

***Progress report on the promotion
and use of energy from
renewable sources***

Fourth report

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This fourth report has been drawn up for the Commission pursuant to Article 22(1) of Directive 2009/28/EC on the promotion of the use of energy from renewable sources, on the basis of the template provided by the Commission.

Disclaimer: the data included in this document for the year 2016 are partly derived from estimates and may ultimately be different once the outcome of the final surveys for 2016 are published in 2018.

1. Sectoral and overall shares and actual production and consumption of energy from renewable sources in 2015 and 2016

Table 1 below can be easily compared with Table 3 of the National Renewable Energy Action Plan (NREAP), which sets out the target trajectory for France as regards the share of renewable energy in gross final energy consumption. By way of a reminder, in its NREAP France set a target percentage of renewable energy in gross final energy consumption of 15 % for 2013 and 16 % for 2014.

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

| | 2015 | 2016 (provisional) |
|--|-------------|-----------------------|
| RES-H&C ¹ (%) | 19.8 | 21.1 |
| RES-E ² (%) | 18.8 | 19.3 |
| RES-T ³ (%) | 8.3 | 8.6 |
| Overall RES share⁴ (%) | 15.1 | 16 |
| <i>of which from cooperation mechanism (%)</i> | | |
| <i>surplus for cooperation mechanism (%)</i> | | |

Sources: Shares (provisional figures) for mainland France + estimate for overseas departments.

A direct comparison reveals that France is lagging behind its trajectory by 2 %. In terms of sectoral objectives, France has exceeded its objective for transport (set at 8.4 % for 2016), is 2.2 % behind for electricity (objective of 21.5 % for 2016) and 4.4 % behind for heating and cooling (objective of 25.5 % for 2016).

However, there is a strong correlation in France between the severity of winter and the share

¹Share of renewable energy sources (RES) in heating and cooling: gross final consumption of energy from renewable sources for heating and cooling (as defined in Article 5(1)(b) and 5(4) of Directive 2009/28/EC) divided by gross final consumption of energy for heating and cooling.

²Share of renewable energy in electricity: gross final consumption of electricity from renewable sources for electricity (as defined in Articles 5(1)(a) and 5(3) of Directive 2009/28/EC) divided by total gross final consumption of electricity.

³Share of renewable energy in transport: final energy from renewable sources consumed in transport (see Article 5(1)(c) and 5(5) of Directive 2009/28/EC) divided by the consumption in transport of 1) petrol; 2) diesel; 3) biofuels used in road and rail transport and 4) electricity in land transport (as reflected in row 3 of Table 1).

⁴Share of renewable energy in gross final energy consumption.

of biomass in final consumption. In accordance with Eurostat requirements, household biomass consumption is not corrected for climate variations. In particular, this influenced the decrease in the share of RES in heating and cooling in 2015, a year which was warmer than average but not as warm as 2014.

It should also be stressed that, unlike the figures submitted annually to Eurostat, the data included in this report concern all of France and not just mainland France.

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

| | 2015 | 2016 (provisional) |
|--|-------------|-------------------------------|
| <i>(A) Gross final consumption of RES for heating and cooling</i> | 12113 | 13296 |
| <i>(B) Gross final consumption of electricity from RES</i> | 8244 | 8599 |
| <i>(C) Gross final consumption of energy from RES in transport⁵</i> | 2996 | 3115 |
| <i>(D) Gross total RES consumption⁶</i> | 23353 | 25011 |
| <i>(E) Transfer of RES <u>to</u> other Member States</i> | | |
| <i>(F) Transfer of RES <u>from</u> other Member States and third countries</i> | | |
| <i>(G) RES consumption adjusted for target (D)-(E)+(F)</i> | 23353 | 25011 |

⁵Excluding renewable electricity in the transport sector, which is already included in the gross final consumption of electricity from RES (B).

⁶Under Article 5(1) of Directive 2009/28/EC, gas, electricity and hydrogen from renewable energy sources should be considered only once.

Table 1.b: Total actual contribution (installed capacity, gross electricity generation) from each renewable energy technology in France in the electricity sector

| | 2015 | | 2016 (provisional) | |
|---------------------------|--------------|--------------|--------------------|---------------|
| | MW | GWh | MW | GWh |
| Hydro: | 25277 | 66114 | 25496 | 65591 |
| non pumped ⁷ | 18163 | 57527 | 18382 | 57192 |
| < 1MW ⁸ | 430 | 1362 | 445 | 1385 |
| 1MW-10 MW | 1656 | 5245 | 1671 | 5199 |
| >10MW | 16335 | 51737 | 16523 | 51408 |
| pumped | 1728 | 4911 | 1728 | 4801 |
| mixed | 5387 | 3676 | 5387 | 3599 |
| Geothermal | 16 | 92 | 16 | 97 |
| Solar: | 7138 | 7750 | 7702 | 8647 |
| photovoltaic | 7138 | 7750 | 7702 | 8647 |
| concentrated solar power | 0 | 0 | 0 | 0 |
| Tide, wave, ocean | 240 | 487 | 240 | 501 |
| Wind: | 10258 | 19936 | 11511 | 22411 |
| onshore | 10258 | 19936 | 11511 | 22411 |
| offshore | 0 | 0 | 0 | 0 |
| Biomass ⁹ : | 1133 | 6391 | 1333 | 7578 |
| solid biomass | 810 | 4551 | 976 | 5645 |
| biogas | 320 | 1839 | 353 | 1932 |
| bioliquids | 3 | 1 | 4 | 1 |
| TOTAL¹⁰ | 42335 | 95860 | 44570 | 100025 |
| of which in CHP | n/a | n/a | n/a | n/a |

Comments:

- Data valid as at November 2017.
- Solid biomass includes biomass contained in household waste.
- In line with the methodology set out in Directive 2009/28/EC, pumped hydro generation is not regarded as renewable. The generation figure shown in the 'mixed' row represents the normalised amount of renewable (i.e. non-pumped) hydropower produced by mixed plants. The figure given for total hydro generation is the sum of normalised renewable hydro generation and non-renewable hydro generation.

⁷Normalised in accordance with Directive 2009/28/EC and Eurostat methodology.

⁸Normalised production by unit has been estimated according to the capacity of each unit.

⁹The power of installations consuming biomass does not include the power of installations situated in the overseas departments.

¹⁰Total renewable generation is obtained by deducting pumped hydro generation from this value.

Table 1c: Total actual contribution (final energy consumption) from each renewable energy technology in France in the heating and cooling sector (ktoe)

| | 2015 | 2016 (provisional) |
|---|--------------|-----------------------|
| <i>Geothermal (excluding low temperature geothermal heat in heat pump applications)</i> | 122 | 135 |
| <i>Solar</i> | 161 | 166 |
| <i>Biomass¹¹:</i> | 9840 | 10817 |
| <i>solid biomass</i> | 9646 | 10575 |
| <i>biogas</i> | 194 | 242 |
| <i>bioliquids</i> | 0 | 0 |
| <i>Renewable energy from heat pumps:</i> | 1990 | 2178 |
| <i>- of which aerothermal</i> | 1722 | 1908 |
| <i>- of which geothermal and hydrothermal¹²</i> | 268 | 270 |
| TOTAL | 12113 | 13296 |
| <i>of which DH¹³</i> | 856 | n/a |
| <i>of which biomass in households¹⁴</i> | 6462 | 6951 |

2015 was also a hotter year than average which had an impact on household wood consumption, which is not corrected for climate variations.

¹¹Takes into account only biomass that complies with the applicable sustainability criteria (see Article 5(1), final subparagraph of Directive 2009/28/EC.

¹²Hydrothermal heat pumps are grouped together with geothermal heat pumps.

¹³Heat generation by heating and cooling networks from renewable energy sources.

¹⁴Share of total renewable heating and cooling consumption.

Table 1d: Total actual contribution from each renewable energy technology in France in the transport sector (ktoe)

| | 2015 | 2016 (provisional) |
|---|-------------|---------------------------|
| Bioethanol//bio-ETBE | 434 | 474 |
| <i>of which biofuels¹⁵ under Article 21(2)</i> | 16 | 17 |
| <i>of which imported¹⁶</i> | 102 | 109 |
| Biodiesel | 2562 | 2641 |
| <i>of which biofuels¹⁷ under Article 21(2)</i> | 123 | 126 |
| <i>of which imported¹⁸</i> | 509 | 786 |
| Renewable hydrogen | 0 | 0 |
| Renewable electricity | 219 | 233 |
| <i>of which road transport</i> | 3 | 4 |
| <i>of which non-road transport</i> | 216 | 229 |
| Others (as biogas, vegetable oils, etc.) | 0 | 0 |
| <i>of which biofuels¹⁹ under Article 21(2)</i> | 0 | 0 |
| Biofuel concession | 139 | 143 |
| Electric road vehicle concession | 10 | 15 |
| Rail transport concession | 324 | 343 |
| TOTAL | 3688 | 3849 |
| Total excluding concessions | 3215 | 3348 |

Note:

- Directive 2009/28/EC makes provision for concessions in the transport sector for second-generation biofuels and renewable energy consumed by electric vehicles. They are included in the total.

¹⁵Biofuels under Article 21(2) of Directive 2009/28/EC.

¹⁶Share of ethanol in imports of ETBE. No data on imports of pure bio-ethanol available.

¹⁷Biofuels under Article 21(2) of Directive 2009/28/EC.

¹⁸Share of total amount of biodiesel.

¹⁹Biofuels under Article 21(2) of Directive 2009/28/EC.

2. Measures taken in the preceding two years and/or planned at national level to promote energy from renewable sources

Table 2: Overview of all policies and measures

| Name and reference of the measure | Type of measure | Expected result | Targeted group and or activity | Existing or planned | Start and end dates of the measure |
|---|-----------------|--|--------------------------------|---|---|
| 1. Revision of administrative procedures | Regulatory | Simplification for small renewable electricity or heating projects. Better account to be taken of the environment in large projects (photovoltaic, wind, biomass). Simplification for offshore renewable energy (connection, disputes, competitive selection, etc.). | Individuals, investors | Existing | 2001- |
| 2. Energy Transition Tax Credit (formerly the Sustainable Development Tax Credit) | Fiscal | Increase in the number and quality of energy performance works to have wood-fired heating installed in 9 million dwellings, heat pumps in 2 million dwellings and solar thermal equipment in 4 million dwellings by 2020. | Individuals | Existing and being stepped up to focus scheme on most effective works (energy and RES). | 2005-2017, extended to 2018 by the 2018 Finance Act. |
| 3. Reduced-rate VAT (building works carried out on housing over two years old): for renewable energy generation equipment in the existing residential sector. | Fiscal | 15 % reduction in energy consumption of buildings by 2023. | Individuals | Existing | 1 April 2009 - 31 December 2017 for zero-rate eco-loan. 1 January 2014 - 31 December 2017 for reduced-rate VAT |
| 4. Zero-rate eco-loan for works to improve the overall energy performance of housing. | Financial | Renovate half of the 1.5 million dwellings 'leaking' energy inhabited by low-income owner-occupiers over a period of 5 years. | | Discussions underway with stakeholders on ways to improve the scheme. | Zero-rate eco-loan and reduced-rate VAT extended until 2018 by 2018 Finance Act. |

| Name and reference of the measure | Type of measure | Expected result | Targeted group and or activity | Existing or planned | Start and end dates of the measure |
|---|-----------------|--|---|---|---|
| 5. National Housing Agency (ANAH) aid | Subsidies | The Building Energy Improvement Plan lays down an industrial policy for renovating dwellings 'leaking' energy. To this end, the ANAH's target has been increased from 50 000 to 75 000 energy improvements per year of homes occupied by low-income households ('Habiter Mieux' programme). | Individuals | Existing, currently being stepped up | 2007-2017 renewed for 2018-2020, ongoing. |
| 6. Social housing and public buildings renovation plan | Financial | The renovation of state and local authority building stock must contribute to the general objectives of the Climate Plan, i.e. a 15 % reduction in the energy consumption of buildings by 2023, as compared to 2010. Social housing stock: remove all dwellings 'leaking' energy from the stock of public rental properties. | Social housing managers, state and local authorities | Ongoing A new draft Energy Improvement Plan is currently under consultation, with the aim of increasing the pace at which buildings with high energy consumption and poorly insulated buildings are renovated. | 2009-2020 |
| 7. Energy Saving Certificates | Regulatory | Increase in the number of energy-saving measures based on renewable heat production in construction and industry | Energy suppliers | Existing | 2011-2014 : second period 2015-2017 : third period 2018-2020: fourth period |
| 8. 2012 Heating Regulation | Regulatory | Stricter heating standards in new buildings. | Individuals, anyone constructing buildings for residential or service-sector use. | Existing – analysis of the practical application of the 2012 Heating Regulation. | 28 October 2011-2020 or 2013-2020, depending on the type of building |
| 9. Energy-plus and lower carbon buildings scheme ('E+C-' scheme') | Semi-regulatory | Gradual introduction of labels to encourage the widespread use of renewable energy in new buildings; full introduction in 2020. Furthermore, requirement for the state, public institutions and regional authorities to lead by example. | State, local authorities, individuals, anyone constructing buildings for residential or service-sector use. | E+C- pilot launched in 2016 to prepare future environment legislation with stakeholders. | Labels: 2016- Full introduction. 2020- |

| Name and reference of the measure | Type of measure | Expected result | Targeted group and or activity | Existing or planned | Start and end dates of the measure |
|---|-------------------------------|---|--|--|------------------------------------|
| 10. Energy Performance Diagnosis (DPE) | Regulatory | The Renovation Plan states that by 2018, the state will amend the DPE so as to ensure its reliability and use it for regulatory and tax purposes in the medium-term. | Individuals, building societies | Existing Discussions underway on ensuring reliability. | 2007- |
| 11. Buildability Bonus | Regulatory | Incentive to ensure sound energy performance and to use renewable energy in construction. | Individuals | Existing – currently being stepped up in connection with Article 8 of the Act on energy transition for green growth. | 2005- |
| 12. Exemption from property tax on developed property | Regulatory | Incentive to ensure sound energy performance, use renewable energy and take account of environmental performance. | Social housing, lessors | Planned | 2018 |
| 13. Public service for home energy performance (SPPEH) | Information/awareness raising | Increase in the number and quality of energy-efficiency renovation works: wood-fired heating installed in 9 million dwellings, heat pumps in 2 million dwellings and solar thermal equipment in 4 million dwellings by 2020. Organisation of basic, understandable assistance and a real one-stop shop. | Individuals | Planned, drawing on regional energy improvement platforms. | Mid-2018 |
| 14. ADEME campaigns | Information | Raising awareness on climate change and energy-efficiency renovation, in particular by means of a common brand developed as part of the Renovation Plan. | Individuals | Existing/Renovation Plan brand under preparation | 2009- |
| 15. Regional Climate-Energy-Air plans | Planning | Success in identifying and capitalising on renewable energy potential. | Local authorities | Existing | 2010-2013 |
| 16. Heat Fund | Financial | Financing 5 400 ktOE of renewable heating production by 2020. | Collective, service and industrial sectors | Existing | 2009- |
| 17. Reduced-rate VAT for district heating networks using more than 50% renewable or recovered energy. | Financial | Fivefold increase in renewable and recovered heating and cooling supplied by heating networks by 2030, as compared to 2012. | Developers, investors – heating networks | Existing | 2009- |

| Name and reference of the measure | Type of measure | Expected result | Targeted group and or activity | Existing or planned | Start and end dates of the measure |
|--|--------------------------------------|--|--|----------------------------------|------------------------------------|
| 18. Classification of district heating networks | Regulatory | Fivefold increase in renewable and recovered heating and cooling supplied by heating networks by 2030, as compared to 2012. | Developers, investors – heating networks | Existing | 1997- |
| 19. Extension of concession period (public service delegation) | Financial | Fivefold increase in renewable and recovered heating and cooling supplied by heating networks by 2030, as compared to 2012. | Developers, investors – heating networks | Existing | 2010- |
| 20. Energy Performance Plan for farms (PPE) and, from 2015, Competitiveness and Adaptation Plan for farms (PCAE) | Financial | - Improved overall energy performance on farms - Development of renewable energy | Farms | Existing, scheme revised in 2015 | PPE: 2009-2014 PCAE: 2015- |
| 21. Support for the construction or refurbishment of market garden greenhouses or greenhouses in the ornamental and nursery horticulture sector. | Financial | Development of renewable energy for market garden greenhouses and greenhouses in the ornamental and nursery horticulture sector. | Farms | Existing | Revision of scheme under way |
| 22. Anaerobic Digestion Energy – Nitrogen Autonomy Plan | Financial Regulatory Subsidies | Development of 1 000 farm biogas plants by 2020. | Farms | Existing | 2013-2020 |
| 23. Single licence for the onshore wind and biogas sectors (installations classified for environmental protection purposes) and for offshore renewable energy and hydropower (installations, structures, works and activities) | Regulatory | Simplification of administrative procedures. | Investors | Existing | 2014- |
| 24. Purchase tariffs for electricity produced from renewable energy sources | Financial | Increase in the number of renewable electricity production projects. | Individuals, investors | Existing | 2000- |
| 25. Additional payments for electricity produced from renewable energy sources | Financial | Increase in the number of renewable electricity production projects. NB: additional payments have replaced the purchase obligation for installations with average power (>500 kW in general). | Individuals, investors | Existing | 2016- |

| Name and reference of the measure | Type of measure | Expected result | Targeted group and or activity | Existing or planned | Start and end dates of the measure |
|---|-----------------|---|--|--|------------------------------------|
| 26. Renewable electricity origin guarantees | Regulatory | Promotion of the renewable nature of energy produced. | Investors | Existing | 2011- |
| 27. Calls for tender for renewable energy production | Financial | Increase in installed capacity for renewable energy production (wind, offshore wind, biomass, photovoltaic). NB: since 2016, support has been granted in the form of additional payments for installations of more 500 kW. Below this, support is still granted in the form of purchase tariffs. | Investors | Existing for biomass, biogas, photovoltaic, small-scale hydropower, offshore and onshore wind. | 2005-2023 |
| 28. ADEME demonstration funds, extended by Future Investments programmes | Subsidies | Stimulation of R&D. | Investors, researchers | Existing | 2009-2013 |
| 29. Future Investments | Subsidies | Stimulation of R&D. | Investors, researchers | Existing | 2010- |
| 30. ANR (National Research Agency) | Subsidies | Stimulation of R&D. | Researchers | Existing | 2009- |
| 31. Competitiveness hubs | Subsidies | Stimulation of R&D. | Public-private partnership. | Existing | 2005- |
| 32. General tax on polluting activities (TGAP) | Fiscal | Achievement of biofuel incorporation targets. | Fuel distributors. | Existing | 2005- |
| 33. Partial exemption from domestic consumption tax (TIC) | Fiscal | Reduction of additional costs in biofuel production. | Fuel producers | Ended on 31 December 2015. | 2002-2015 |
| 34. Purchase tariff for biomethane injected into gas grids | Financial | Increase in production of biomethane. | Waste producers: farmers, local authorities, waste water treatment plants. | Existing | 2011- |
| 35. Origin guarantees for biomethane injected into gas grids | Regulatory | Promotion of the renewable nature of part of the gas transported through grids. | Investors | Existing | 2012- |
| 36. Calls for tender for biomethane production | Financial | Achievement of biomethane production targets. | Investors | Planned | 2018- |
| 37. Addition of self-consumption to purchase tariff for photovoltaic installations (including investment grant) | Financial | Help in achieving the target relating to the share of renewables in the energy mix | Individuals, investors | Existing | 2017- |

2.1 Evaluation and improvement of administrative procedures to remove regulatory and non-regulatory barriers to the development of renewable energy

2.1.1 Measures under environment law

With regard to pollution and industrial risk prevention monitoring, the legislation on installations classified for environmental protection purposes (ICPEs) is the legal basis for industrial environmental policy in France (Book V of the Environmental Code). A nomenclature listing every activity and substance by type is annexed to Article R.511-9 of the Environmental Code and lays down rules on them, as referred to in Orders issued by the minister responsible for the environment. Installations are subject to different schemes depending on the scale of the risk that they entail: the licence scheme, the registration scheme or the declaration scheme. The registration scheme was introduced by Order No 2009-663 of 11 June 2009. It forms a new intermediate ICPE classification category in which there is a simplified assessment procedure for installations of a type which is well understood and which present a limited risk.

The administrative procedures for environmental protection are addressed in greater detail on pages 24 and 25 of the NREAP.

1. Promoting anaerobic digestion

Under a plan to support anaerobic digestion launched in March 2013 the threshold for the licence scheme for biogas plants subject to ICPE regulations was raised from 50 to 60 tonnes of inputs per day. By simplifying legislation in this way, a barrier to the development of anaerobic digestion in France was removed.

Law No 2015-992 of 17 August 2015 on energy transition for green growth ('the Energy Transition Law') has made it possible to extend until 1 November 2015 the trial of a single licence for the anaerobic digestion sector applicable throughout French territory. The single licence should simplify administrative procedures for project leaders by combining into one licence a number of official authorisations, such as the building permit, the licence to operate a power-generating facility and authorisation under the ICPE regulations.

Finally, Article 112 of this law establishes limits for the use of food crops (excluding associated crop residues and intermediate crops for energy use) in biogas plants processing non-hazardous waste or crude plant materials. This measure is designed to steer the development of the anaerobic digestion sector towards the treatment and utilisation of waste, in particular agricultural waste.

2. Promoting onshore wind power and hydropower

With the adoption of Order No 2014-355 of 20 March 2014 on the trial of a single licence for installations classified for environmental protection purposes and Decree No 2014-450 of 2 May 2014 on the trial of a single licence for installations classified for environmental protection purposes, the Government laid down provisions concerning the trial of a single licence issued by the Departmental Prefect covering onshore wind farms subject to authorisation under the procedure for installations classified for environmental

protection purposes (ICPEs), applicable in seven trial regions.

In March 2017, following the trial, the single environmental licence was introduced across the whole of France. In particular, the licence establishes a one-stop shop with the administration for applicants, reduces the hearing length and marks the end of building permits for wind farms subject to a licence.

The single licence also applies to hydropower installations subject to 'IOTA' authorisation, simplifying the corresponding procedures.

In addition, Article R.553-10 of the Environmental Code was introduced to allow ICPE licences for onshore wind farms to be extended up to a maximum of 10 years, in particular so as to take account of connection times and to avoid a situation whereby licences expire before an installation has become operational. A licence extension for classified installations is possible where there has been no substantial change in the circumstances under which the licence was first granted, either in fact or in law, for installations that, for reasons outside the operator's control, have not become operational during the initial three-year period.

3. Promoting offshore renewable energy

- **Simplification and consolidation of the legal framework for offshore wind power**

In 2016, the Government undertook a safety and simplification exercise in which it published Decree No 2016-9 containing a number of provisions:

- Appeals concerning the administrative licensing of offshore wind farms, grid connection systems and port infrastructure needed for their construction to be handled at first and last instance by the Nantes Administrative Court of Appeal, with a view to limiting the duration of appeals;
- Licences to occupy public maritime property extended from thirty to forty years;
- Appeal period reduced to four months for licences under the Water Act.

- **Publication of Decree No 2017-627 of 26 April 2017 on an insurance scheme for marine renewable energy installations so as to make marine renewable energy projects easier to insure.**

This Decree of the Council of State implementing Article 84 of Act No 2016-816 of 20 June 2016 on the Blue Economy is aimed at encouraging the insurance of offshore renewable energy projects by adding 'marine renewable energy installations' to the list of 'major risks' set out in Article L.111-6 of the Insurance Code.

- **Introduction of the single environmental licence**

Since 1 March 2017, the different procedures and environmental decisions needed for projects subject to licensing for installations classified for environmental protection purposes and projects subject to licensing under the Water Act have been merged under the environmental licence. The reform will also reinforce the stage prior to applying for a licence, so that applicants are better able to understand the rules governing their projects.

The single procedure has three objectives:

- simplify the procedures without reducing the level of environmental protection;
- improve the overall vision of all environmental challenges relating to a project;
- increase project promoters' planning, understanding and legal stability.

- **Introduction of specific compensation for offshore renewable energy projects in the event that connection to the transport network overruns**

The Act on energy transition amended Article L.342-3 of the Energy Code by limiting the RES connection period to 18 months and by stating that failure to comply with the time period 'may give rise to compensation according to a scale established by Decree of the Council of State'. The Act also stated that the 18 month period could be exceeded for certain categories of installation on account of special technical or administrative constraints.

Decree No 2017-628 of 26 April 2017 sets out the conditions for compensation in the event of a delay in connecting offshore renewable energy projects to the high and very high voltage grid.

- **Modernisation of the connection framework for offshore wind farms**

The reform of the arrangements for connecting offshore wind farms under a call for tender carried out by virtue of Act No 2017-1839 of 30 December 2017 stopping hydrocarbon prospecting and exploitation and laying down various provisions pertaining to energy and the environment, laid down that the transmission system operator (RTE) must ensure, at their own expense, that wind farms are connected to the grid by a deadline indicated in the tender specification. Under this new framework, two compensation mechanisms were introduced to benefit producers, namely compensation for delays in providing a grid connection system, and compensation in the event that the system breaks down. Compensation is paid by the RTE and covered by the public electricity distribution network (TURPE).

4. Promoting small-scale geothermal activities

Small-scale geothermal activities have been redefined in the context of the reforms introduced by Decree No 2015-15 of the Council of State. The concept refers to works (groundwater probes and boreholes) of more than 10 and less than 200 metres in depth and with a capacity of less than 500 kW that are subject, from 1 July 2015, to a simplified declaration scheme instead of the licence scheme.

Central to the reforms is the designation of recognised professional experts who can vouch for the quality and reliability of the works. The reforms are also based on provisions designed to ensure that the planned installation of the geothermal equipment does not pose any risks to the environment or to nearby buildings. A map of France has been drawn up broken down into green zones, which are subject to a simple declaration scheme, orange zones, in which projects must be assessed by an approved expert, and red zones, in which geothermal works are not eligible for the small-scale activities scheme.

2.1.2. Planning law measures

Since 2016, it has been possible to extend more than once the validity of planning permission for all works concerned with renewable energy production, up to a maximum period of 10 years from the date of the original decision.

Promoting onshore wind power

The Town Planning Code contains specific provisions on coastal areas. Under Article L.146-4 of the Code, *'development must take place contiguously with existing urban areas and villages'* in coastal municipalities. At the same time, the supplementary paragraph to Article L.553-1 of the Environmental Code states that wind farms must be situated at a distance of at least *'500 metres from buildings used for residential purposes, inhabited property and areas intended for residential use as laid down in the planning documents in force on the date of publication of the Act'*. These provisions therefore prohibit the construction of wind farms in coastal municipalities. Article 26 of Law No 2013-312 of 15 April 2013 amends Article L.156-2 of the Town Planning Code and establishes an exemption from the principle of contiguous development for the overseas departments, where the majority of municipalities are coastal.

Article 138 of the aforementioned Act on energy transition makes it possible for wind farms to be built in municipalities to which the 'Coastal Law' applies, while continuing to take account of the relevant environmental and landscape considerations:

- wind turbines may be built non-contiguously to urban areas, on sites at a distance from the coast and beyond a strip of 1 km from the upper limit of the shore or the uppermost point water has been known to reach;
- the authorities responsible for the Local Urban Development Plan may alter the depth of this strip.

In addition, Article R.424-21 of the Town Planning Code has been amended to allow building permits for onshore wind farms to be extended up to a maximum of 10 years, in order to take account of connection times and avoid a situation whereby a licence expires before an installation has become operational.

2.1.3 Measures under energy law

Act No 2015-992 on energy transition for green growth was passed on 17 August 2015. It sets ambitious targets regarding the development of renewable energy:

- increasing the share of renewable energy to 23% of gross final energy consumption by 2020, and to 32% by 2030;
- reaching 40 % renewable electricity production by 2030;
- reaching 38 % final renewable heat consumption by 2030;
- reaching 15 % final renewable fuel consumption by 2030;
- reaching 10 % renewable gas consumption by 2030;
- increasing fivefold the amount of renewable and recovered heating and cooling supplied by district heating and cooling systems by 2030.

In order to meet these objectives, the Government has introduced a new programming tool, called the multi-annual energy programme (*Programmation pluriannuelle de l'énergie*,

PPE), which replaces the previous multi-annual investment programmes (PPIs) and which sets quantitative objectives for each renewable sector over a period of 10 years. The PPE will be reviewed every five years, with the exception of the first review which will take place in 2018. The first PPE was published in October 2016 (Decree No 2016-1442 of 27 October 2016).

The programme sets objectives for each renewable sector for 2018 and 2023. Work on the second PPE began in summer 2017.

- The first PPE set the following objectives for renewable electricity in mainland France:

| | 2018 | 2023 |
|--|-----------------------|------------------|
| Installed onshore wind capacity | 15 GW | 21.8 to 26 GW |
| Installed solar capacity | 10.2 GW | 18.2 to 20.2 GW |
| Installed hydropower capacity | 25.3 GW | 25.8 to 26.05 GW |
| Installed offshore wind capacity | 0.5 GW | 3 GW |
| Installed marine energy capacity | No specific objective | 100 MW |
| Installed geothermal capacity | 8 MW | 53 MW |
| Installed wood energy capacity | 540 MW | 790 to 1040 MW |
| Installed anaerobic digestion capacity | 137 MW | 237 to 300 MW |

- The following objectives have been set for renewable and recovered heating and cooling production in mainland France:

| | 2018 | 2023 |
|--|-----------|-------------------|
| Heat production from biomass | 12 Mtoe | 13 to 14 Mtoe |
| Heat production from biogas (including injection into the gas grid with heat exploitation) | 300 ktoe | 700 to 900 ktoe |
| Heat production from heat pumps | 2200 ktoe | 2800 to 3200 ktoe |
| Heat production from low and medium-energy geothermal sources | 200 ktoe | 400 to 550 ktoe |
| Heat production from solar thermal energy | 180 ktoe | 270 to 400 ktoe |

- In overall terms, the objectives for mainland France in terms of developing renewable and recovered heating and cooling supplied by district heating and cooling systems are 1.35 Mtoe by 2018, and 1.9 to 2.3 Mtoe by 2023.

- The production objectives for mainland France in terms of injecting biomethane into the gas network are 1.7 TWh by 2018 and 8 TWh by 2023.
- Finally, in terms of developing renewable fuels, including natural biogas for vehicles (bioGNV), the objectives are as follows:
 - For bioGNV, reach a consumption of 0.7 TWh by 2018 and 2 TWh by 2023, with a view to bioGNV representing 20 % of consumption of natural gas for vehicles by 2023 across segments supplementing electric vehicles and rechargeable hybrid vehicles.
 - In terms of incorporating advanced biofuels into fuel:

| | 2018 | 2023 |
|---------------|-------------|-------------|
| Petrol sector | 1.6 % | 3.4 % |
| Diesel sector | 1 % | 2.3 % |

1. Electricity generation

• Promoting all RES sectors

Since 1 January 2012, facilities using renewable energy with an installed electrical capacity of less than 12 MW have benefited from simplified operating licence procedures. The ceiling has been increased to 30 MW for wind farms. In 2016, the levels below which an operating licence does not have to be requested were raised to 50 MW for all renewable sectors.

The tender procedure, which previously comprised a 'simplified' and an 'ordinary' procedure laid down by Decree No 2002-1434 of 4 December 2002, was also reformed in 2016. There is now only one type of procedure, meaning that the time between launching the call for tenders and the selection of successful applicants can be reduced. The procedure was introduced under Decree No 2016-170 of 18 February 2016.

Finally, since 2016, the administrative procedure for applying to the Prefect for a purchase obligation certificate (CODOA), which was a prerequisite for all purchase contracts, has been abolished, thereby speeding up the implementation of projects.

• Promoting onshore wind power

Administrative simplification measures for onshore wind farms were introduced under Law No 2013-312 of 15 April 2013. Wind power development zones (ZDEs) and the 'five-tower' and '12 MW' rules, which were a criterion for eligibility for the electricity purchase obligation have been abolished. In 2016, the onshore wind power support scheme was reformed (see part 3) in line with the Guidelines on State aid for environmental protection and energy.

2. Injection of biomethane (purified biogas) into natural gas grids

The Order of 7 April 2016 establishing various measures for adapting the gas sector laid down the possibility whereby the administrative authority may use a tender procedure if

capacity for producing biogas intended for injection into the gas grid does not meet the quantitative targets set out in the multi-annual energy programme.

2.2 Measures ensuring the transmission and distribution of renewable electricity and improving the framework or rules for the bearing and sharing of costs related to grid connections and grid reinforcements

It should be noted that all producers have a right of access to the grid that is guaranteed by law. If the system operator refuses to grant access, the regulator may impose a penalty, unless the refusal is justified by objective, non-discriminatory and open criteria. These criteria may be based only on imperatives connected with the proper performance of public service tasks and on technical grounds relating to grid safety and security and the quality of grid operation. Producers are entitled to obtain a technical and financial proposal for their connection under the conditions laid down in the system operator's technical reference documentation.

In 2010, Act No 2010-788 of 12 July 2010 on the national commitment to the environment (known as 'Grenelle 2') set out schemes intended to improve coordination and speed up grid connection procedures for renewable energy. These provisions are now codified in Articles L.321-7, L.342-1 and L.342-12 of the Energy Code. Decree No 2012-533 of 20 April 2012 on regional renewable energy grid connection plans provides more detail on how they are to be applied.

The regional renewable energy grid connection plans (S3REnRs) are drawn up by the transmission system operator, in conjunction with the distribution system operators concerned, on the basis of the renewable energy development targets set by the regional climate, air and energy plans (SRCAEs), and are approved by the Regional Prefect. Under these plans, the connection capacities for renewable energy considered necessary to achieve the targets set by the SRCAEs can be reserved for 10 years. In accordance with Article 1 of the Decree of 20 April 2012, as amended by Decree No 2014-760 of 2 July 2014, all RES facilities with an installed capacity of more than 100 kVA are to be connected according to the methods set out in the S3REnR.

The S3REnRs specify how the costs of any electricity works are to be shared among producers. All renewable energy producers connected under an S3REnR must therefore pay the same share. This mechanism helps to prevent the barrier and dead-weight effects resulting from the application of ordinary legislation on connection that was in force before S3REnRs came into existence and according to which the first producer whose connection required works to take place bore the costs of those works alone, with subsequent producers benefiting from them free of charge.

Electricity works requiring reinforcement are financed by system operators. As in the ordinary connection scheme, 'own works', i.e. works from the production facility up to S3REnR works, are financed by producers. To date, the 22 S3REnRs from former French administrative regions have been approved. A number of S3REnRs are currently being revised (e.g. Haut de France).

The Act of 24 February 2017 also reintroduced the principle of a reduction for renewable energy producers on the price of connecting to the electricity grid by means of tariff reductions. The implementing rules were laid down in a Decree of 30 November 2017 and entered into force on 4 December 2017. Installations of less than 5 MW receive a discount on connection costs of up to 40 %. The greater the capacity of the installation, the smaller the reduction. Consequently, small installations for which connection costs may be a barrier

to the development of projects receive a bigger discount. Similar arrangements have been introduced for reducing the cost of connecting biomethane installations to the public natural gas grid.

3. Description of support schemes and measures to promote renewable energy and developments with respect to the National Renewable Energy Action Plan

3.1 Support schemes for renewable energy production

Support schemes for renewable heat production are described on pages 66 to 75 of France's NREAP. The following paragraphs refer mainly to the developments that have taken place since the first report.

1. Heat Fund

The Heat Fund scheme is described in detail on pages 67 to 70 of the NREAP.

A total of EUR 1.7 billion was allocated to the Heat Fund for 2009-2016. A review of the Heat Fund for 2009-2016 is set out in Annex 1. Commitments totalling EUR 197 million have been authorised for 2017.

2. Sustainable Development Tax Credit, now the Energy Transition Tax Credit

The Sustainable Development Tax Credit (CIDD) is described in detail on pages 57 to 59 of the NREAP. It is revised at regular intervals to bring it into line with market developments and to make the scheme more efficient.

In order to speed up energy renovation work in the residential sector, Article 3 of the 2015 Finance Act (Law No 2014-1654 of 29 December 2014) has simplified and broadened the conditions under which the scheme now known as the Energy Transition Tax Credit (CITE) is applicable, through the:

- introduction of a single rate of 30 % (as opposed to 15 % or 25 %) applicable to all expenditure eligible for the tax credit, regardless of the manner in which work is completed (removal of the requirement for a 'package of works' to be carried out), with effect from 1 September 2014;
- extension of eligible works to include the fitting of individual heating and hot water meters in shared properties, and the installation of charging points for electric vehicles;
- extension of eligible works in the overseas departments – La Réunion, French Guiana, Martinique, Guadeloupe and Mayotte – to cover new expenditure on energy-saving works:
 - expenditure on equipment to connect to a district cooling network that uses mainly renewable or recovered cooling;
 - expenditure on equipment or materials to protect glass and opaque walls from solar radiation;
 - expenditure on equipment or materials designed to maximise natural ventilation, in particular electrical fans.

The CITE was extended until 31 December 2017 at a rate of 30 %. Furthermore, since

1 March 2016, it has been possible to combine the CITE with the zero-rate eco-loan described below, without means-testing.

3. Zero-rate eco-loans

The zero-rate eco-loan scheme is described in detail on page 59 of the NREAP. Moreover, since 1 January 2015, the technical criteria for the zero-rate eco-loan and the CITE have been aligned in order to improve the scheme.

Since June 2011, works guidelines specifically geared to overseas climates have applied to eco-loans awarded in the overseas departments.

4. 2012 Thermal Regulation

The 2012 Thermal Regulation (2012 TR), described on pages 29 to 32 of the NREAP, is helping to drive the use of renewable energy in new buildings.

It should be stressed that the 2012 TR makes the use of renewable energy compulsory in individual homes through the adoption of one of the following solutions:

- producing domestic hot water using a solar thermal water heater;
- connecting to a heating network for which renewable or recovered energy accounts for more than 50% of the fuel supply;
- proving that the building's energy consumption includes a minimum of 5 kWh/m² per year of primary energy produced from an individual renewable energy source;
- producing domestic hot water using a thermodynamic water heater;
- producing heating and/or domestic hot water using a micro-combined heat and power boiler.

In the case of new buildings, the Act on energy transition prioritises energy-positive buildings and environmental performance by taking into consideration greenhouse gas emissions.

Article L.128-1 of the Town Planning Code has been amended accordingly by Article 4(III)(1) of the Act on energy transition, making it necessary to define in the short term what is meant by setting an example as regards energy and the environment and by an energy-positive building.

A consultation has been organised with all stakeholders affected by the energy performance requirements applicable to new buildings, with a working group appointed to deal with various issues, in view of assessing the situation with regard to TR 2012 and proposing a roadmap for energy-positive buildings (Working Group 6). An E+C- trial has been launched and the experience gained from this will result in environmental legislation for new buildings.

Finally, for buildings of less than 1 000 m² and for buildings of more than 1 000 m² undergoing minor renovation or built after 1948, the thermal regulations for each component will set out the minimum performance for replaced components. The review of the Decree on thermal regulations for each component was published on 22 March 2017.

5. Energy Saving Certificates

The Energy Saving Certificate scheme and its links with development of renewable heating are described on pages 72 to 74 of the French NREAP.

The third period of the Energy Saving Certificate scheme began on 1 January 2015 and is scheduled to end on 31 December 2017, with a target of 850 TWh cumulative and recalculated ('cumac' in French) The fourth period will begin on 1 January 2018 and will end on 31 December 2020 with a significantly increased target of 1 600 TWh cumac. The second period ended on 31 December 2014 and achieved energy savings of 460 TWh cumac.

Part of the Energy Saving Certificate requirement is now dedicated to households affected by fuel poverty, which means that they are able to benefit from a higher rate of aid (particularly for developing central heating powered by renewable energy).

3.2 Support scheme for biomethane injection

Articles L.446-2 onwards of the Energy Code (based on Article 92 of Act No 2010-788 of 12 July 2010 on the national commitment to the environment) make provision for biogas utilisation through the injection of biomethane (purified biogas) into natural gas grids. The decrees implementing those articles and the accompanying orders define the regulatory framework to that end: a guaranteed purchase price, the conditions under which biomethane producers may obtain that price, the rules governing relations between producers and the natural gas suppliers who purchase biomethane and a guarantee of origin system.

The decrees and orders were drafted in close cooperation with all stakeholders in this sector and were published in the Official Gazette in 2011

Changes are currently being made to allow a purchase price to be attributed for each tender, supplementing the existing procedure.

3.3 Support scheme for renewable energy production

Until 2016, support for renewable electricity production chiefly consisted of a purchase obligation on an open-ended basis or in the form of a call for tender (see pages 52 to 57 of the NREAP). Both purchase obligation methods are very similar insofar as they are open to all and are financed in exactly the same way. They both enable operators of renewable electricity installations to benefit from a long-term purchase contract at a guaranteed price (generally 15 to 20 years). The main difference is that, in a call for tender, the electricity sale price is one of the elements making up the tenderer's bid, while for the open-ended method, a purchase price is set by the State for each type of installation.

Changes were made to the support scheme for renewable electricity production in 2016. A new support scheme, the 'additional payment', was introduced, which will, in part, take the place of the purchase obligation. This additional payment consists of a premium paid to renewable electricity producers on top of the market price received for the sale of the electricity. The premium should help ensure that producers receive sufficient remuneration overall to cover the cost of running their installation while guaranteeing a normal return on invested capital. It is also allocated in two ways, namely on an open-ended basis or by tender.

The scheme chosen was an ex-post premium, calculated as the difference between a reference price set either by the State under an open-ended system or by the applicant under a call for tenders, and a market reference price calculated by the sector (e.g. average annual electricity spot price). If the market price is greater than the reference price, the producer is required to reimburse the difference.

1. Photovoltaic electricity

Support for photovoltaic electricity generation takes the form of a purchase obligation scheme and calls for tender, as described in section 4.3.2 of the NREAP below. Before 2016, calls for tender were divided into two categories, i.e. building installations with a capacity of between 100 and 250 kWp and (ground or building) installations with a capacity in excess of 250 kWp. Since 2016, calls for tender have been categorised differently and now distinguish between building installations (with a capacity of between 100 kWp and 8 MWp) and ground or canopy installations with a capacity of between 500 kWp and 17 MWp.

- Purchase prices, adjusted quarterly, for building installations of at least 100 kWp (equivalent to an area of 1 000 m² of photovoltaic panels).

The purchase price level for installations of less than 100 kWp depends on their capacity and nature (sale of surplus or total). The price schedule can be found on the website of the French Energy Regulatory Commission.

Purchase prices are automatically adjusted each quarter on the basis of the requests for connection received during the preceding quarter. Prices will fall by between 5 % and 10 % per year if the number of requests to connect installations is in keeping with the target trajectory (of approximately 350 MW/year).

- Call for tenders for building installations

Three calls for tenders for developing building installations (with a capacity of between 100 and 250 kWp) were previously launched, following the simplified tender procedure set out in Decree No 2002-1434 of 4 December 2002:

→ A first call for tenders was launched on 1 August 2011 and closed in March 2013. This call for tenders covered a capacity of 300 MW and ran for seven successive quarterly application periods. The successful candidates in this call for tenders have been selected.

→ A second call for tenders was launched on 26 March 2013 and closed in June 2014. This call for tenders covered a total capacity of 120 MW and consisted of three application periods, each lasting four months. The successful candidates in this call for tenders have been selected.

→ A third call for tenders was launched on 20 March 2015 and closed in June 2016. It covered a total capacity of 240 MW and was divided into three application periods, each lasting four months. The successful candidates in this call for tenders have been selected.

A new call for tenders for building installations was launched in September 2016 following the new tender procedure and consisting of two categories of candidate, namely for capacity of between 100 kWp and 500 kWp and capacity of between 500 kWp and 8 MWp. The call for tenders initially covered a volume of 1 350 MW, split over three years, with nine application periods of 150 MW each. As of 2018, volumes will be increased progressively up to 250 MW for each application period.

- Call for tenders for ground installations

In the past, installations with a capacity in excess of 250 kWp (both ground and building installations) received support under the ordinary call for tenders procedure set out in Decree No 2002-1434 of 4 December 2002. Applicants submitted their tender documentation to the Energy Regulatory Commission, which is responsible for examining bids.

Various criteria were used to select successful tenderers, i.e. price, environmental impact, industrial innovation, project time-frame, etc. Priority was given to areas of little competitive value, such as industrial wastelands, with a view to preserving biodiversity and agricultural and forestry uses.

Three calls for tenders were launched and awarded:

→ A first call for tenders was launched on 15 September 2011 and closed on 3 August 2012. This call for tenders related to the construction of 450 MW of new large-scale solar projects. The successful candidates in this procedure were selected in August 2012. It was stipulated that the chosen projects should be operational within two years of that date.

→ A second call for tenders was launched on 13 March 2013 and closed on 16 September 2013. It related to the construction of 400 MW of photovoltaic projects, split equally between roof and ground systems. The successful candidates in this procedure were selected in April 2014.

→ A third call for tender was launched on 27 November 2014 and closed on 1 June 2015. This call for tenders related to the construction of 800 MW of new large-scale solar projects.

A new call for tenders for ground installations was launched in August 2016 following the new tender procedure and consisting of three categories of candidate (capacity of between 500 kWp and 5 MWp, capacity of between 5 and 17 MWp, carpark canopy installations with a capacity of between 500 kWp and 10 MWp). The call for tenders initially covered a volume of 3 000 MW, split over three years, with six application periods of 500 MW each. As of 2018, volumes will be increased progressively up to 850 MW for each application period.

The rating criteria have been revised. Projects are now selected based on the price proposed by the applicant, the low-carbon nature of the project and the suitability of the site. Applicants always submit their tender documentation to the Energy Regulatory Commission (using an electronic platform set up by the Energy Regulatory Commission) which is responsible for examining bids.

- Call for tenders for own-consumption installations

In order to develop renewable installations in commercial, industrial and service sectors which consume some of the electricity generated at the place of production, two calls for tenders for own-consumption installations were launched successively:

→ A first call for tenders was launched in August 2016 for a volume of 40 MW split between two application periods. Installations with a capacity of between 100 and 500 kWp were eligible under the call for tenders.

→ A second call for tenders was launched in March 2017 for a period of three years, with a volume of 150 MW/year (three application periods per year).

- Call for tenders for innovative installations

To enable an initial entry onto the market for innovative installations for which a demonstrator was already in place, a call for tenders was launched in March 2017 for developing innovative installations. The call for tenders consisted of three application periods of 70 MW each (one application period per year).

For all calls for tenders launched since 2016, installations with a capacity of more than 500 kW will be eligible for support in the form of an additional payment, while those with a capacity of less than 500 kW will benefit from support in the form of purchase prices.

2. Wind-generated electricity (onshore and offshore)

The support framework for onshore wind power was overhauled in 2017. Support is now

exclusively granted in the form of an additional payment.

- After approval as State aid by the European Commission, a Tariff Order was published on 6 May 2017, offering installations with less than six towers (and a maximum unit capacity of 3 MW) a 20 year additional payment contract. The Tariff Order introduces an annual limit on generation potential above which the payment amount is reduced.
- A specific three-year call for tenders for onshore wind power was launched in parallel and approved by the European Commission. Installations with more than seven turbines are eligible. Successful applicants are awarded a 20 year additional payment contract, for which the target price is stated in the applicant's bid.

Onshore wind power is currently supported by an electricity purchase price, as laid down in section 4.3.2 of the NREAP, which is guaranteed for 15 years. The support scheme was notified to the European Commission, which approved the mechanism in March 2014, deeming it compatible with European Union rules on State aid.

With regard to offshore wind power, two calls for tenders were awarded, in 2012 and 2014 respectively.

→ A first call for tenders relating to offshore wind farms with a maximum capacity of 3 000 MW was launched on 11 July 2011. The call for tenders covered five areas designated after concerted planning in order to prevent conflicts of use wherever possible. The tender procedure ensures the best possible match between the support offered and the location and operating conditions which vary greatly from one site to another. The successful candidates were selected on 6 April 2012, and almost 2 000 MW, split into four lots, were ultimately awarded. The winning bids have completed the risk minimisation phase and the authorisation procedures for the farms are in progress.

→ A second call for tenders was launched on 18 March 2013. This follows on from the first call for tender and will help to consolidate the industrial sector that has started to emerge. It should enable wind farms to be built offshore from Tréport and the islands of Yeu and Noirmoutier, with a total installed capacity of 1 000 MW. The successful candidates for these two lots were selected in June 2014 and the risk minimisation phase is currently under way.

→ A third call for tenders was launched in December 2016 pertaining to an area off the coast of Dunkirk. It should enable a wind farm to be built with a capacity of between 400 and 600 MW. The procedure is still ongoing. The successful candidate is due to be selected in summer 2018.

Lastly, the Order of 8 March 2013 introduced a specific purchase price for wind farms equipped with production smoothing and forecasting systems located in areas at risk of cyclones. The areas in question are La Réunion, Guadeloupe, Martinique, Saint Martin and Saint Barthélemy.

3. Electricity generated by offshore renewable energy (excluding offshore wind power)

The term marine renewable energy (MRE) covers all technology that enables electricity to be generated from the different forms of power or resources present in the marine environment:

- marine current power harnesses the energy of marine currents;
- wave power makes use of the energy of waves;
- tidal power uses energy obtained from tides;

- ocean thermal energy makes use of hydrothermal energy, i.e. the temperature gradient between warm surface water and cold deep water.

As emerging sectors, these forms of renewable marine technology are, along with floating offshore wind power, in the research and experimentation stage. State assistance in bringing these sectors to maturity consists chiefly of financing research projects, the demonstration of technological building blocks and pre-commercial farms.

Since 2009, several calls for expression of interest have been launched in relation to marine energy. Led by ADEME under the Future Investments Programme (PIA), the calls for projects seek to remove obstacles of a technological and non-technological nature (environmental and economic etc.) in the various sectors, and include 'marine energy' (2009), 'ships of the future' (2011), 'technological building blocks for marine energy' (2013), 'pilot marine-current farms' (2014) and 'multiple renewable energy sources' (2014).

In total, eight projects are being financed and have received total funding of almost EUR 132 million in the marine current and wave power sectors.

In August 2015, the Government launched a fresh call for projects, with the aim of financing demonstrator projects, technological building blocks in the field of marine renewable energy and pilot river-current farms. It is split into three parts:

- the building of innovative demonstrator units in the marine current and wave power sector;
- the provision of technological building blocks critical for the development of marine renewable energy;
- the creation of pilot current farms on national territory, upstream from the transversal limit of the sea.

As regards offshore floating wind power, the Government launched a call for projects in August 2015 for the creation of pilot floating wind farms (consisting of three to six turbines) off the coast of Brittany and in the Mediterranean Sea. Possible future commercial objectives will depend on the results obtained in the demonstration and pre-commercial phases, which represent crucial stages in terms of progress in:

- identifying the most promising technologies and the rate at which they can be brought to maturity;
- assessing resources and consolidating estimates of generation potential;
- reducing the cost of these technologies, particularly in relation to the design and construction of turbines, electrical architecture and installation and maintenance methods;
- improving their integration into the environment;
- evaluating wind energy potential in terms of resources, environmental considerations, acceptability and conflicts of use.

Four projects were selected in 2016:

- o PGL project led by EDF EN, with turbines built by Siemens and floating foundations by SBM/IFPEN, in the Faraman area of the Mediterranean – 24 MW total capacity;
- o EFGL project led by Engie/EDPR/CDC, with turbines built by GE and floating foundations by Eiffage/PPI, in the Leucate area of the Mediterranean – 24 MW total capacity;
- o project led by Eolfi/CGN in Groix, Brittany, with turbines built by General Electric and

floating foundations designed by DCNS and built in cooperation with VINCI – 24 MW total capacity;

- project led by Quadran in the Gruissan area of the Mediterranean, with 6 MW turbines built by Senvion and floating foundations by Bouygues Travaux Publics and Ideol – 24 MW total capacity;

4. Electricity generated from biomass

Electricity production by cogeneration from biomass is now supported exclusively by calls for tenders. In 2016, a call for tenders for a period of three years and a volume of 50 MW per year was therefore launched, with one submission period per year. Projects must have a capacity of between 0.3 and 25 MW.

5. Electricity generated from biogas

Electricity production from biogas is now supported on the basis of

- a purchase price set out in the Tariff Order of 13 December 2016, for installations of up to 500 kW using mostly biogas produced through anaerobic digestion of non-hazardous waste;
- a call for tenders as an additional payment, for installations using biogas produced through anaerobic digestion of non-hazardous waste. The target volume is 10 MW per year, with one submission period per year. Projects must have a capacity of between 500 kW and 5 MW;
- a purchase price up to 500 kW and an additional payment over 500 kW, laid down in the Tariff Order of 9 May 2017, for installations using mostly biogas from wastewater treatment plants. Installations with a capacity of less than 12 MW are also eligible.

The French authorities are still awaiting approval from the European Commission for open-ended support for landfill biogas (in the form of a purchase price up to 500 kW and an additional payment over 500 kW).

6. Geothermal electricity

Since the end of 2016, support has been based on an additional payment granted on an open-ended basis (Decree of 13 December 2016).

7. Hydropower

Support consists principally of two schemes.

The first scheme is set out in the Decree of 13 December 2016 laying down the conditions of purchase and additional payment for electricity generated by installations using hydropower from lakes, watercourses and water collected by gravity flow. The scheme, which is available on request, enables installations of less than 1 MW to benefit from support in the form of a purchase obligation or additional payment. It also covers the renovation of existing installations with prices tailored to approved investments.

The second scheme relates to new authorised installations with a capacity in excess of 1 MW. Under the scheme, such installations are eligible for an additional payment if they are awarded a tender. 19 applicants were selected for a total of 27 MW under the first procedure launched in 2016. A new procedure was launched in 2017 for a total volume of 105 MW over a period of three years.

3.4 Support scheme for the transport sector

The main incentive: General tax on polluting activities (TGAP)

Article 32 of the 2005 Finance Act established a tax on the release of petrol and diesel for consumption based on the sale price excluding VAT. It encourages the incorporation and distribution of biofuels by penalising operators who release biofuels for consumption in proportions below the incorporation objective.

In accordance with the annual targets set by France for the incorporation of biofuels, this General Tax on Polluting Activities (TGAP) is reduced in proportion to the volume of biofuels incorporated into fuels released for consumption.

Rates set for the General Tax on Polluting Activities (EUR 000 000)



Biofuels incorporation targets have been gradually increased since 2007:

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|------|------|------|------|------|------|------|------|------|------|------|
| Incorporation target as % of energy (diesel sector) | 3.50 | 5.75 | 6.25 | 7.00 | 7.00 | 7.00 | 7.00 | 7.70 | 7.70 | 7.70 | 7.70 |
| Incorporation target as % of energy (petrol sector) | 3.50 | 5.75 | 6.25 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.5 |

The TGAP encourages operators to incorporate and distribute biofuels by penalising those marketing biofuels in proportions below the set threshold.

The Amending Finance Act for 2016 has extended the incorporation target to 75 % of non-road diesel by volume.

Greater incentive for biofuels produced from waste: double counting

Biofuels produced from waste and residue are able to benefit from double counting under the TGAP. In other words, the share represented by such biofuels is counted twice for the purposes of the incorporation target.

Double counting gives the products in question a competitive advantage. It encourages the development of biofuels not competing with food whilst helping to draw value from used cooking oils, animal fat, grape marc and wine lees.

The Decree of 21 March 2014 lays down the implementing arrangements for double

counting. It limits the amount of biofuel energy able to benefit from the advantage to 0.35 % of incorporation for the diesel sector and 0.25 % for the petrol sector. This helps to limit the dead-weight effects which resulted in considerable imports of waste and biofuels produced from waste in 2011.

Domestic consumption tax on energy products (TICPE) reduced for biofuels: ended on 31 December 2015

The aim of the partial exemption from domestic consumption tax on energy products (TICPE) was to compensate the additional costs of producing biofuels (from approved units) as compared to fossil fuels. The tax advantage was intended to help industry amortise its production units.

By the end of 2012, only around 50 % of investments were considered to have amortised. The decision was therefore taken to extend the scheme. New approvals were therefore granted for the period 2013-2015.

The tax exemption rates were regularly reduced until the end of the scheme on 31 December 2015.

| EUR/hl | 2011 | 2012 | 2013 | 2014 | 2015 |
|----------------|------|------|------|------|------|
| FAME | 8 | 8 | 8 | 4.5 | 3 |
| ETBE* | 14 | 14 | 14 | 8.25 | 7 |
| Ethanol | | | | | |
| VOEE** | 14 | 14 | 14 | 8.25 | 7 |
| SB*** | 8 | 8 | 8 | 4.5 | 3 |

* only share of ethanol eligible // ** vegetable oil ethyl esters // *** synthetic biodiesel

3.5 Research and innovation

Support for research is one of the key strategies driving energy transition and is intended to help the relevant sectors to mature and become competitive. The public R&D budget for energy in 2015 was EUR 1.02 billion, including EUR 440 million for new energy technologies (43 %). New energy technologies include energy efficiency (in industry, services, housing and transport), renewable energies (solar, wind, marine, bio, geothermal and hydro), CO₂ capture, storage and utilisation, energy storage, electricity grids and hydrogen and fuel cells.

For seven years, the first two parts of the Future Investments Programme have driven the strong innovation dynamic amongst the economic operators behind the environmental and energy transition. Continuing this, the third part of the Future Investments Programme is extending the initial ambition by responding to three priorities, namely supporting progress in teaching and research, enhancing the value of research and accelerating business modernisation.

An overview of the financing methods and the amounts currently available to support new energy technologies is provided below.

The National Research Agency (ANR) supports projects prior to collaborative research.

The National Research Agency (ANR) supports projects prior to collaborative research and individual projects by young researchers. The National Research Agency's targeted action in

the area of new energy technologies and energy efficiency has made it possible to commit close to EUR 25 million a year.

The Single Interministerial Fund (FUI) supports the collaborative projects of the competitiveness hubs.

The FUI finances the collaborative research and development projects of the competitiveness hubs. The Fund is intended to support applied research projects aimed at developing products or services that can be marketed in the short or medium term.

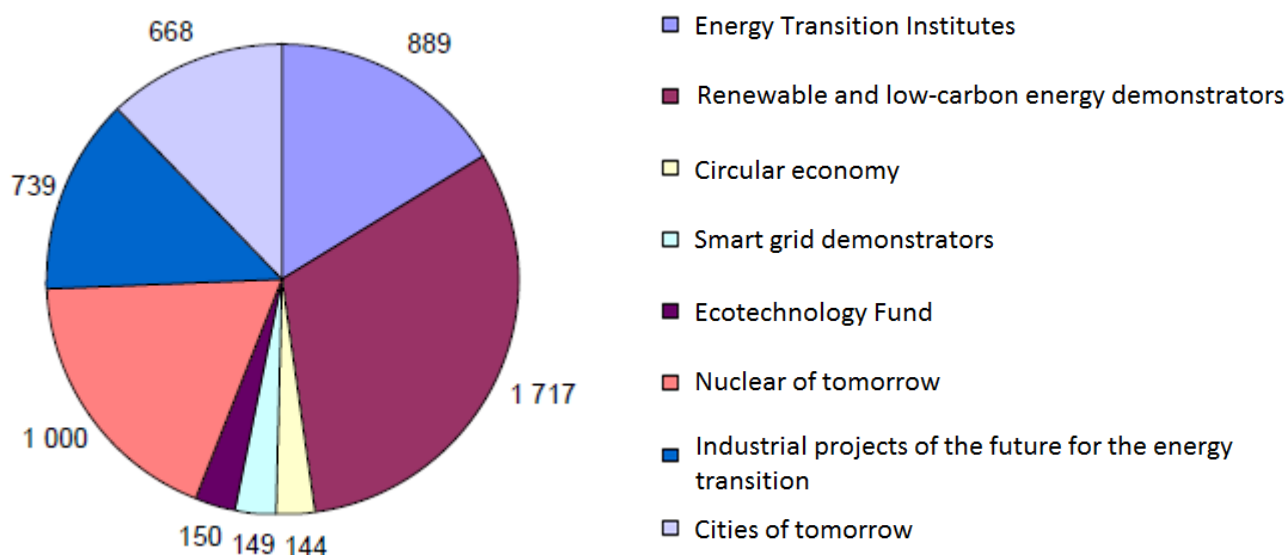
In 2017, the two annual calls for projects saw funding allocated to 93 projects overall.

| FUI | CfP No 23 | CfP No 24 | 2017 |
|-----------------|----------------|----------------|----------------|
| State financing | EUR 38 million | EUR 28 million | EUR 66 million |
| Local financing | EUR 38 million | EUR 28 million | EUR 66 million |
| No of projects | 55 | 38 | 93 |

Main energy sub-programmes under the Future Investments Programme

With a total budget of almost EUR 47 billion, the first two parts of the Future Investments Programme are intended to finance profitable assets and research and innovation infrastructure likely to assist France's economic development.

The breakdown of amounts allocated to areas with a direct link to energy is shown in the chart below:



*Future Investments Programme – Breakdown of energy-related funding (in EUR million) –
Source: 2014 CGI report*

Energy Transition Institutes

The 'Energy Transition Institutes' sub-programme run by the ANR is intended to set up a world-class technological innovation platform for renewable energies, new energy technologies and energy efficiency.

These public-private research centres provide a foundation for research and innovation activities in low-carbon energy sectors. Activities are organised around an ongoing technological and economic strategy (a work programme lasting at least 10 years), collaborative projects, joint training schemes and shared investment, in particular for prototype development, testing and demonstration resources.

Ten entities are currently active under the Energy Transition Institutes sub-programme:

- *Picardie innovations végétales, enseignements et recherches technologiques* [Picardy Plant Innovations, Teaching and Technological Research] (PIVERT)
- *France énergies marines* [Marine Energy France] (FEM)
- *Institut français des matériaux agrosourcés* [French Institute for Bio-Sourced Materials] (IFMAS)
- *Institut photovoltaïque d'Ile-de-France* [Ile-de-France Photovoltaic Institute] (IPVF)
- Supergrid
- Geodenergies
- *Institut du véhicule décarboné et communicant et de sa mobilité* [Institute for Carbon-Free Communicating Vehicles and their Mobility] (VeDeCoM)
- *Institut national énergie solaire 2* [National Solar Energy Institute 2] (INES2)
- EFFICACITY
- *Institut national d'excellence facteur 4* [National Institute of Excellence to the Power of 4] (INEF4).

Environmental and Energy Transition Demonstrators

Organised by ADEME, this measure covers five strategic areas, and seeks to create a research and innovation demonstration platform for low-carbon energy and environmental and energy transition in relation to the following:

- renewable energy;
- decarbonisation of energy use, energy efficiency and smart grids;
- sustainable construction, including energy renovation;
- water and biodiversity;
- circular economy.

The total funding allocated to this measure comes to EUR 2 130 million, broken down as follows:

| | |
|--|--------------------------|
| Renewable and low-carbon energy | EUR 1 717 million |
| Circular economy | EUR 144 million |
| Smart electricity grids | EUR 149 million |
| Contribution to Ecotechnologies Fund | EUR 120 million |
| Total Environmental and Energy Transition | EUR 2 130 million |

Future Vehicles and Transport

Also run by ADEME, this measure is aimed at speeding up innovation and industrialisation as regards new mobility solutions and transport technology and infrastructure using lower levels of fossil fuels and exerting a lesser impact on the environment.

Future Industrial Projects (PIAVE)

Managed by BPI France since 2015, this measure is intended to develop an industrial policy based on:

- improving competitiveness;
- introducing sector-specific policies for each energy type;
- implementing environmental and energy transition.

Applicable in particular to projects resulting from the 34 plans for a New Industrial France, this measure is designed to support ventures that do not benefit from dedicated support under the other PIA sub-programmes.

3.6 Amount of expenditure on support for renewable energy

In order to reflect the reality of the schemes, and, in particular, their financing, it has been decided not to use the table suggested in the Commission's template. At the same time, as much economic data is provided as possible on the cost of support schemes, although the costs listed are not exhaustive.

1. Electricity generation

The public electricity service contribution (CSPE) was set up in 2003 in order to finance public service tasks such as the development of renewable electricity, price adjustments with areas that are not interconnected, social measures for households affected by fuel poverty and support for cogeneration. The contribution was added to the electricity bills of final consumers.

The French authorities decided to **overhaul the CSPE under the draft Amending Finance Act for 2015, entering into force on 1 January 2016**. As part of this reform, the contribution **ceased to exist in its current form and was incorporated into the domestic tax on final electricity consumption (TICFE)**, the tax base and level of which were revised and which took on the name 'CSPE'. **Public electricity service charges were also integrated into the budget.**

Public energy service charges (for electricity and gas) are now partly covered by a special account ('Energy Transition' special account) and partly by a general State budget programme (programme 345 'Public Energy Service').

Support for renewable energy (electricity and gas) is financed by the Energy Transition special account.

The compensation due for the application of purchase obligation contracts (prices and calls

for tender) is assessed in relation to the costs avoided by purchasers (EDF, local distribution companies and now State-approved bodies), defined with reference to the market price of electricity. The compensation amount for a given year therefore depends on the market prices recorded in that year. In the same way, compensation due for the application of additional payment contracts (prices and calls for tender) are assessed in relation to the amount paid to producers as a premium and by their contracting partner (exclusively EDF), also defined with regard to the reference market price for the ex-post sector identified. The amount of compensation therefore also depends on the market price.

Each year, the Energy Regulatory Commission (CRE) records the costs that purchase contracts, additional payment contracts and other public service tasks (price adjustments and the application of social measures) have represented for operators in the previous year and, at the same time, draws up a forecast for the following year and updates the forecast for the current year. This forecast is used for the draft Finance Act, so that the amounts to be charged to the budget for the coming year can be adopted.

For the purchase obligation, the purchaser's avoided costs are set by sector. For each sector, the CRE distinguishes between production considered to be 'quasi-certain'²⁰ and 'chance' production. The avoided cost of quasi-certain production is calculated by reference to forward market prices, while the cost of chance production is calculated by reference to the spot price. **In its 2018 forecasts, the monthly market prices used to calculate avoided costs are therefore EUR 36/MWh on average for quasi-certain production and between EUR 31/MWh and EUR 47/MWh²¹** depending on the 'chance' production sector concerned.

In the case of the electricity sector, the support granted in respect of an energy type for a given period is considered to be the amount of compensation due to purchasers bound by purchase contracts and due to EDF for additional payment contracts connected with that energy type for the same period.

At the time of drafting this report, the costs recorded for 2016 and the forecast costs for 2018 were available. The data for 2017 are taken from the forecast costs updated by the CRE in its deliberation of 13 July 2017. The data for 2018 are taken from the forecast costs estimated by the CRE in the aforementioned deliberation.

Table 3a: Support schemes for renewable energy and cogeneration (electricity only)

| In EUR million | Cost of support recorded by the CRE in 2015 | Cost of support recorded by the CRE in 2016 | 2017 forecasts | 2018 forecasts |
|---|---|---|----------------|----------------|
| Gas cogeneration | 506.5 | 501 | 571.8 | 705.6 |
| Renewable electricity financed under the special account (mainland and areas | 4198.8 | 4369 | 4746.1 | 5371.8 |

²⁰The quasi-certain capacity is the capacity available at any time in a given period and is considered to have a probability of some 90 %.

²¹Details of charges and avoided costs are given in the CRE deliberation at the following address: <http://www.cre.fr/documents/deliberations/decision/cspe-2018/consulter-l-annexe-1-charges-de-service-public-de-l-energie-previsionnelles-au-titre-de-l-annee-2018-cp-18>; the method by which the purchaser's avoided costs are calculated can be consulted at: <http://www.cre.fr/documents/deliberations/communication/obligation-d-achat4>

| | | | | |
|--|--------|--------|--------|--------|
| not interconnected) excluding contract management costs | | | | |
| Photovoltaic | 2622.4 | 2694.1 | 2697 | 2881.4 |
| Wind | 1029.6 | 1008.7 | 1290.3 | 1558 |
| Hydro | 170.2 | 215.7 | 199.3 | 228.6 |
| Biomass | 200.8 | 239.3 | 315.7 | 416.9 |
| biogas | 138.8 | 183.8 | 205.7 | 243.2 |
| Geothermal | 0.5 | 0.7 | 1.3 | 1.4 |
| Domestic waste incineration | 36.5 | 26.6 | 36.8 | 42.2 |

In 2016, the average unit purchase cost of support recorded by the CRE was some EUR 341.5/MWh for photovoltaic, EUR 88.3/MWh for wind, EUR 74.7/MWh for hydro, EUR 138.1/MWh for biomass, EUR 139.2/MWh for biogas, and EUR 57.0/MWh for incineration.

In the case of biogas and photovoltaic energy, this unit cost of support is not entirely representative of the unit cost of support for new installations, as purchase prices have changed greatly in recent years – falling for photovoltaic and increasing for biogas. Moreover, in the case of biogas, this figure relates essentially to landfill biogas installations for which the purchase price is naturally not as high as for anaerobic digestion units.

2. Injection of biomethane into gas grids

As explained in the paragraph above, support for biomethane injection is financed by the Energy Transition special account.

The scheme under which natural gas suppliers purchase biomethane from producers is designed to ensure that they are compensated for the difference between the purchase price of methane and the wholesale market price of natural gas. As provided for in Article L.446-2 and clarified in Article R.121-27 of the Energy Code, the compensation is calculated annually for the following year by the CRE.

The cost was EUR 7.1 million for 2015 and EUR 18.6 million for 2016. The CRE has estimated that it is EUR 37.3 million for 2017 and EUR 99.56 million for 2018.

3. Heat production

The following table shows the breakdown of Heat Fund assistance from 2009 to 2016:

Table 3b: Support schemes for renewable energy (heat only)

| Key figures 2009-2016 | No of projects | Amount of eligible investment (EUR m) | ADEME aid (EUR m) | Toe RES/year | ADEME aid (EUR/toe over 20 years) |
|------------------------------|-----------------------|--|--------------------------|---------------------|--|
| BCIAT wood | 158 | 940 | 364 | 861 | 1.8 |
| Non-BCIAT wood | 870 | 1387 | 357 | 543 | 2.8 |

| | | | | | |
|--|------|------|------|------|------------|
| Geothermal | 444 | 565 | 124 | 140 | 3.8 |
| Biogas | 71 | 314 | 48 | 95 | 2.1 |
| Solar | 1654 | 164 | 76 | 7 | 49.3 |
| Heating networks | 740 | 1716 | 586 | 265 | 9.5 |
| Waste heat recovery installations | 51 | 66 | 17 | 62 | 1.2 |
| TOTAL investment measures | | | 1572 | 1973 | 3.4 |
| Matching contribution under Geothermal Guarantee Fund | | | 35 | | |
| Support activities | | | 106 | | |
| Total | 3988 | 5152 | 1713 | 1973 | 3.7 |

4. Transport sector

The partial exemption from domestic consumption tax on energy products (TICPE) allowed the additional costs of producing biofuels (from approved units) as compared to fossil fuels to be compensated.

After falling steadily, tax exemption rates for biofuels were kept the same between 2011 and 2013. They then fell until the concession was abolished on 31 December 2015. The exemption amounts were estimated at EUR 97.5 million in 2015. Since the TGAP entered into force in 2005, the cumulative tax exemption amount has risen to approximately EUR 3.9 billion.

The total amounts of the tax exemption are given in the following table:

| 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 720 | 521 | 425 | 271 | 288 | 280 | 145 | 97,5 |

5. Cross-cutting support

In terms of cross-cutting support schemes which have a positive impact on renewable energy development, but which cannot be broken down by the main production sectors, the following costs can be given:

- 2017 Sustainable Development Tax Credit²² (on household expenditure in 2016): EUR 1.67 billion (leading to EUR 5.8 billion in works). 2016: EUR 1.67 billion (on works in 2015). 2015: EUR 900 million (on works in 2014).
- Zero-rate eco-loan (expenditure incurred in 2015 spread over five years from 2016): EUR 40 million
- The 'Waste Fund': EUR 20 million in 2016 for anaerobic digestion. Under this Fund, administered by ADEME, grants may be awarded for new waste processing methods, for the most part anaerobic digestion installations. The Heat Fund also finances biomethane injection into the grid.

3.7 Information on how supported electricity is allocated to final customers for the purposes of Article 3(6) of Directive 2003/54/EC

In accordance with Article 5 of Decree No 2004-388 of 30 April 2004, electricity suppliers are required to inform final customers of the origin of the electricity supplied, as laid down in Article 3(6) of Directive 2003/54/EC.

Suppliers must therefore specify in their electricity bills to final customers:

- the various primary energy sources used to generate the electricity that they sold over the preceding year;
- the contribution of each primary energy source to the supplier's overall electricity supply over the preceding year;
- a reference to publications concerning the environmental impact of the electricity generated by all the primary energy sources used by the supplier.

This decree was initially amended by Decree No 2012-62 of 20 January 2012 on electricity origin guarantees in order to stipulate that the amount of energy generated from renewable sources corresponding to guarantees of origin transferred from an electricity supplier to a third party is not to be taken into account when determining the share of primary energy sources, in accordance with Article 15(8) of Directive 2009/28/EC.

The provisions were then amended again by Decree No 2016-944 of 11 July 2016 laying down various provisions for adapting the Energy Code to European Union law as regards the production of electricity from renewable sources and cogeneration. The Decree introduced into legislation the concept of the residual mix (consumption mix from which used and exported guarantees of origin are deducted) such that the information used by suppliers who do not apply a traceability system to their supply (and therefore indicate the national production mix) is as accurate as possible and rules out any possible double counting for green electricity. The Decree also lays down that suppliers must use guarantees of origin if offering a renewable share which is greater than the renewable share in the residual mix..

4. Information on how, where applicable, the support schemes have been structured to take into account RES applications that give additional benefits, but

²²The tax data do not allow a breakdown by sector.

may also have higher costs, including biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material

For electricity and heat production, support schemes are matched to each sector to ensure that support is given to all technologies, including those which have additional advantages but entail higher costs.

Examples include calls for tender targeting both photovoltaic energy and storage in order to overcome the issue of intermittence, or the anaerobic digestion sector, which contributes to waste management policy, in particular as regards agricultural waste (manure).

For renewable electricity and heat production, support schemes are matched to each sector to ensure that support is given to all technologies, including those which have additional advantages (associated with the environment, employment, supply security) but entail higher costs, with a view to ultimately reducing costs across all sectors. Aid amounts are calculated such that heating is approximately 5 % cheaper than the price of the reference fossil-based alternative.

In the transport sector, the General Tax on Polluting Activities (TGAP) was amended in 2010. Biofuels produced from waste and residue are able to benefit from double counting under the TGAP. In other words, the share represented by such biofuels is counted twice for the purposes of the incorporation target. Double counting gives the products in question a competitive advantage. It encourages the development of biofuels not competing with food whilst helping to draw value from used cooking oils, animal fat, grape marc and wine lees.

The Decree of 21 March 2014 lays down the implementing arrangements for double counting and lists the biofuels eligible for the reduction under the TGAP. In particular, it provides:

- a list of biofuels and renewable fuels of non-biological origin eligible for the reduction under the TGAP;
- a list of raw materials from which it is possible to produce conventional biofuels;
- a list of raw materials from which it is possible to produce advanced biofuels eligible for double counting;
- a list of raw materials from which it is possible to produce biofuels other than advanced biofuels eligible for double counting and a list of residue from which it is possible to produce biofuels other than advanced biofuels, which count for their real energy value.

The Decree limits the amount of biofuel energy able to benefit from double counting to 0.35 % of incorporation for the diesel sector and 0.30 % for the petrol sector. This helps to limit the dead-weight effects which resulted in considerable imports of waste and biofuels produced from waste in 2011.

5. 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

France did not consider it appropriate to establish a system of guarantees of origin for heating and cooling from RES, this not being a requirement under EU legislation. However, it did set up such a system for biomethane injected into the gas grid.

As regards the guarantees of origin for electricity generated from renewable sources or by cogeneration, Articles L.314-14 to L.314-17 of the Energy Code and Decree No 2012-62 of 20 January 2012 brought the guarantee of origin system into line with the requirements under Article 15 of Directive 2009/28/EC. These articles state, in particular, that guarantees of origin are the only possible means of certifying the renewable nature of electricity generation.

Under the Order of 19 December 2012, Powernext was appointed as the body responsible for issuing, monitoring and withdrawing guarantees of origin in France. On 1 May 2013, when this appointment came into effect, Powernext was entrusted for a period of five years with ensuring the accuracy, reliability and protection against fraud of the guarantee of origin system. Powernext sends a yearly report to the Minister responsible for energy on the guarantees of origin issued in the course of the preceding year.

As of mid-2018, the guarantees of origin for electricity produced by renewable electricity installations will benefit from a support scheme (in the form of a purchase obligation or additional payment) and will be auctioned by the State. The new provision follows on from Act No 2017-227 of 24 February 2017 and amends the framework previously in force which laid down that purchasers bound by the obligation replaced producers in their right to obtain guarantees of origin. This replacement was introduced to stop consumers from doubling the value of the renewable share of electricity. The economic valuation of the guarantee of origin by purchasers under obligation was systematically deducted from the overall amount of compensation that they receive via public energy service charges. With the introduction of the additional payment in which producers sell their production themselves and receive an additional premium to compensate the difference between their production costs and the market price, it was impossible to replicate this system. This is why France wished to set up a new auction mechanism, thereby also preventing any doubling of value. Producers will still be unable to directly draw value from the guarantees of origin in addition to their support scheme. Moreover, the auction revenue will reduce the cost of support for renewable electricity borne by the local authorities via energy taxation.

Producers wishing nevertheless to issue guarantees of origin whilst benefitting from a support scheme will be able to do so in accordance with Article 15 of Directive 2009/28/EC. However, they will have to reimburse the support they received.

6. Description of developments in the preceding two years in the availability and use of biomass resources for energy purposes

The method used to calculate the quantities of biomass used for energy purposes and the quantities of energy produced has changed since the NREAP was submitted in 2010. The

reason for this change is the lack of a robust statistical evaluation method for or specific survey of the quantities of raw material imported for use for energy purposes or the quantities of energy produced from imported biomass. There has been no change, however, to the indicative trajectory.

In view of the absence of data resulting from the lack of a survey, the following table is incomplete. Data not available are marked by a hyphen (-).

All raw material is shown in the 'amount of domestic raw material' columns of Table 4. These data are taken from the declarations made by producers of energy from biomass (electricity and heating). The corresponding amount of domestic biomass has been calculated using the conversion factors set out in the 2010 NREAP.

In the case of biomass supply for transport (common arable crops for the production of biofuels), the information collected by the customs authorities at the time of payment of the General Tax on Polluting Activities sheds light on the 'release for consumption' in France of biofuels produced from domestic biomass and imported biomass.

Table 4: Biomass supply for energy use

| | Amount of domestic raw material (in m ³ unless otherwise indicated) | | Primary energy in domestic raw material (ktoe) | | Amount of imported raw material (in m ³ unless otherwise indicated) | | Primary energy in amount of imported raw material (ktoe) | |
|---|---|-----------------------|--|-----------------------|---|-----------------------|--|-----------------------|
| | 2015 | 2016 (provisional) | 2015 | 2016 (provisional) | 2015 | 2016 (provisional) | 2015 | 2016 (provisional) |
| Biomass supply for heating and electricity: | | | | | | | | |
| Direct supply of wood biomass from forests and other wooded land energy generation (fellings, etc.)** | 46 685 400 | 51 061 200 | 9 154 | 10 012 | 838 026 | 973 040 | 164 | 191 |
| Indirect supply of wood biomass (residues and co-products from wood industry, etc.)** | | | | | 1 252 798 | 1 692 400 | 246 | 332 |
| Energy crops (grasses, etc.) and short rotation trees | - | - | 448 | 448 | - | - | - | - |
| Agricultural by-products/processed residues and fishery by-products ** | - | - | | | - | - | - | - |
| Biomass from waste (municipal, industrial, etc.) ** | - | - | 1 610 | 1 598 | - | - | - | - |
| Biomass supply for transport: | | | | | | | | |
| Common arable crops for biofuels | - | - | 2 434 | 1 411 | - | - | 461 | 1 346 |
| Energy crops (grasses, etc.) and short rotation trees for biofuels | - | - | - | - | - | - | - | - |

** The definition of this biomass category should be understood in line with 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.

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

| Land use | Surface (ha) | |
|--|--|---|
| | 2015 | 2016 (provisional) |
| 1. Land used for common arable crops (wheat, sugar beet, etc.) and oilseeds (rapeseed, sunflower, etc.) | - wheat-maize: 216 000 ha - beet: 46 250 ha - oilseed surface area (rapeseed, sunflower): 1 113 200 ha | - wheat-maize: 212 380 ha - beet: ? ha - oilseed surface area (rapeseed, sunflower): 946 220 ha |
| 2. Land used for short rotation trees (willows, poplars) Main types: poplars, eucalyptus and willows felled before 20 years and rejecting stumps, excluding pines | n/a | n/a |
| 3. Land used for other energy crops such as grasses (reed canary grass, switch grass, Miscanthus), sorghum | n/a | n/a |

Until 2009, surveys were carried out of industrial set-aside land and areas used for energy crops benefiting from aid. With this data, it was possible to assess areas used for energy crops. Following the end of mandatory set-aside in 2009, only areas used for energy crops which benefitted from aid were known for that year. Such data has not been compiled since 2010. Consequently, no data is available for subsequent years in row 3 of Table 4a above.

The data given in row 1 of the above table were obtained from competitive intelligence relating to biofuels. These are gross area figures that do not take account of by-products.

The data shown in row 2 are taken from farmers' declarations and do not include areas planted by industrial or forestry concerns.

7. Information on changes in commodity prices and land use in the preceding two years associated with increased use of biomass and other forms of energy from renewable sources

With regard to wood energy, the Wood Economy Research Centre (CEEB) has been carrying out surveys since 2011 on behalf of the Statistical and Forecasting Department (SSP) of the Ministry of Agriculture on wood energy from forests and on behalf of the Ministry of Finance for other types of wood energy.

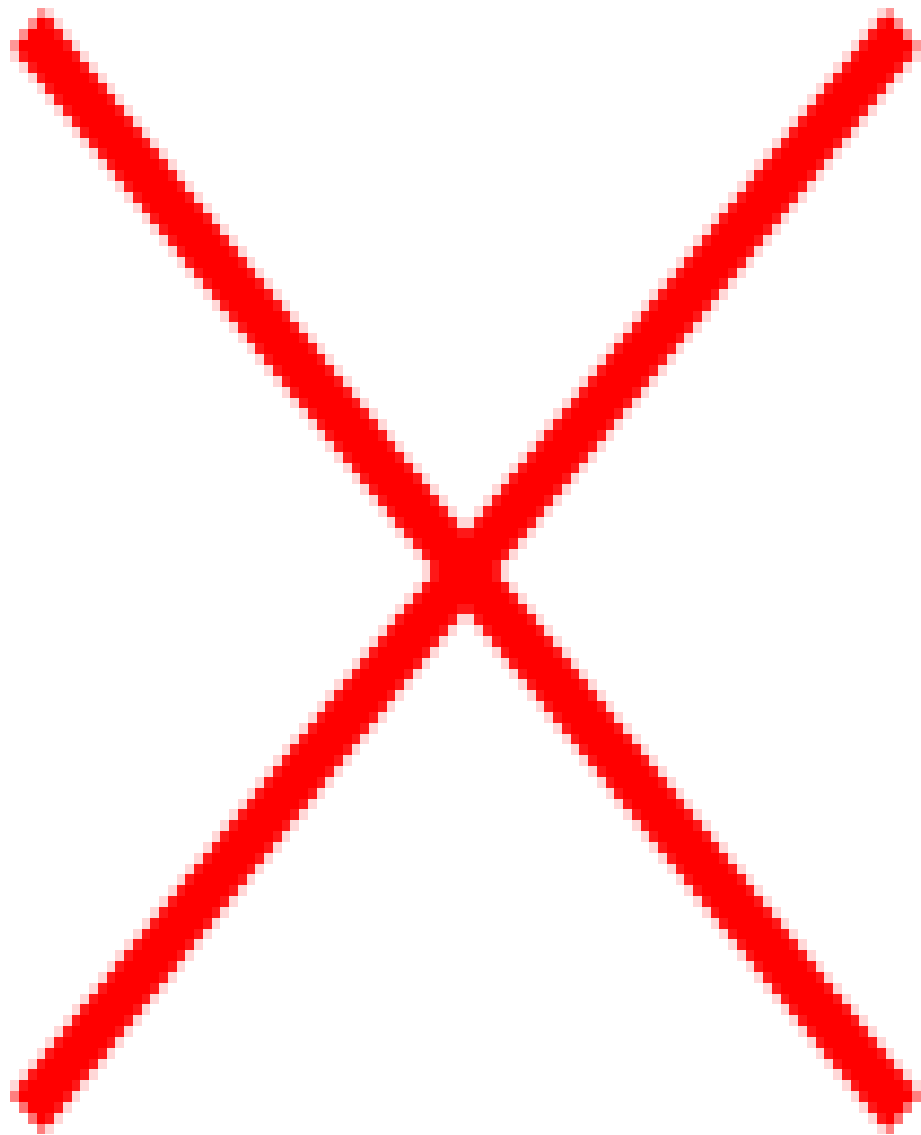
This work has enabled wood energy price indices to be published in France.

In order to monitor the price of wood energy from forestry, the SSP aggregates the data from the CEEB to produce three indices:

- forest/hedgerow/urban wood chips
- timber of all lengths

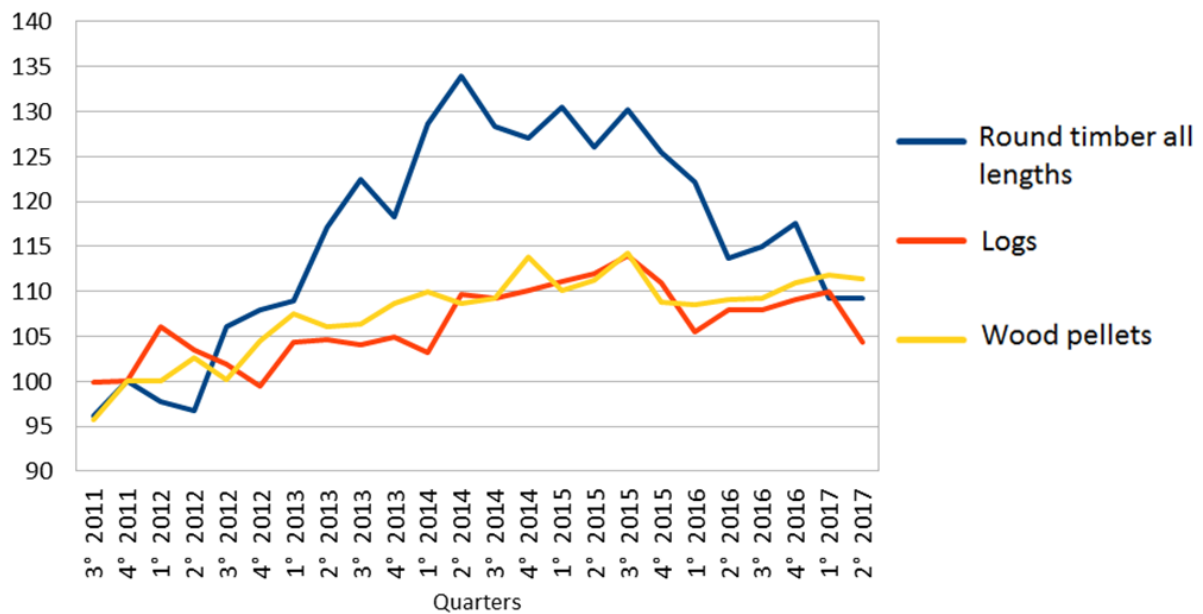
- timber of less than two metres

The chart shows an upward trend in the price indices for wood energy (baseline index of 100: fourth quarter 2011) between 2011 and 2014, stagnation between 2014 and 2015, and a downward trend in 2016. Recent changes in the price of wood energy were caused by milder winters in 2014-2015 and 2015-2016 which reduced the need for heating and, therefore, for wood energy considerably.

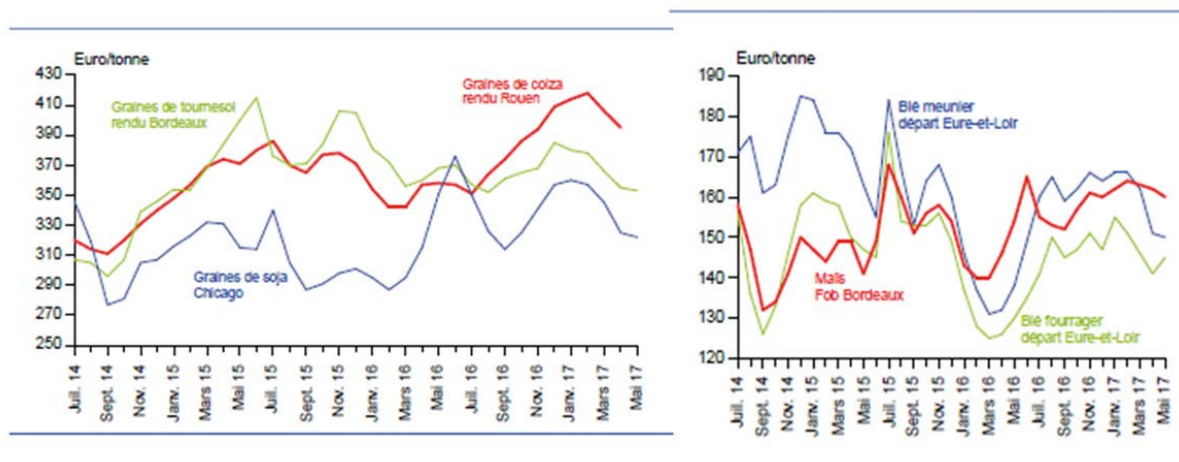


Forest wood energy indices (source: Agreste, SSP, CEEB)

Forest-based energy wood price index Index 100 - 4th quarter 2011



The prices of basic raw materials used to produce biofuels have been extremely volatile (see below, source: Agreste). Currently, there are no indicators able to link this to an increase in the use of biomass.



Furthermore, the scientific literature highlights the difficulty in isolating the net effect of the development of biofuels on agricultural prices, owing to interactions with numerous other factors and to feedback loops. It also points to a significant degree of heterogeneity in the results (between 1 and 36 % of the price rise being attributed to biofuels), which is down to differences in the methods used (econometrics, modelling or empirical research).

The 2013 report by the HLPE²³ underlines, in particular, the great difficulty in distinguishing the net effect of any given factor, due to how interdependent they are. The reality is that direct and indirect interaction (substitution, feedback) between biofuels and

²³Biofuels and food security, Report of the High Level Panel of Experts on Food Security and Nutrition, HLPE, 2013.

agricultural prices is highly complex.

8. Development of the share of biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material

Table 5: Production and consumption of Article 21(2) biofuels (ktoe)

| Article 21(2) biofuels²⁴ | 2013 | 2014 | 2015 | 2016 |
|---|-------------|-------------|-------------|-------------|
| Total consumption of Article 21(2) biofuels | 232 | 268 | 278 | 286 |
| % share of Article 21(2) fuels from total RES-T | 7.00 % | 7.00 % | 8.00 % | 7.00 % |

The calculation methods used mean that we are able to provide data on the consumption of these biofuels between 2013 and 2016 but not on their production in France.

9. Estimated impacts of the production of biofuels and bioliquids on biodiversity, water resources, water quality and soil quality in the preceding two years

The impact of biofuel production on these natural resources has not been assessed in the last two years.

10. Estimated net greenhouse gas emission savings due to the use of renewable energy

Table 6: Estimated GHG emission savings from the use of renewable energy (t CO₂eq)

| Form of renewable energy | 2013 | 2014 | 2015 | 2016 |
|--|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Total estimated net GHG emission saving from using renewable energy | 60.66 m t C O₂eq | 60.60 m t C O₂eq | 63.19 m t C O₂eq | 61.97 m t C O₂eq |
| - Estimated net GHG saving from the use of renewable electricity | 36.47 m t CO ₂ eq | 37.67 m t CO ₂ eq | 40.00 m t CO ₂ eq | 38.43 m t C O ₂ eq |
| - Estimated net GHG saving from the use of renewable energy in heating and cooling | 18.80 m t CO ₂ eq | 17.13 m t CO ₂ eq | 17.25 m t CO ₂ eq | 17.50 m t C O ₂ eq |
| - Estimated net GHG saving from the use of renewable energy in transport | 5.38 m t CO ₂ eq | 5.81 m t CO ₂ eq | 5.93 m t CO ₂ eq | 6.05 m t CO ₂ eq |

²⁴Biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material.

Methodology

The emissions calculation method has been revised in order to bring the calculation of emissions benefits into line with assessments carried out as part of the annual report to the Commission produced in accordance with Directive 2003/87/EC of 13 October 2003.

In order to illustrate trends in net benefits associated with the use of renewable energy sources, the results revaluated according to the new method for 2013 and 2014 are also provided.

1. Estimated net GHG saving from the use of renewable electricity

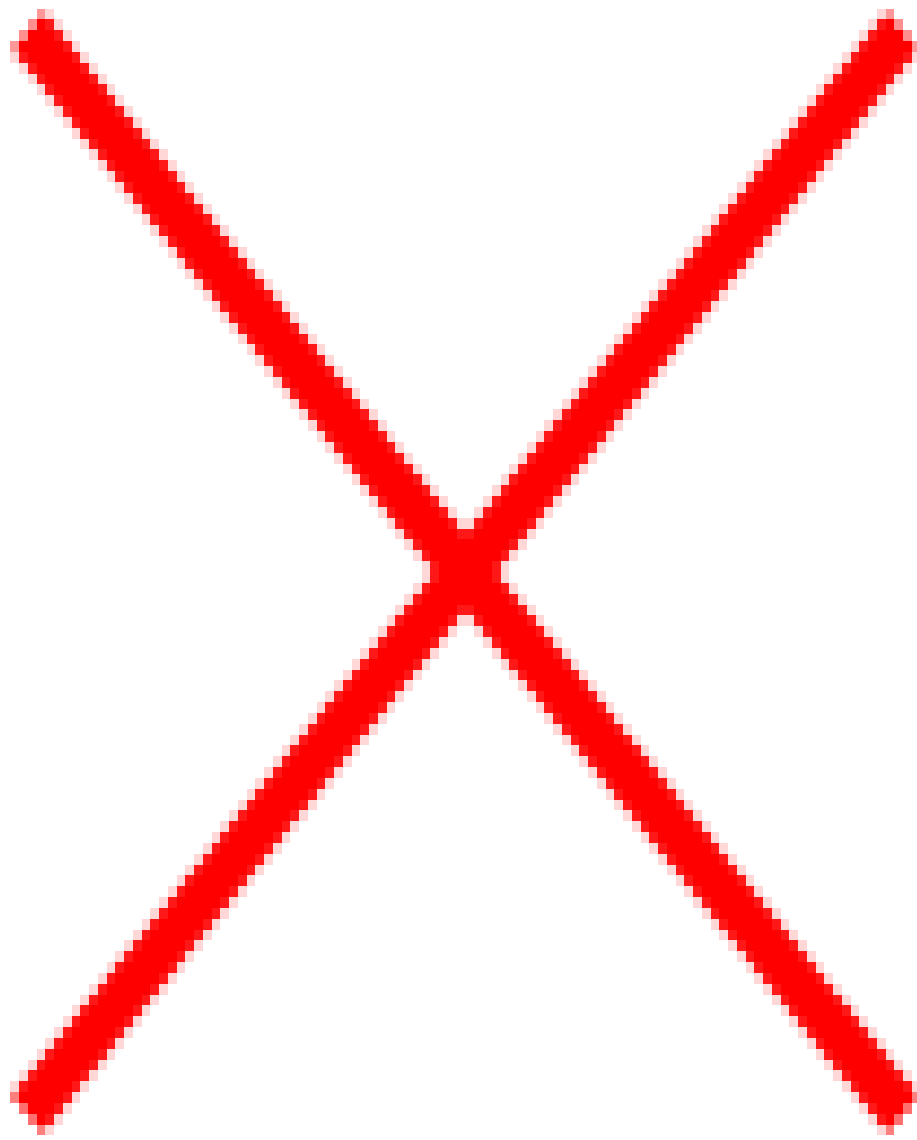
In line with current standards, the counterfactual scenario to the development of renewable energy is to resort to gas-fired plants. The net GHG emissions saving from the use of renewable electricity is therefore calculated based on consumption of electricity produced from different renewable sources compared to the 'combined-cycle gas' reference mix.

The LCA emission values are taken from ADEME's 'Carbon Database' and records (version 11.0.0 of 18 November 2014).

In previous years, the alternative scenario resulted from modelling of the electricity system dating back to 2012, which led in reality to an alternative mix comprising predominantly fuel oil and coal. This resulted in far higher GHG emissions benefits.

However, this new estimate can be recognised as failing to take into account all the benefits of using RES (at a time when electricity is predominantly produced from coal on a global level).

Overall, GHG emissions savings from the production of renewable electricity came to **40** and **38.4 m t CO₂eq** in **2015** and **2016** respectively.



2. Estimated net GHG savings from the use of heating and cooling from renewable energy sources

- *Biomass energy*

GHG emission savings are calculated on the basis of the final consumption of heat produced from biomass. In the case of wood-fired heating in the residential and collective and service sectors, the results of the LCAs carried out for ADEME in 2005 were used.

The reference mixes for individual heating and for the collective and service sector have been addressed separately in order to take account of their differences. For the collective and service sector, gas heating was selected as the reference mix. This approach is similar to the approach used for assessing the Heat Fund in the report submitted pursuant to Directive 2003/87/EC and produced reference emissions totalling 243 kg CO_{2eq}/MWh.

In the individual residential sector, the average wood energy emissions were estimated by taking account of the market shares of logs (89 %) and pellets (8 %), and the performance of the different types of installation reported in the 2017 Overview of Renewable and Recovered Heating²⁵. An average performance factor of 60 % is assumed for individual wood-fired heating installations, along with average LCA emissions of 34.3 kg CO₂/MWh for primary energy and 57.1 kg CO₂/MWh overall (taking into account the average performance of wood-fired heating installations).

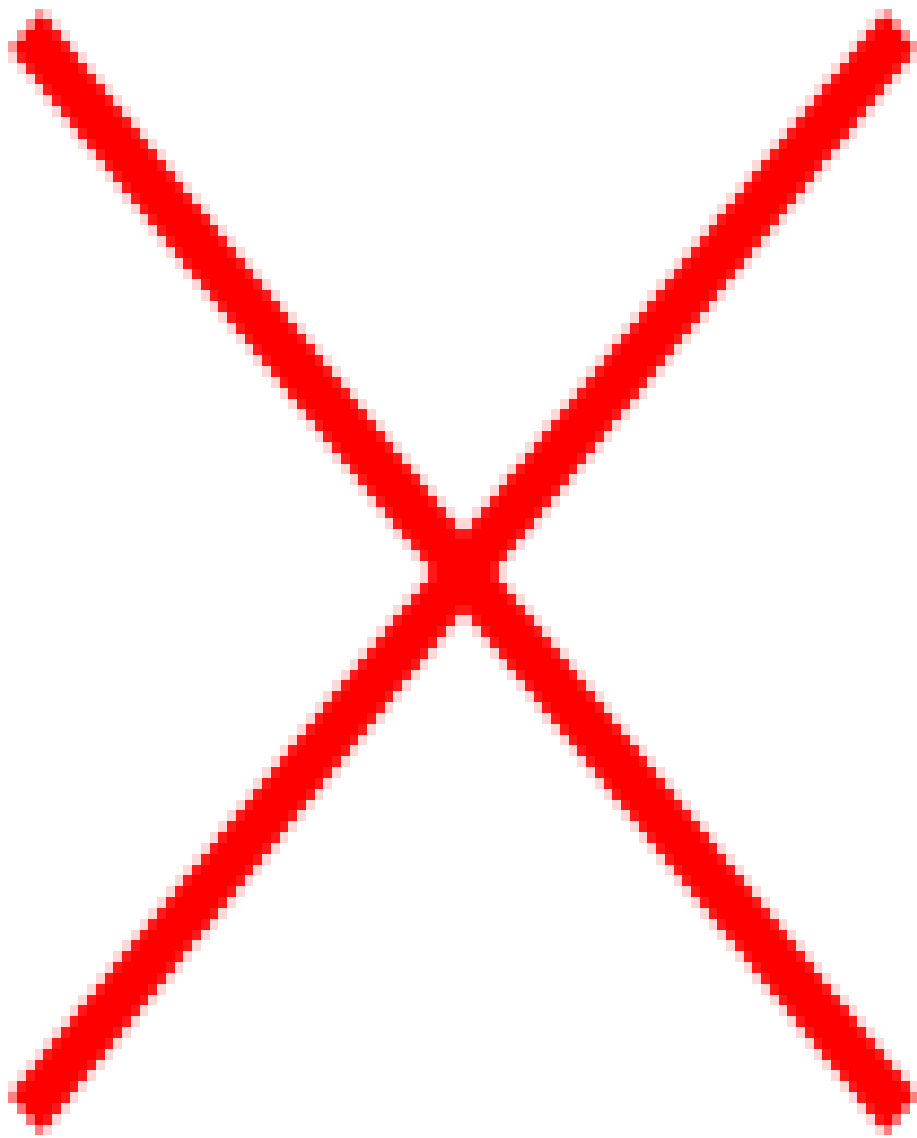
- *Other renewable energies*

LCA emissions are taken from ADEME's 'Carbon Database' in the case of biogas, heating networks, solar thermal energy and heat pumps.

The geothermal energy sector has not been included owing to insufficient data.

Overall, GHG emissions savings from the production of renewable energy for heating and cooling purposes came to **18.8, 17.1, 17.2 and 17.5 m t CO_{2eq}** in **2013, 2014, 2015 and 2016** respectively. The larger emissions benefit in 2013 as compared to the other years was due to the particularly harsh winter in 2013 and corresponding increase in the consumption of wood.

²⁵<https://www.bioenergie-promotion.fr/wp-content/uploads/2017/09/panorama-chaleur-renouvelable-2017-bd.pdf>



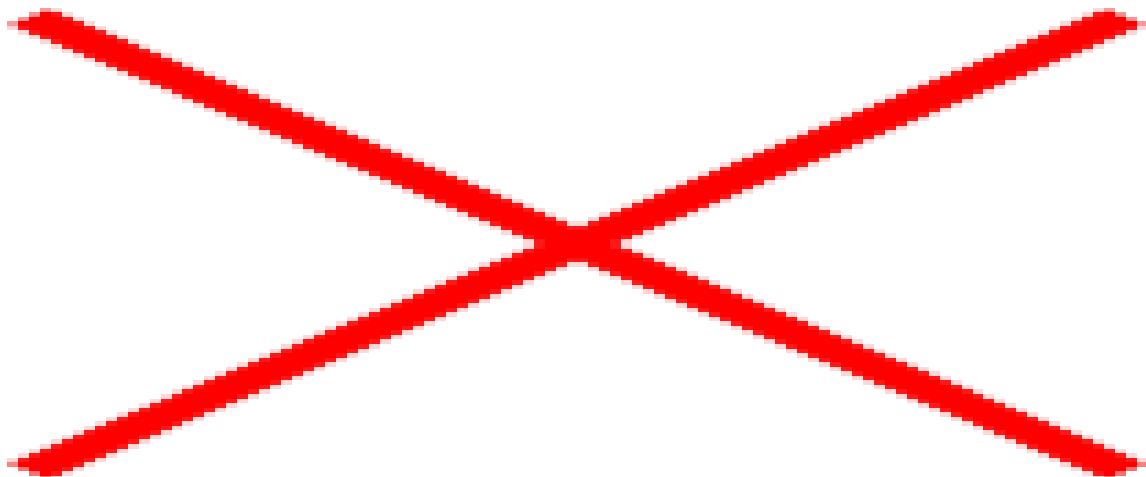
3. Estimated net GHG savings from the use of renewable energy in transport

The emission savings from the use of renewable energy in transport are calculated from:

- the rate of physical incorporation of the different categories of biofuels,
- emission factors for fossil fuels and the different categories of biofuels in France, estimated on the basis of data submitted annually by biofuel distributors (litres incorporated, inputs in manufacturing processes, types of processes, emissions benefits per process type).

For the various fuels (whether of biological origin or not), the GHG emissions intensity is estimated by means of an LCA, i.e. from 'well-to-wheel' or 'field-to-wheel'. For biofuels, only the direct effects of land use change are taken into consideration.

The reference values for petrol and diesel are taken from Part 2 of Annex I to Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels.



Overall, GHG emissions savings from the use of renewable energy in transport came to **5.9** and **6 m t CO₂eq** in **2015** and **2016** respectively.

11. Values and estimates for the excess/deficit production of energy from renewable sources compared to the indicative trajectory

Table 7: Actual and estimated excess and/or deficit (-) production of renewable energy compared to the indicative trajectory (ktoe)

| Sector | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 (provisional) | 2017 | 2018 | 2019 | 2020 |
|---|------------|-------------|-------------|-------------|-------------|-------------|--------------|-----------------------|----------|----------|----------|----------|
| Electricity | | | | | | | | | | | | |
| Hydropower | N/A | -34 | -154 | -220 | -176 | -200 | -365 | -433 | 0 | 0 | 0 | 0 |
| of which pumped | N/A | -32 | -28 | -63 | -57 | -20 | -111 | -139 | | | | |
| Geothermal | N/A | -12 | -11 | -14 | -14 | -17 | -19 | -21 | 0 | 0 | 0 | 0 |
| Solar | N/A | 9 | 119 | 265 | 289 | 345 | 410 | 430 | 0 | 0 | 0 | 0 |
| Tide, wave, ocean | N/A | -2 | -2 | -10 | -20 | -20 | -26 | -31 | 0 | 0 | 0 | 0 |
| Wind | N/A | -95 | -163 | -327 | -527 | -756 | -920 | -1123 | 0 | 0 | 0 | 0 |
| Biomass: | N/A | -70 | -48 | -100 | -213 | -294 | -353 | -366 | 0 | 0 | 0 | 0 |
| <i>solid biomass</i> | N/A | -77 | -53 | -109 | -217 | -280 | -328 | -322 | 0 | 0 | 0 | 0 |
| <i>biogas</i> | N/A | 7 | 6 | 9 | 4 | -14 | -25 | -44 | 0 | 0 | 0 | 0 |
| TOTAL Electricity (I)²⁶ | N/A | -171 | -230 | -343 | -603 | -923 | -1162 | -1406 | 0 | 0 | 0 | 0 |
| Heating and cooling | | | | | | | | | | | | |
| Geothermal energy (excl. heat pumps) | N/A | -53 | -67 | -82 | -110 | -150 | -188 | -215 | 0 | 0 | 0 | 0 |
| Solar | N/A | -20 | -35 | -50 | -134 | -216 | -304 | -389 | 0 | 0 | 0 | 0 |
| Biomass: | N/A | -392 | -2253 | -1363 | -775 | -2836 | -2920 | -2683 | 0 | 0 | 0 | 0 |
| <i>solid biomass</i> | N/A | -375 | -2247 | -1375 | -741 | -2781 | -2854 | -2605 | 0 | 0 | 0 | 0 |
| <i>biogas</i> | N/A | -16 | -6 | 11 | -34 | -55 | -66 | -78 | 0 | 0 | 0 | 0 |

²⁶Pumped hydro energy not included

| Sector | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 (provisional) | 2017 | 2018 | 2019 | 2020 |
|--|------------|-------------|--------------|--------------|--------------|--------------|--------------|-----------------------|----------|----------|----------|----------|
| Renewable energy from heat pumps: | N/A | 288 | 247 | 184 | 269 | 359 | 485 | 603 | 0 | 0 | 0 | 0 |
| <i>of which aerothermal:</i> | N/A | 293 | 294 | 279 | 384 | 497 | 642 | 788 | 0 | 0 | 0 | 0 |
| <i>of which geothermal:</i> | N/A | -5 | -47 | -95 | -115 | -138 | -157 | -185 | 0 | 0 | 0 | 0 |
| TOTAL Heating and cooling (II) | N/A | -178 | -2108 | -1312 | -750 | -2843 | -2927 | -2684 | 0 | 0 | 0 | 0 |
| Transport | | | | | | | | | | | | |
| Bioethanol//bio-ETBE | N/A | -156 | -159 | -147 | -156 | -136 | -116 | -76 | 0 | 0 | 0 | 0 |
| Biodiesel | N/A | -137 | -211 | -75 | -56 | 191 | 187 | 141 | 0 | 0 | 0 | 0 |
| Renewable hydrogen | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Renewable electricity | N/A | 0 | 10 | -2 | -33 | -41 | -41 | -54 | 0 | 0 | 0 | 0 |
| <i>of which road transport</i> | N/A | 0 | 0 | -10 | -9 | -19 | -28 | -37 | 0 | 0 | 0 | 0 |
| <i>of which non-road transport</i> | N/A | 0 | 10 | 8 | -24 | -22 | -13 | -17 | 0 | 0 | 0 | 0 |
| Others (vegetable oils, biogas, etc.) | N/A | 0 | 0 | 0 | 0 | -10 | -30 | -50 | | | | |
| TOTAL Transport (III) (excl. concessions) | N/A | -293 | -359 | -224 | -245 | 4 | 0 | -39 | 0 | 0 | 0 | 0 |
| TOTAL (I + II + III)²⁷ | N/A | -641 | -2708 | -1877 | -1565 | -3721 | -4048 | -4075 | 0 | 0 | 0 | 0 |

²⁷Renewable electricity in transport has been removed from the total in order to prevent it from being counted twice.

11.1 Details of statistical transfers, joint projects and joint support scheme decision rules

No statistical transfers or joint projects are planned at present, although France does not rule out their use in future.

12. 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

The share of biodegradable waste in all waste used for producing energy is set at 50 %, as suggested by Eurostat. Accordingly, no steps have been taken to improve estimates of this share.

Annex I – Review of renewable heating and cooling measures

Review of the 2015 and 2016 Heat Fund

The Heat Fund continued to prove very successful and effective. 344 investments benefitted from support from the Heat Fund in 2016, corresponding to a total investment amount of EUR 523 million, which will enable 180 ktoe/year (2 TWh/year) to be generated. This is cost-effective for the public authorities as it equates to an average cost of EUR 3.7/MWh produced over 20 years for the period 2009-2016.

1. Review of the 2015 BCIAT call for projects

The seventh BCIAT call for projects was launched in September 2014, with an indicative target of 125 000 toe. It enabled eleven new installations to benefit from support, amounting to 77 000 toe/year of production. The production objective was therefore not met, although output in 2015 exceeded that of previous years (67 000 toe/year for BCIAT 2014 and 73 000 toe/year for BCIAT 2013). The combination of low fossil fuel prices and low prices per tonne of CO₂ encouraged commercial energy users to wait rather than invest in renewable thermal energy.

2015 saw industrial concerns themselves submitting most files. This represented a change on previous years where files were essentially submitted by energy operators who had been experiencing a degree of difficulty in terms of their biomass supply and financing. Industry concerns submitted large-scale files which enabled waste wood found on-site to be recovered and for certain parties to provide industrial areas with heating networks.

Key figures

No of projects committed: 11

Total aid budget: EUR 47.5 million

Total thermal generation: 77 000 toe/year

Average aid ratio: EUR 30.8/toe over 20 years

2. Review of the 2016 BCIAT call for projects

Ten new installations were selected under the eighth BCIAT call for projects, amounting to 49 000 toe/year of production. With 66 installations in operation, annual heat production from biomass by BCIAT installations is currently in excess of 330 000 toe and should ultimately reach 680 000 toe once the projects under way have been completed.

Half of the projects selected are directly associated with the development of industries in the

wood sector. Their boiler systems will be chiefly powered using by-products generated and on a self-consumption basis. Other projects will enable energy to be recovered from waste wood and industrial by-products generated by commercial activity.

Key figures – BCIAT 2016

No of projects committed: 10

Total aid budget: EUR 29.5 million

Total thermal generation: 49 000 toe/year

Average aid ratio: over 20 years: EUR 30.1/toe over 20 years

3. Overview of the Heat Fund including calls for projects and regional aid

Over the period 2009-2016, ADEME committed EUR 1.7 billion in support to almost **4 000 measures**, generating a total investment amount of more than EUR 5 billion and production of 1.973 million toe/year (approximately 23 TWh/year).

The table below provides a summary of the different projects which have been granted support since the fund was set up and presents the effectiveness of public money invested in the Heat Fund, as highlighted by the Court of Auditors in its 2013 report.

| Key figures 2009-2016 | No of projects | Amount of eligible investment (EUR m) | ADEME aid (EUR m) | Toe RES/year | ADEME aid (EUR/toe over 20 years) |
|---|-----------------------|--|--------------------------|---------------------|--|
| BCIAT wood | 158 | 940 | 364 | 861 | 1.8 |
| Non-BCIAT wood | 870 | 1387 | 357 | 543 | 2.8 |
| Geothermal | 444 | 565 | 124 | 140 | 3.8 |
| Biogas | 71 | 314 | 48 | 95 | 2.1 |
| Solar | 1654 | 164 | 76 | 7 | 49.3 |
| Heating networks | 740 | 1716 | 586 | 265 | 9.5 |
| Waste heat recovery installations | 51 | 66 | 17 | 62 | 1.2 |
| TOTAL investment measures | | | 1572 | 1973 | 3.4 |
| Matching contribution under Geothermal | | | 35 | | |

| | | | | | |
|------------------------------|------|------|------|------|------------|
| Guarantee Fund | | | | | |
| Accompanying measures | | | 106 | | |
| Total | 3988 | 5152 | 1713 | 1973 | 3.7 |