationwide	Beginning: January 2009	The nationwide network of 'Infopoints' is complete and can be consulted on the Myenergy website (myenergy.lu).
13. Some municipalities and associations of municipalities regularly organise information and awareness-raising campaigns on climate change and related subjects, such as how to save energy and use renewable energy sources. Myenergy is intending to step up its cooperation with local authorities in this field.	Informative	Behavioural change	Citizens	Existing	Beginning: 2009	All 105 municipalities belong to the climate pact. The range of measures under the climate pact includes municipalities regularly organising information and awareness-raising campaigns on climate change and related subjects, such how to save energy and use renewable energy sources.
14. Every year, the Luxembourg Chamber of Trades (*Handwerkskammers*) holds a training course for tradespeople leading to the acquisition of two quality labels in the areas of renewable energy and energy efficiency (the *Energie fir d'Zukunft+* and *zertifizierter Passivhaushandwerker* labels).	Training, informative	Increase in installed capacity and energy production from RES	Tradespeople	Existing	Beginning: 2001	The *'Energie fir d'Zukunft+'* label has been combined with the '*zertifizierter Passivhaushandwerker*' label. These labels are linked to practical training and can be obtained in a single course. The '*Energie fir d'Zukunft*' label still exists, but has been superseded 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 Association of Architects and Consulting Engineers (*Berufsverband der Architekten und der beratenden Ingenieure*) organises a training course on sustainable construction and energy.	Training, informative	Increase in installed capacity and energy production from RES	Planners	Existing	Beginning: 2003	The association reorganised its training provisions. The syllabus of the 'Building and Energy' training course has been maintained and added to. Subjects such as renewable energy and energy-efficient buildings are offered.
18. The first smart meters have already been installed by various network operators.	Organisational, infrastructure Legislative	Raising energy awareness	Network operators	Partially existing	Beginning: 2009	Since the middle of 2016, the lobby group *luxmetering GIE* has been gradually introducing smart meters for customers. By the end of 2018, a total of 140,000 smart electricity meters and 30,000 smart gas meters had been installed. The full conversion to smart meters for electricity and gas should be completed in 2020.

19. In the context of improving the national security of supply and increasing Luxembourg's integration into the European electricity grid, different approaches to connecting Luxembourg to the transmission networks of neighbouring countries are being examined which might benefit the development of renewable energy in the electricity grid.	Infrastructure	Increase in installed capacity and energy production from RES	Network operators	Partially under construction, partially in the planning stage	Existing	In 2016/17, Luxembourg's only transmission network operator, Creos, improved the North-South link within the country, increased coverage in the capital by completing the Luxring project and, at the same time, created interconnectivity for Luxembourg's connections with Germany and Belgium. A BeDeLux cross-border connection was also launched in October 2017 and, after testing over a period of one year, was brought into service, thereby ensuring Luxembourg's security of supply at least up to 2030.
29. Feed-in payment for electricity from RES The amount and structure of feed-in payments will, if necessary, be adjusted as part of the implementation of this plan.	Financial, legislative	Increase in installed capacity and energy production from RES	Operator	Existing	Beginning: 1994	A fully revised regulation was published in August 2014 in the form of the Grand-Ducal Regulation of 1 August 2014 on the production of electricity on the basis of renewable energy sources (French version:http://legilux.public.lu/eli/etat/leg/rgd/2014/08/01/n1/jo). The revision of this Regulation was, as far as possible, consistent with the trajectories set out in the NREAP for the various renewable energy sources. The Regulation was revised further in July 2016, April 2017 and April 2019: the feed-in payment for electricity from PV installations was adjusted by being extended to energy cooperatives and civil-law companies (2016), a regulatory basis for PV tendering was introduced at national and European level (2017), and in 2018 the feed-in payment for PV installations was overhauled following the identification of a virtual stagnation in new installations. A new category for installations below 10 kW was introduced, and the feed-in tariffs were adjusted upwards. A new category (200-500 kW) was also introduced for energy cooperatives. Moreover, a feed-in payment (market premium) was established for biomass or waste wood installations with a nominal capacity of more than 10 MW. The relevant Regulation entered into force in April 2019.

30. A blending obligation currently exists for all diesel and petrol fuels. This is expected to lead to increased use of energy from renewable sources in the transport sector. This blending obligation, which was supplemented in 2011 by the sustainability criteria of Directive 2009/28/EC, has been stepped up.	Legislative	Increased energy production from RES	Petroleum refineries	Existing	Beginning: 2007	The blending obligation as supplemented in 2011 by the sustainability criteria contained in Directive 2009/28/EC was 5.50% for 2017 and 5.70% for 2018 (before double–counting).
35. Forest mobilisation	Financial, cooperative, Infrastructure	Increase in installed capacity and energy production from RES	Private forest owners, businesses, municipalities	Existing	Beginning: 2016	A new project concerning biomass use (wood, solid biomass) was launched: The Cluster project *Bësch an Holz* was launched in 2016 on the basis of the preparatory work of the Nature and Forest Agency. The Government decided to set up the *LUXINNOVATION* Cluster project under the title 'Wood Cluster'. The creation of wood clusters forms part of the effort to offer members a framework promoting the implementation of projects in support of Luxembourg's wood sector. The *Holz vun hei* project was launched on 1 October 2018 under the EU's LEADER programme.
39. An initiative known as the climate pact has been introduced for municipalities.	Financial, legislative	Increase in installed capacity and energy production from RES	Municipalities	Existing	Beginning: 2013 Ended at: 2020	The Law of 13 September 2012 establishing a climate pact with municipalities (French version: http://legilux.public.lu/eli/etat/leg/loi/2016/03/29/n7/jo) published in 2012 provides for financial support from 1 January 2013 for municipalities participating in the climate pact. By signing the climate pact with the State as contractual partner, participating municipalities can benefit from technical and financial support and assume an active role in combating climate change. All municipalities are now part of this pact.
40. It became mandatory for all new residential and functional buildings to draw up a feasibility study for renewable energy systems.	Legislative, financial	Increase in installed capacity and energy production from RES	Consumers	Existing	Beginning: 2014	A feasibility study of this kind must be carried out for every new residential and functional building. The technical, ecological and financial feasibility of renewable energy systems, etc., is systematically examined.

42. Expansion of the electromobility infrastructure	Legislative	Behavioural change, priority for energy production from RES	Distribution system operator	Already partially existing	Beginning: 2012 Ended at: 2020	In 2015 a Regulation entered into force concerning the expansion and administration of a national electromobility infrastructure (Grand-Ducal Regulation of 3 December 2015 on the public infrastructure linked to electromobility; French version:http://legilux.public.lu/eli/etat/leg/rgd/2015/12/03/n2/jo). Amongst other things, this defined the technical specifications for the charging station infrastructure. A 2012 amendment to the 2007 Electricity Market Law imposes an obligation on distribution system operators to set up this national vehicle-charging infrastructure. 800 charging stations, each with two charging points, are to be ready for use by the end of 2020. By the end of 2018, 277 charging stations had already been installed.
43. Future-oriented debate on 'The Third Industrial Revolution'	Informative	Behavioural change, priority for energy production from RES, increase in installed capacity and energy production from RES, analysis of the potential for renewable energy	All	Existing	Beginning: 2015	The Luxembourg Government is encouraging a broad future-oriented debate on 'The Third Industrial Revolution' with the assistance of the US economist Jeremy Rifkin. Two of the nine 'pillars' of the strategic study are energy and mobility; important cornerstones are the use of self-generated electricity, digitisation and decentralised energy production. The study will continue to serve as a cornerstone for the digitisation process.
44. Transposition of Directive 2015/1513/EU	Legislative	Sustainability of biofuels	All	Existing	Beginning: 2015	Directive 2015/1513/EU was transposed by the Grand-Ducal Regulation of 28 February 2017 amending the Grand-Ducal Regulation of 27 February 2011 laying down the sustainability criteria for biofuels and bioliquids (French version:http://legilux.public.lu/eli/etat/leg/rgd/2017/02/28/a246/jo), introduced as part of the regulatory process of amending certain provisions involving in particular - the addition of certain definitions; - the amendment of the values for the reduction of CO_2 emissions to be met in relation to the production of biofuels and bioliquids; - the amendment of the rules on the calculation of the greenhouse effect of biofuels, bioliquids and reference fossil fuels.

* Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).

** Is the expected result behavioural change, installed capacity (MW;t/year) or energy generated (ktoe)?

*** What is the target group: Investors, end users, public administration, planning offices, architects, installers, etc., or what is the target activity/target sector: biofuel production, energetic use of animal manure, etc.

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 fourth progress report.

2. b) Please describe the measures taken to ensure the transmission and distribution of electricity produced from renewable energy sources and to improve the framework or rules for the 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 fourth 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 the measures set out in the National Renewable Energy Action Plan (*Article 22(1)(b) of Directive 2009/28/EC*).

The following figures refer to plants which were connected to the power grid in 2018. The feed-in payment/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 payments for existing plants are established for a term of 10 years and may be requested from the network operator after the initial term of the payment (15 or 20 years). These payments apply to hydroelectric and biogas plants.

Biogas and biomass installations 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 be granted as part of a residual feed-in payment even after this term expires. Biogas installations may also receive a manure bonus.

New biogas installations which feed biogas into the natural gas network may receive a payment.

It should be noted that all tariffs have been approved by decisions of the Directorate-General for Competition of the European Commission:

- *State aid SA.37232 (2014/NN) – Luxembourg*
  Feed-in tariffs for renewable energy production and other support measures

- *State aid SA. 43128 (2015/N) – Luxembourg*
  Change to RES support in Luxembourg

- *State aid SA.31319 (2011/N) – Luxembourg*
  State aid in favour of producers of biogas

- *State aid SA. 40010 (2014/N) – Luxembourg*
  Amendment to Grand-Ducal Regulation on biogas

Table 3: Support measures for renewable energy;

Support measures for renewable energy 2017/2018			**Per unit support**	**Total (€ million)***
Technology or fuel (sub-)category - Wind, photovoltaic, hydroelectric, biogas, gas from waste water treatment plants, biomass/waste wood				
Instrument (please explain, where appropriate)	Requirement/share (%) **Biofuels in the transport sector: 5.70% (2018)**			
	Penalty/buy-out option/buy-out price (€/unit)			
	average certificate price			
	Tax exemption/refund			
	Investment support (grants or loans) (€/unit) Investment support for the production of energy from RES Small enterprises Medium enterprises Large enterprises		Percentage of eligible costs 65 55 45	Subsidies granted 2017: € 33 million 2018: € 27.9 million
	Production incentives/feed-in premiums			
	1	**New installations** **Feed-in tariff/market premium** Electricity 15 years	For 2018 - €/MWh	
		Wind energy	91.08	
		Solar Up to 30 kW	145.20	
		Up to 100 kW	140.8	
		Up to 200 kW	134.64	
		Hydroelectric power Up to 300 kW	178.2	
		Up to 1 MW	148.5	
		Up to 6 MW	123.75	
		Biogases Up to 150 kW	190.08	
		Up to 300 kW	179.19	
		Up to 500 kW	169.29	
		Up to 2 500 kW	151.47	
		Sewage gas Excluding municipalities	118.8	
		For municipalities	64.35	
		Old and waste wood Up to 1 MW	136.62	
		Up to 10 MW	116.82	
		Biomass Up to 1 MW	161.37	
		Up to 10 MW	141.57	
		Calls for tenders		
	2	**New installations** **Heating bonus** Heating sector	For 2018 - €/MWh	

		15 years Biogases** Up to 150 kW Up to 300 kW Up to 500 kW Up to 2 500 kW Sewage gas (excluding municipalities), Old and waste wood Up to 1 MW Up to 10 MW Biomass*** Up to 1 MW Up to 10 MW	 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00	
	3	**Existing installations - residual feed-in** Electricity sector 10 years Hydroelectric up to 300 kW Up to 1 MW Up to 6 MW Biogases Up to 150 kW Up to 300 kW Up to 500 kW Up to 2 500 kW	For 2018 - €/MWh 105.00 105.00 65.00 118.00 118.00 118.00 98.00	
	4	**Existing installations** **Heating bonus** Heating sector 10 years Biogases Up to 150 kW Up to 300 kW Up to 500 kW Up to 2 500 kW	For 2018 - €/MWh 30.00 30.00 30.00 30.00	
	5	**New installations** **Manure bonus** **Biogases 150-2 500 kW** **Manure content: minimum 70%**	For 2018 - €/MWh 20.00	Points 1-5: Net support costs 2017: EUR 56.7 million (of which €7.4 million for heat bonus) 2018: EUR 60 million (of which €11 million for heat bonus)
	6	**New installations** **Biogas installation feeding into the gas network** private operators public operators	For 2018 - €/MWh 80.00 72.00	in paragraph (6): Net support costs 2017: EUR 4.4 million 2018: EUR 4.1 million
Total estimated annual support in the electricity sector				
Total estimated annual support in the heating sector				
Total estimated annual support in the transport sector				

* The quantity of energy supported per unit is an indicator of the effectiveness of the support for each type of technology

** The minimum proportion of sold heat must be at least 50%, otherwise the heat bonus falls to €15/MWh (40% ≤ heat bonus < 50%)

*** The minimum proportion of sold heat must be at least 75%, otherwise the heat bonus falls to €15/MWh (65% ≤ heat bonus < 75%)

- Point 4.2.3(c) of the NREAP: Buildings

  The gradual tightening of national regulations concerning total energy efficiency and thermal insulation resulted, as planned, in a regulation under which newly built residential buildings are required to meet the NZEB standard 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 complied with 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 photovoltaic installations into account in the calculation.

  A timetable for tightening 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.

  A new measure entered into force for non-residential buildings in 2015 and is aimed at tightening the requirements for energy efficiency moving towards 'NZEB non-residential buildings'. For non-residential buildings, NZEB will be standard as of 1 January 2021.

- 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 Buildings

  See Point 4.2.3.(c). Re.:

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

  Public buildings – New construction: In addition 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 buildings: 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 surface area of public buildings was adopted. Renovations carried out in this context are also to be brought into line with the switch to renewable energies. While the fourth progress report stated that 'Out of 26 000 m2 of building space to be renovated in the period 2014 to 2020, 13 900 m2 had already been renovated/modernised by the end of 2016', at the Commission's request Luxembourg changed the calculation of surface areas from being based on net rather than gross surfaces. Accordingly, the following picture emerged at the end of 2018: The building space to renovated in the period 2014-2020 is 15 750 m^2 (net). Up to the end of 2018, 18 900 m^2 had been renovated, by the end of 2020 the area renovated is expected to be

23 000 m^2. Luxembourg has accordingly exceeded its target in this area and would achieve a result of 144% in 2020.

Public buildings – as models: Since July 2015, the Nature and Forest Agency has been housed in a positive-energy building in Diekirch (see also the fourth progress report). This building is 'platinum' certified according to the DGNB and received the Energy Globe Award in 2017. In 2016 it produced surplus electricity of 23 MWh (25 MWh in 2017 and a total of 27 MWh in 2018 (metered)). A second public positive energy building (a college for healthcare professions) is under construction. In Schifflingen, an existing building (built in 1950) was converted to a positive-energy building in 2018. (Details (in French) in „Stratégie d'assainissement énergétique du patrimoine de l'État – Addendum 2019; https://travaux.public.lu/fr/publications/documentation/strategie.html).

There are currently 26 state-owned PV installations on newly built or existing buildings, with an installed capacity of 3.5 MW. A further 35 installations (with a capacity of approximately 11 MW) are under construction or planned. Secondary schools above all 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.

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

Myenergy Infopoints have been expanded, and almost all 105 municipalities in the country were represented at the end of 2018.

Cooperation with the municipalities has been intensified by means of the climate pact (launched on 1 January 2013). All 105 municipalities now participate in the climate pact. Myenergy is responsible for managing the climate pact and supports the municipalities in implementing it using technical instruments such as guidelines on energy-efficient municipal planning. Myenergy is also the point of contact for the municipalities with regard to the climate pact and on specific topics relating to renewable energy and energy efficiency. Municipalities can find all measures and several examples for 'best practices' on the climate pact website.

In 2017 a portal focusing exclusively on photovoltaics was launched. In addition to the general portal www.myenergy.lu, interested citizens can now also consult www.cleversolar.lu. The portal is geared towards small installations for single and multi-dwelling buildings and persons interested in participating in the energy transition as part of a cooperative. It contains model statutes and rental agreements, etc., as a means of assisting with the establishment of a cooperative PV installation (reserved categories for feed-in tariffs of 30-200 kW, and up to 500 kW from 2019).

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 signed by the Luxembourg Government and the Luxembourg Business Federation (Fedil) for the period 2017 to 2020.

Additional information can be found at www.myenergy.lu.

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

  As already stated in the previous progress reports, there is an *Energie fir d'Zukunft+* label issued by the Chamber of Trades that is associated with the *zertifizierten Passivhaushandwerkers* label. Together these labels seek to prepare the trades sector for the NZEB standard in the best possible way.

  Additional information can be found at www.cdm.lu/.

  The professional association of architects and consulting engineers (OAI) has 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 positive-energy buildings.

  Additional information can be found at www.oai.lu/formation.

- 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: Buildings Provision of information

  'The Third Industrial Revolution' (TIR) is a joint project launched in September 2015 by the Ministry for Economic Affairs, 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 transition to a new economic model which is sustainable in the long term, shaped in particular by a combination of information technologies, renewable energies and intelligent transport networks. Luxembourg has 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 support for renewable energies.

  This process continues to provide a basis for aspects such as the smart economy, digitisation and the circular economy. Approaches and plans regarding the areas of renewable energy, energy efficiency and the environment will in future be dealt with on the basis of the energy and climate plan.

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

  The *LuxBuild2020* initiative was maintained in 2017 and 2018.

The four partners of the Luxbuild 2020 consortium have implemented many projects since 2014 aimed at improving access to training for tradespeople and construction workers and the services offered.

The partners divide the various tasks as follows:

- myenergy: project management and awareness raising
- the IFSB (*Institut de Formation Sectoriel du Bâtiment*, *Weiterbildungsinstitut für das Baugewerbe*): promotion of further training
- the Federation of Craft Workers: the structure of training
- the Chamber of Trades: further development of further training

The training for passive house traders organised by the Chamber of 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 Trades has developed didactically adapted teaching material for the blue-collar worker target group, with increased focus on teaching 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 the National Council for Sustainable Construction (*Conseil National pour la Construction Durable*, CNCD), a non-profit organisation which supports a more sustainable future and seeks to ensure the competitiveness of the Luxembourg construction sector by developing its competence in the area of sustainable construction. The LuxBuild2020 initiative was therefore integrated into the CNCD's 'Training and qualifications' (*Formations et qualifications*) working group. 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.

Samples of energy performance certificates were also collected in 2017 and 2018 in accordance with Directive 2010/31/EC.

- Point 4.2.6.(c) of the NREAP: Development of the 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 Law. Network operators in the electricity and gas sector have formed a financial-interest group, Luxmetering GIE, to jointly organise the national roll-out of smart meters. The Grand-Ducal Regulation of 27 August 2014 on arrangements for metering electrical energy and gas (in French:*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 arrangements for metering energy consumption and the technical properties of meters.

In 2016, gas and electricity network operators started to introduce the use of smart meters nationwide 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 smart meters. By the end of 2018, a total of 140,000 smart electricity meters and 30,000 smart gas meters had been installed. The full conversion to smart meters for electricity and gas should be completed in 2020.

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

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

  The phase-shift transformer in Schifflange, which connects the electricity network of Elia and Creos, was put into operation in October 2017. After testing over one year, the connection entered into service at the end of 2018. This interconnector is intended to link up 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 Luxembourg's security of supply up to at least 2030.

  With regard to the security of supply and 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 supply in the middle and the south of the country.

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

  As mentioned in the last progress reports, the sustainability criteria were introduced for biofuels and other bioliquids in 2011 by means of a national regulation.

  In February 2017, the Regulation amending the Regulation of 27 February 2011 determining sustainability criteria for biofuels and bioliquids (in French:http://legilux.public.lu/eli/etat/leg/rgd/2017/02/28/a246/jo) entered into force.

  This Regulation transposes 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. In particular, these amendments:

  - added certain definitions;
  - amended the values for the reduction of CO_2 emissions to be met in relation to the production of biofuels and bioliquids;
  - amended the rules on the calculation of the greenhouse effect of biofuels, bioliquids and reference fossil fuels.

The Amended Law of 17 December 2010 determining excise duties and equivalent taxes on energy products, electricity, manufactured tobacco products, alcohol and alcoholic beverages (in French: *Loi modifiée du 17 décembre 2010 fixant les droits d'accise et les taxes assimiliées 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) provides for mandatory blending of biofuels for all diesel and petrol fuels. Accordingly, biofuels had to make up at least 5.5 % of all fuels in 2017 and 5.7 % in 2018, calculated on the basis of the fuel's energy content.

The contribution of biofuels made from waste, residues or cellulose materials (Annex IX to Directive 2009/28/EC) is taken into account at twice the rate applicable to traditional biofuels. In 2018, the minimum percentage of biofuels produced from waste, residues or cellulose materials for consumption was at least 15% after double-counting as a ratio of total biofuel consumption.

- Points 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)

  A so-called climate pact has been 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 European Energy Award (EEA) international quality management and certification system. A total of 10 municipalities currently have the highest certification standard of at least 75%.

  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 Environmental Protection Fund (*Fonds pour la protection de l'environnement*). The maximum system sizes from the aforementioned measure also apply under the climate pact.

  The scheme is based on a catalogue of 79 measures, sub-divided into six areas (http://www.pacteclimat.lu/fr/les-mesures).

- 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)

  At the end of 2017, a new revised Law entered into force based on the European block exemption principle for the purposes of regulating, *inter alia*, renewable energy (in French:

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).

With a view to administrative simplification, the new Law brings investment aid for industry and SMEs, which had previously been dealt with in two different texts, under one roof. The new Law covers all sectors (including the tertiary sector and liberal professions) as well as private individuals. The categories of eligible projects from the previous Law are maintained but are expanded to the following eligible measures: energy efficiency of buildings, rehabilitation of dumps and contaminated sites, efficient heating-cooling networks, recycling and reuse of waste, and energy infrastructure. All funding rates remain the same, although for energy efficiency projects there has been an increase of 10 percentage points. While the aid could previously only be granted in the form of capital or interest-rate subsidies, it has now been expanded to include the following instruments: advance payments, tax advantages, grants, guarantees or loans. This means that the range of instruments available under the 2010 Law has been expanded and strengthened.

- 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 payments for electricity from renewable energy sources were modified by a new Regulation, which entered into force in 2014 (in French: http://legilux.public.lu/eli/etat/leg/rgd/2014/08/01/n1/jo). The Regulation was revised for the first time in 2016 (see the fourth progress report).

  At the end of 2016, a further revision was launched, which entered into force on 24 April 2017. This draft aimed to create a regulatory basis for the planned PV tendering procedure, and enabled both domestic and international tendering to take place.

On 24 February 2018, the first public tender for large PV installations was launched. To that end, it was decided to organise the procedure and the lots in a relatively simply way using an external consultant and drawing on existing procedures abroad (primarily France and Germany). An overall installed capacity of 20 MW was put out to tender. This was made up of two lots with the following characteristics:

- Lot 1: The installation of PV equipment on the roofs of industrial and/or commercial premises in the broad sense (not necessarily sealed) and on sites requiring renovation, of a maximum total capacity of 10 MW; highest bid: €90/MWh;
- Lot 2: Installation of PV equipment on building envelopes, car ports and sealed transport and parking premises, of a maximum total capacity of 10 MW; highest bid €135/MWh;

The minimum size for an installation was 500 kW, the maximum 5 MW. The tendering procedure ran over six months, with bids having to be submitted by 31 August 2018. The Ministry received 10 bids in total, all of which were submitted within the deadline. All of the bids also met the conditions so that they were all accepted. The result of this first tendering procedure is summarised in the following table:

	Industrial/commercial sites	Building envelope
Capacity put out to tender.	10 MW	10 MW
Number of bids	2	8
Capacity offered	7.26 MW	7.90 MW
Weighted average value of bids	€88.9/MWh	€120.6/MWh
Weighted average value (total)	€105.03/MWh	

Table 4: Result of the first PV tender

The table shows that both of the bids in lot 1 were close to the maximum bid permitted. In lot 2, three bids were close to the maximum price, one in the range €120-130, three in the range €110-120, and one below €100.

Given the number of specifications requested, it was hoped within the Ministry that it would be possible to award the entire 20 MW. The questions officially asked in accordance with the specifications were answered in detail. Moreover, after the procedure had been completed, feedback was again obtained from almost all of the parties that had asked to receive the specifications. This was all closely analysed, and the results of this analysis were incorporated into the second set of specifications (published in September 2019).

The tenders were awarded on 18 September 2018. According to the specifications, this meant that the installations had to be connected to the grid by 18 March 2020 (or 18 September 2020 with a penalty) at the latest.

The 2014 Renewable Energy Regulation was further revised in 2018. Owing to procedural problems, however, the entry into force of this Regulation was delayed until 19 April 2019 (with effect from 1 January).

Although various rather technical aspects were adjusted and simplified, the main point of this revision was to increase the feed-in tariff for photovoltaics and to introduce two new categories. This was prompted by a marked decrease in the fitting of PV installations, as shown in the following table:

	2014	2015	2016	2017	2018
Number of installations on 31.12	5 500	5 979	6 414	6 813	6 990
Increase	23.0 %	8.7 %	7.3 %	6.2 %	1.8 %

Table 5: Number of PV installations since 2014; Year-on-year increase

An increase of +23% was observed in the first year of the new Regulation (2014), thus providing the effect hoped for. However, the rate of increase fell significantly in the second year. The tariffs applicable in 2014 fell by as much as 6% or 9% (depending on the category), in line with

the price trend for PV modules in the 2000s and at the beginning of the 2010s. However, this price trend subsequently weakened. The drop in prices fell to 3-4% (depending on the category), and at the same time the feed-in tariffs rose again compared to the 2018 reference year. These changes are as follows:

(kW)	Feed-in tariff for 2018 (€/MWh)	Feed-in tariff for 2019 with the old reduction (€/MWh)	New feed-in tariff (€/MWh)
0-10	145	121 (9%)	165 (3%)
10-30			155 (3%)
30-100*	141	131 (6%)	145 (4%)
100-200*	135	125 (6%)	140 (4%)
200-500*			125 (4%)

Table 6: 2019 reform of PV feed-in tariffs; Reduction in brackets; * only cooperative installations

As the table shows, a new category of up to 10 kW was introduced for small installations in order to achieve better coverage of the roofs of residential buildings. A new category was also introduced for the sizes of installations reserved for cooperative and civil-law companies because the Government was still trying to encourage civil society to become more involved in the energy transition. Demand had existed in the past, but many projects had failed because of costs. As a result, alongside the introduction of the new category, the tariffs were again increased (slightly).

Finally, in the area of wood-based biomass (virgin wood as well and used and waste wood) a further category of more than 10 MW was introduced on top of the existing categories of up to 1 MW and 1-10 MW. This was intended to cover demand in industry. In 2019 the newly introduced tariff was €90/MWh for virgin wood and €80/MWh for used and waste wood. The possible heat bonus for this size of installation was reduced from €30 to €20/MWh.

The amended feed-in tariffs were approved by Decision of the European Commission (DG COMP) (State aid SA. 48601 (2018/N).

In the area of financial incentives, a new housing construction package was also adopted in 2016 with a view to amending the regulations governing investment grants for renewable energies in the area of housing construction and promoting sustainable construction and renovation (see the fourth progress report).

The package entered into force on 1 January 2017 and comprised a financial assistance programme ('PRIMe House') focusing on sustainable housing and sustainable building renovation.

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

Technology	Aid (% of costs)	Maximum amount	
		Single-family dwelling	Multi-family dwelling
Thermal solar systems			
Domestic hot water	50%	€2 500	€2 500 per housing unit max. €15 000
Domestic hot water with heating support	50%	€4 000	€4 000 per housing unit max. €20 000
Bonus for a combination with wood heating or heat pump €1 000			
Photovoltaic installation			
Installation on building envelope ≤ 30kW	20%	€500/kWp	
Heat pump			
Geothermal heat pump	50%	€8 000	€6 000 per housing unit max. €30 000
Air/water heat pump*	25%	€2 500	
Exhaust air/water heat pump**	25%	€2 500	
Wood heating			
Pellet and wood chip boiler	40%	€5 000	€4 000 per housing unit max. €24 000
30% bonus for swapping an existing heating system for an improved heating system			
15% bonus for buffer storage system			
Log-burning boiler or combination of logs/pellets	25%	€2 500	€2 500
Pellet stove	30%	€2 500	
Block heating network			
Connection to a block heating network	-	€50/kW max. 15kW	€15/kW max. 8kW per housing unit
Establishment of a local heating network	30%	€7 500	

* solely in single-family dwellings built to the NZEB standard.
** solely in single-family dwellings built to the NZEB standard and fitted with a mechanical ventilation system.

- 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.(a) of the NREAP: Promotion of the use of energy from renewable sources in the transport sector.

  The mandatory blending percentages for all diesel and petrol fuels were adjusted to 5.5 % in 2017 and 5.7 % in 2018 (before double-counting). An explanation is given in Chapter 1 under Table 1d). Re.:

- Point 4.5.(b) of the NREAP: Promotion of 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. Among other things, this lays down the technical specifications for the charging station infrastructure. An amendment to the Electricity Market Law in 2012 imposed an obligation on distribution system operators 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, with 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 (see also the fourth progress report). 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. By the end of 2018, 277 charging stations were already in service.

- Point 4.5.(c) of the NREAP: Promotion of the use of energy from renewable sources in the transport sector - Legal provisions

  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

A Grand-Ducal Regulation from 2011 promotes the **production of biogas, its treatment and supply into the natural gas grid** by means of a feed-in tariff.

In 2014 the amount of the payment was adjusted upwards for new installations. In 2016 further improvements were made in line with a profitability analysis. There have not been any new developments in the area of biogas.

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

The Government decided in 2016 to create the 'Wood Cluster'. This is housed at the premises of the national Agency for Innovation (Luxinnovation). The creation of the 'Wood Cluster' forms part of the effort to offer members a framework which promotes the realisation of projects in support of Luxembourg's wood sector. This strategy is based at national level on the following points:

- enhancing the value of wood (from forests and along the entire value chain)
- support for regional and circular wood value chains
- support for wood-processing firms (innovation, value creation, etc.)

The *Holz vun hei* project was launched on 1 October 2018 under the EU's LEADER programme.

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 being planned.

A nationwide potential study commissioned by the environmental administration was concluded in May 2017 as regards the use of biomass for energy production. (see (in French) 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-Ducal Regulation on feed-in tariffs for electricity from renewable sources was replaced by a new, completely revised version in 2014 (in French:*Règlement grand-ducal modifié 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)

There has been no change to the principle of allocating supported electricity to final customers.

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 cellulose material, and ligno-cellulose material (*Article 22(1)(c) of Directive 2009/28/EC*).

Nothing has changed compared to the fourth 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)*.

Chapter II of the Grand-Ducal Regulation of 1 August 2014 on the production of energy based on renewable energy sources (in French: *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) provides for a certificate of origin system.

The regulatory authority ('Institut Luxembourgeois de Régulation') bases its activities on the EECS system („European Energy Certificate Scheme"). The EECS system corresponds to an international 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, offers operators the opportunity 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 2 years in the availability and use of biomass resources for energy purposes (*Article 22(1)(g) of Directive 2009/28/EC*).

Table 4: Biomass availability for energy use

	Amount of domestic raw material (*)		Primary energy obtainable from domestic raw material (ktoe)		Amount of imported raw material from EU (*)		Primary energy obtainable from imported raw material (EU) (ktoe)		Amount of imported raw material from non EU (*)		Primary energy obtainable from imported raw material (non-EU) (ktoe)	
	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
Biomass availability for heating and electricity:												
Direct supply of wood biomass from forests and other wooded land for energy generation (fellings, etc.)**	38 408 m^3	40 768 m^3							5 483 t	4 877 t		
Indirect availability of wood biomass (residues and co-products from wood industry, etc.)**												
Energy crops (grasses etc.) and short-rotation trees (please specify) **Main types: silage maize, miscanthus, Sudan grass, whole crop silage.**	13 709 tTM	15 564	…	…	-	-	-	-	-	-	-	-

No figures for industrial oilseed rape												
Agricultural by-products/processed residues and fishery by-products**												
Biomass from waste (municipal, industrial, etc.) **												
Others (please specify)												
Biomass availability for transport:												
common arable crops for biofuels (please specify main types) **Main type: Industrial oilseed rape**	No information	no specific survey										
Energy crops (grasses etc.) and short rotation trees for biofuels (please specify the main types)												
Others (please specify)												

* Amount of raw material if possible **in m^3 for biomass from forestry** and **in tonnes for biomass from agriculture and fishery and biomass from waste**.

** For the definition of this biomass category, please refer to table 7 of part 4.6.1 of Commission Decision C (2009) 5174 final 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 on the availability of biomass in Luxembourg.

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

Land use	Surface (ha)	
	2017	2018
1. Areas given over to common arable crops (wheat, sugar beet, etc.) and oilseeds (rape, sunflowers, etc.) (please specify main types) **Main type: silage maize, whole crop silage**	720	1014
2. Areas given over to short-rotation trees (willows, poplars) (please specify main types)	no specific survey	no specific survey
3. Areas given over to other energy crops such as grasses (reed canary grass, switch grass, miscanthus) and millet (please specify main types) **Main types: miscanthus, Sudan grass, green fodder**	244	295

7. Please provide information on any changes in commodity prices and land use within your Member State in the preceding 2 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*).

The size of areas used for energy purposes increased between 2017 and 2018 according to the Rural Economy Service (*Service d'économie rural*). However, this is probably not part of a general trend. The size of areas used for energy purposes fluctuated over the years between 965 ha and 1 300 ha, with a relatively constant five-year average of around 1 090 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 internally 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 Sudan grass 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, and their prices cannot be used to assess the value of 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 payments for electricity produced by biogas plants and for biogas fed directly into the grid.

8. Please describe the development and share of biofuels made from waste, residues, non-food cellulose material, and ligno-cellulose 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 nearby in neighbouring countries, and the mandatory blending requirement is therefore met entirely by means of imported biofuels.

The proportion of biofuels made from waste, residues, non-food cellulose material and ligno-cellulose material increased slightly between 2017 and 2018.

There are no plants for producing biofuels in Luxembourg. All biofuels have to be imported. In addition, there are no blending 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 quantity of biofuels produced from the raw materials listed in Annex IX to Directive 2009/28/EC (ktoe)

Raw materials listed in Annex IX, Part A to Directive 2009/28/EC	2015	2016
a) Algae if cultivated on land in ponds or photobioreactors.	0	0
b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under Article 11(2)(a) of Directive 2008/98/EC;	0	0
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.	0	0
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.	0	0
e) Straw	0	0
f) Animal manure and sewage sludge.	0	0
g) Palm oil mill effluent and empty palm fruit bunches.	0	0
h) Tall oil pitch	0	0
i) Crude glycerine	0	0
j) Bagasse	0	0
k) Grape marcs and wine lees.	0	0
l) Nut shells	0	0
m) Pods	0	0
n) Cobs cleaned of kernels of corn.	0	0
o) Biomass fraction of wastes and residues from forestry and forest-based industries, namely, bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil;	0	0
p) Other non-food cellulose material as defined in point (s) of the second paragraph of Article 2.	0	0
q) Other ligno-cellulose material as defined in point (r) of the second paragraph of Article 2 except saw logs and veneer logs.	0	0
Raw materials in accordance with Annex XIV, Part B to Directive 2009/28/EC	2017	2018
a) Used cooking oil.	6.83	1.48
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	2.43	9.05

9. Please provide information on the estimated impact of the production of biofuels and bioliquids on biodiversity, water resources, water quality and soil quality within your country in the preceding 2 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 last progress reports, 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 CO_2 equivalent)

Environmental aspects	2017	20168
Total estimated net GHG emission savings from use of renewable energy[22]	812 912	916 440
- estimated net GHG savings from the use of renewable electricity	481 488	556 867
- estimated net GHG savings from the use of renewable energy in heating and cooling		
- estimated net GHG savings from the use of renewable energy in transport	331 424	359 573

Source: Inventory of GHG emission of the Luxembourg Environmental Administration.

11. Please report on (for the preceding 2 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/estimated excess 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)[23][24]

	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	94.6	N/A	86

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 from 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 rely on the cooperation mechanism under Directive 2009/28/EC to achieve its targets. Luxembourg concluded two such agreements in 2017 with Lithuania and Estonia. These agreements stipulate that Luxembourg will provide statistical transfers for the period 2018-2020 in order to meet its target under Directive 2009/28/EC.

Under both agreements, the transferred funds must be used to speed up the transition to the use of renewable energy sources by, for example, supporting new energy or research projects (including in the area of energy efficiency); both countries must also draw up a report in this connection.

Both agreements refer to minimum values and also provide for the possibility of transferring additional amounts, which Luxembourg could potentially use. They both therefore make it possible to cover the amounts provided for in the NREAP.

For 2018, Luxembourg acquired a total of 1 100 GWh in statistical transfers, 550 GWh from Lithuania and 550 GWh from Estonia, meaning that the interim target for 2017-2018 was met (7.68% as compared to an indicative interim target for 2017-2018 of 7.47%).

It should also be noted that Luxembourg is the first country to use the cooperation mechanism to meet its national targets, sending a clear signal of its interest in closer European cooperation in the area of renewable energies and that it also plans to pursue such cooperation beyond 2020.

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 2(1)(n) of Directive 2009/28/EC*).

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

The different shares in wet waste (in tonnes) are determined on the basis of on-site surveys (from 1992, 1994, 2001, 2004/2005 and 2009) and extrapolated to the total quantity of waste.
The total quantity of wet waste is then converted into dry waste using wet waste coefficients. The quantity of energy is then calculated on the basis of the calorific value of the waste category concerned. The biodegradable carbon content is used to calculate the biodegradable fraction of the waste category in question. The renewable energy share of the waste, and consequently the renewable share of electricity production, is thus determined

13. Please indicate the amounts of biofuels and bioliquids in energy units (ktoe) corresponding to each category of feedstock group listed in part A of Annex VIII taken into account by that

Member State for the purpose of complying with the targets set out in Article 3(1) and (2), and in the first subparagraph of Article 3(4).

Feedstock group	2017	2018
Cereals and other starch-rich crops	N/A	9.04*
Sugar	N/A	
Oil crops	N/A	59.42

*Cereals and sugar were counted together.

14. Conclusions as regards the compliance with the indicative trajectory 2017-2018 and further efforts for meeting targets in 2020

The Grand Duchy of Luxembourg is on the right path to meet its targets set for 2020. As a result of the cooperation mechanism, Luxembourg's share of the gross final consumption of renewable energies in the year 2018 was 9.06 %, as opposed to 6.29 % in 2017, and 5.44 % in 2016. This means that Luxembourg has continuously increased its share of renewable energies in the past years and is performing above the indicative trajectory (7.47%, whereas 7.68% was achieved).

Gross final consumption of energy from renewable sources in Luxembourg was 517.9 ktoe in 2017-2018 (2017: 245.7 und 2018: 272.2).

This means that the development of total renewable energy consumption in Luxembourg is slightly below the expectations of the NREAP (544.69 ktoe)