



French Biomethane Roadmap and Proposed Action Plan for the Period up to 2030

Novembre 2013

Coordination technique : *Guillaume BASTIDE et Olivier THEOBAL*

Direction / Service :

Direction Economie Circulaire et Déchets / Service Mobilisation et Valorisation des Déchets



REMERCIEMENTS

The authors gratefully acknowledge the invaluable contributions to this report made by Valérie Borroni (RAEE), Caroline Marchais (ATEE), and Marie-Laure Charlot, Valérie Bosso and Anthony Mazzenga (GrDF)

En anglais :

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1 The situation in France

Approximately 100 anaerobic digestion (AD) plants were built and developed in France during the 1990s, mainly on on-farm sites or by agro-food companies. Less than ten years later, however, most of them had been either abandoned or destroyed. The main reasons invoked were the difficulties experienced by owners when attempting to maintain the units in operating condition, the multiplication of suppliers and the absence of adequate maintenance.

The real foundations of the biogas sector in France were laid in 2006 with the appearance of the new feed-in tariffs for electricity produced from biogas (approximately 13 eurocents/kWh for on-farm AD plants), together with the offer of added subsidies (representing about 30% of investment). The introduction of these two measures was the first step towards the development of biogas industry.

In 2011, the feed-in tariff for electricity was increased and a new feed-in tariff for biomethane was created.

Over the same period, specific laws were passed to promote and simplify biogas activity. The table below shows the main measures which have been adopted since 2006.

Table 1: Main new measures affecting the biogas sector between 2006 and 2011

Years	Economic tools	Legislative improvements
2006-2011	<ul style="list-style-type: none"> - Electricity feed-in tariffs €0.13/kWh - Subsidies: 30 % - Price for waste treatment: €30/tonne 	<i>Specific environmental regulations for biogas production ("ICPE")</i>
2011- present	<ul style="list-style-type: none"> - New feed-in tariffs: Electricity - €0.17/kWh Biomethane - €80-120/MWh HHV - Subsidies - Price for waste treatment: €10-20/tonne¹ 	<i>Regulation requiring biowaste from catering, small businesses, large retailers & wholesale markets to be recycled by anaerobic digestion or composting ("Décret gros producteurs")</i>

In 2013, 60 % of the French biogas production came from landfills. Sewage sludge was the second source of production, accounting for approx. 15 % of the biogas produced. The remaining biogas production came from industrial plants, municipal solid waste plants, on-farm plants and centralized plants.

¹ ADEME, 2010. *Note interne sur la rentabilité des installations de méthanisation avec les projets de nouveaux tarifs d'achat de l'énergie*

On-farm units and centralized units currently enjoy the fastest rate of growth, with 60 new plants per year in the former case and 10 new units per year for the latter. The relevant figures for the biogas sector in 2013 are shown in the table below.

Table 2: Type and number of plants in France 2013 - under specification of feedstock

Type	Number of plants in operation	Feedstock (biowaste/ agriculture/ sewage/ landfill)
Existing AD biogas plants in total	On-farm~120 Centralised~15 Industrial ~ 80 WWTP 60 Municipal ~10 Landfill 245	Manure Mix of organic waste Sewage sludge Biowaste Landfill material Crops and intermediate crops
Existing AD biogas green electricity installations receiving a feed-in tariff	135 green electricity on-farm and centralized AD plants ? green electricity WWTP and 90 landfills	
Existing thermo-chemical biogas plants	?	Forestry wood-chips
Existing biogas upgrading plants	4	Landfill/biowaste/ on-farm
Existing Upgrading plants injecting into the natural gas grid	3	Biowaste/ on-farm

Source: ADEME 2013

2 Biogas potential for 2030

2.1 Substrate production

In early 2013, ADEME published a study of biogas potential for 2030. The purpose was to evaluate the amount of substrates that would be available for the production of biogas. The aim was to use feedstock that were not in competition with food production (animal and human).²

The resources that were considered were:

- Household biowaste, waste water and green waste
- Agricultural resources: manure, intermediate crops for energy purposes and crop residues,
- The resources from agro-food industries (IAA) classified by sector
- Bio-waste from catering, small businesses, distribution and markets.

Resources were estimated in terms of different rates of production, such as kilograms of food waste per number of meals for restaurants; numbers of cows and pigs in France and their corresponding production of manure; and the production of organic waste by companies.

The amount of resources is estimated at 360 million tons and 200 GWh of Lower Heating Value (LHV).

Table 3: Potential of biogas feedstock

	<i>Resources, tonnes/year</i>	<i>Energy production, GWh/year LHV</i>
<i>Household waste</i>	<i>47 500 000</i>	<i>20 000</i>
<i>Manure</i>	<i>183 100 000</i>	<i>40 500</i>
<i>Intermediate crops</i>	<i>45 300 000</i>	<i>21 600</i>
<i>Crop residues</i>	<i>65 000 000</i>	<i>108 500</i>
<i>Agro-food companies, bio-waste from catering</i>	<i>19 300 000</i>	<i>11 900</i>
Total	360 200 000	202 500

3 Potential levels of feedstock use for biogas production in 2030

Not all of these resources can be mobilized, for various environmental, technical and financial reasons. For example, some waste production could be reduced by better consumption habits. Some waste from

²Study biogas deposit, ADEME, 2013.

<http://www2.ademe.fr/servlet/getDoc?cid=96&m=3&id=88252&p1=00&p2=05&ref=17597>

industries could be used for the production of new products. It could cost too much to harvest crop residues.

During the year 2013, a French study group³ analyzed these figures and proposed 2 scenarios for 2030:

1. a baseline scenario (low-level scenario)
2. a prospective or potential scenario (high-level scenario)

56 million tonnes of feedstock could be treated by AD under the low-level scenario, and 132 million tonnes with the high-level scenario. This result integrates value assessment in terms of major types of resources, economic and technical constraints and legislative mobilization.

Figures for these two scenarios are presented below.

Table4: potential for the low-level scenario

Feedstock	Resources mobilization, tons/year	GWh Low Caloric Value/y
Household waste	3 800 000	1 600
Manure	36 620 000	8 100
Intermediate crops	6 795 000	3 240
Crop residues	6 500 000	10 850
Agro-food companies, bio-waste from catering	2 509 000	1 547
Landfill biogas		5 000
Total Biogas	56 224 000	30 337

³ National biomethane group: GrDF, Club biogaz, Solagro, ADEME, RAEE

Table 5: potential for the high-level scenario

Feedstock	Resources mobilization, tons/years	GWh Low Caloric Value/y
House hold waste	7 400 000	3 100
Manure	95 500 000	22 000
Intermediate crops	13 600 000	6 500
Crop residues	13 400 000	22 800
Agro-food companies, bio-waste from catering	2 300 000	1 500
Landfill biogas		5 000
total Biogas	132 200 000	60 900

Estimated energy production levels would be:

- 30 000 GWh of raw energy for the first scenario
- 61 000 GWh for the second.

The difference is explained by the fact that conditions for biogas production are much better in the case of the high-level scenario than for the low-level scenario.

The potential for biogas substrate is mainly derived from agriculture: manure, crops and crop residues. **90 % of total biogas production derives from agriculture** in each scenario.

This biogas production could be used for heat, electricity or the production of biomethane.

4 Production of biomethane in 2030

In the low-level scenario, 40 % of the biogas production would be upgraded to biomethane and injected into the grid. The production of biomethane would be of **12 000 GWh** Lower Heating Value. 500 AD plants would produce biomethane.

In the high-level scenario, **31 000 GWh** (LCV) would be injected into the grid. By 2030, there would be **1 400** biomethane plants. In this scenario 50 % of biogas production would be upgraded.

Table 6: Production of biomethane and number of biomethane plants (high-level scenario).

Types	GWh biogas	% injection	GWh biomethane	m ³ /h biométhane	GWh for each plant	Number of BM plants
On-farm	33 795	22%	7 435	150	15	500
MSW	2 245	70%	1 572	500	50	30
Industrial	225	0%	0			0
Sewage sludge	695	90%	626	110	11	60
Centralised	18 940	95%	17 993	250	25	720
Landfill	5 000	60%	3 000	500	50	60
Total	60 900		30 625			1 370

5 Supportive measures for French biomethane development by 2030

9 main measures have been selected to improve the biomethane situation.

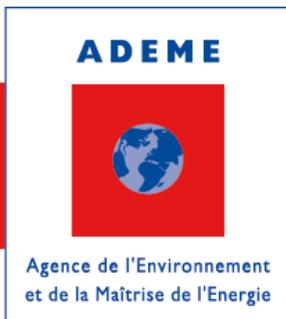
1. Create greater coordination between different French ministries (Agriculture, Environment, Industry and Finance ministries) in relation to biomethane. The best way would be to appoint a coordinator to engage in a range of initiatives concerning the biogas and biomethane industry. This person would need to have specialized knowledge of biogas technology and of viable solutions to promote it.
2. Review French fuel taxation, with an evaluation of the environmental impact of different scenarios.
3. Every four years, and whenever necessary, analyze the feed-in tariffs and adapt them to the current context. Feed-in tariffs could be modified if necessary. This decision will be made based on feedback from biogas plants.
4. Increase the lifetime of the feed-in tariff from 15 years to 20 years or 25 years, in the light of the actual life duration of biogas plants. Such measures will improve the facilities for obtaining bank loans, and will ensure the continuity of biogas production after 15 years.
5. Maintain research on anaerobic digestion technologies, biogas upgrading and biomethane injection. The research into biogas and biomethane needs to be conducted over a long, clear and visible time frame.
6. Standardization of interpretations and assessments between different regions and public services, e.g. concerning the use of animal by-products, injection of biomethane and bioCNG.
7. Include biomethane development as an objective in a future energy law for 2020 or 2030. Figures should be clearly defined and precise (in terms of the kind of energy recovery of biogas).
8. Develop training programs for biogas, biomethane and bioCNG (university, high school and technical school graduates).
9. Propose specific subsidies for the development of bioCNG filling stations. Call for action for 100 filling stations. This would be the first step towards bioCNG development.

ABOUT ADEME

The French Environment and Energy Management Agency (ADEME) is a public agency under the joint authority of the Ministry of Ecology, Sustainable Development and Energy, and the Ministry for Higher Education and Research. The agency is active in the implementation of public policy in the areas of the environment, energy and sustainable development.

ADEME provides expertise and advisory services to businesses, local authorities and communities, government bodies and the public at large, to enable them to establish and consolidate their environmental action. As part of this work the agency helps finance projects, from research to implementation, in the areas of waste management, soil conservation, energy efficiency and renewable energy, air quality and noise abatement.

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ADEME
20, avenue du Grésillé
BP 90406 | 49004 Angers Cedex 01

www.ademe.fr