IEA Bioenergy Task 37

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

France Country report

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iea Energy Technology Network

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Biogas Plant Inventory (2014)

	Number of plants	Electricity production (GWh)	Heat production (GWh)	Power installed (MW)
Sewage sludge	88	40	400	7
MSW	11	50	15	7
On-farm and centralized	210	460	530	66
Industrial	~80	10	350	1
Landfill	113	950	295	212
Total	**502**	**~1500**	**~1600**	**293**

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Biogas upgrading plants in operation (Oct. 2015)

Year	Aera - Region	Capacity (m^3/h biomethane)	Technology		Substrate
2009	Paris	100	PSA + membranes	Cirmac	MSW landfill
2010	Toulouse	40	PSA + membranes	VerdeMobil (Xebec)	MSW landfill
2011	Lille	200	water scrubber	Greenlane	biowaste from cities
2013	Forbach	50	membranes	Air Liquide	biowaste from cities
2013	Paris	145	membranes	Air Liquide	mix of agri and agro
2014	Nantes	95	PSA	VerdeMobil (Xebec)	agricultural waste
2014	Annecy	60	membranes	Prodeval (Evonik)	urban sludge
2014	Paris	140	membranes	MT Energie	intermediate crops and waste
2014	Paris	140	membranes	MT Energie	intermediate crops and waste
2015	Lille	85	water scrubber	Chaumeca	agricultural waste
2015	Troyes	140	membranes	MT Energie	intermediate crops and waste
2015	Troyes	200	membranes	MT Energie	intermediate crops and waste
2015	Clermont-Ferrand	35	membranes	Air Liquide	mix of agri and agro
2015	Le Touquet	130	membranes	Pentair Haffmann	mix of agri and agro
2015	Belfort	50	membranes	Prodeval (Evonik)	mix of agri and agro
2015	Rennes	50	membranes	Prodeval (Evonik)	mix of agri and agro
2015	Lille	360	membranes	Prodeval (Evonik)	MSW
2015	Strasbourg	185	membranes	Eisenmann (Evonik)	urban sludge

Green : injecting into grid
red : upgrading plant only, not injecting to grid

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Biogas Upgrading

- Table or a link to all Up-grading Plants including:
  see previous slide

- Annual production of biomethane : 200 GWh (50,000 Nm^3/a), 270-300 GWh (70,000 Nm^3/a) by the end of 2015
  guarantee of origin each MWh (12,000 delivered in 2014, incl. 75% as fuel vehicle and 25% given to groups of municipalities (collectivities)

- Existing LBG production plants : one pilot in operation on WWTP

http://www.ademe.fr/biognval-experimentation-preindustrielle-production-distribution-biomethane-carburant-liquefie-issu-biogaz-station-depuration

- Biological methanation plants and other power to gas installations connected to biogas plants: one pilot in operation on biomass (Gaya project)

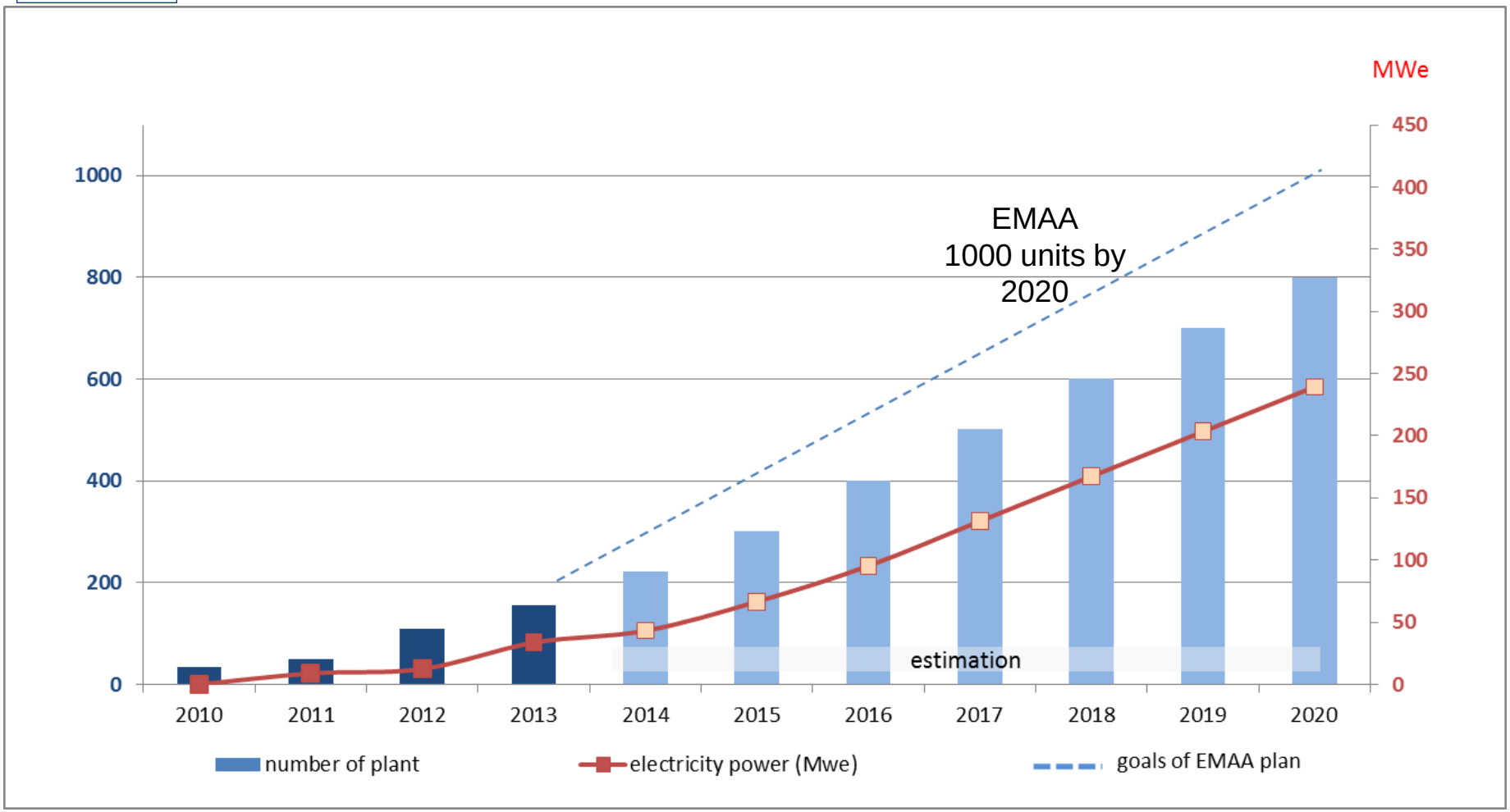
Biogas Trends

Trends in numbers of AD Plants:
see next slide

Potential biogas production 2020-2030 with specific conditions (e.g. what feedstocks)
see next slide

Trends in numbers of Up-grading Plants:
15-18 new sites to aim 30 units by the end of 2016

On-farm and centralized AD plant development forecast by 2020



2014 : 50 new plants/a → not sufficient to reach the aims

Potential biogas production by 2030

	Feedstock T/a	Energy production (GWh/a)
Municipal solid waste	47 500 000	20 000
Manure / Slurries	183 100 000	40 500
Energy and intermediate crops	45 300 000	21 600
Waste crops	65 000 000	108 500
Agrofood industry and cantine or supermaket waste	19 300 000	11 900
Total	360 200 000	202 500

Source : ADEME study, 2013

CNG use

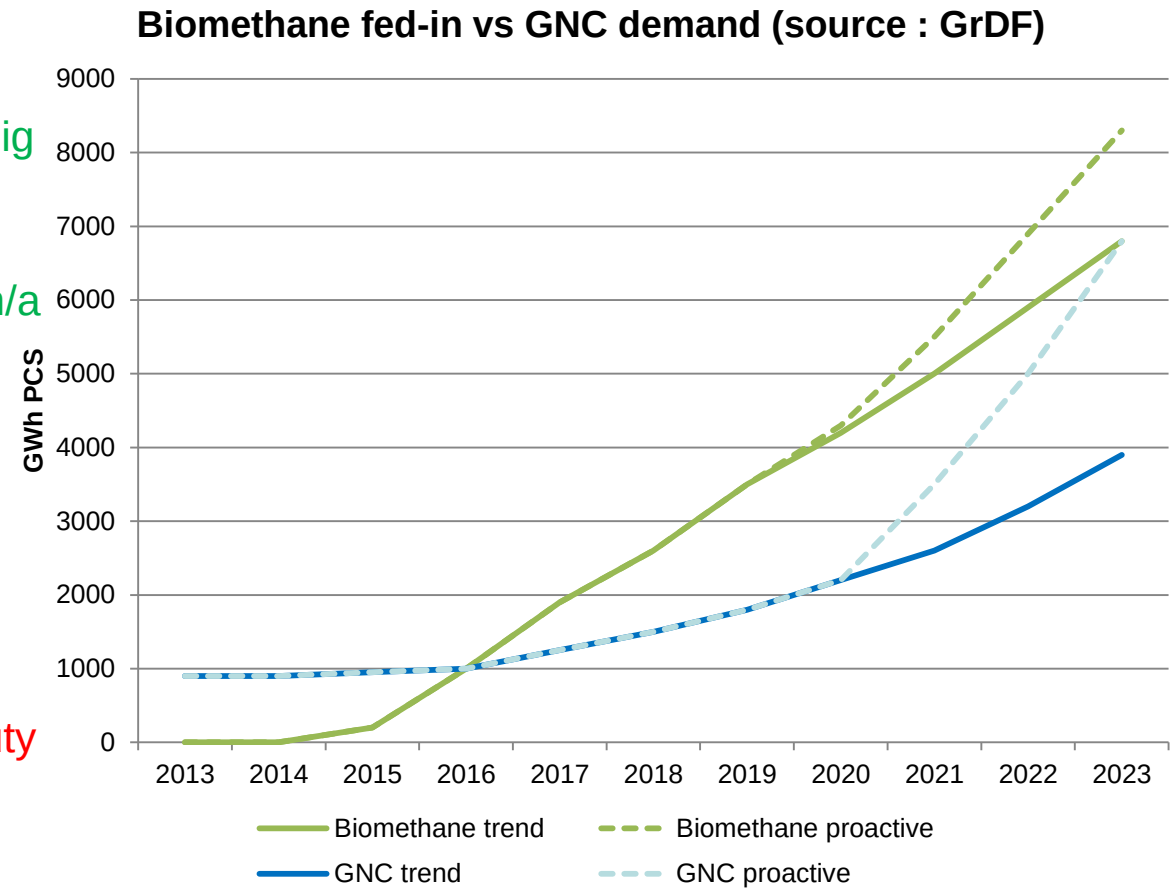
- CNG : in 2050 the gas will represent 45 % of energy consumed in transports with a big part of biogas
- 10% of green gas in the grid by 2030 – between 12 and 30 TWh/a representing several hundred sites

47 public filling stations

115 private stations for bus, municipal waste collection et supplying trucks

145 private stations for light and duty vehicles (collectivities)

12,000 vehicles



Digestate handling

Digestate utilisation

- The major part of the digestate is spread or dried, with or without phase separation
- Transformation of the digestate in an organic product by composting
- Homologation of digestate for sale (end-of-waste)

Ongoing development and trends and existing regulations

- Current discussion : make organic products from digestate
- The homologation of digestate is a relatively recent way

Financial Support Systems for Biogas

- Feed-in tariffs (on 15 years)
- paid by the consumer of electricity/gas
  - Electricity (2011) : 11 to 21 c€/kWhe
  - Biomethane (2011) : 4,5 to 12,5 c€/kWh HHV

- Investment grants : 25 % subsidies by
  - ADEME (15 %)
  - Regional councils and EU funds (10 %)

National Strategy

“To increase the development of AD by simplification and better economic results”

→Spring 2015 : creation of a National Biogas Committee incl. 4 WG

- tariffs (CHP)
- injection into the gas grid
- use biogas as GNC (LNG)
- Regulation and procedures

→Energy, Anaerobic Digestion and Nitrogen” Action Plan,

- Still in operation with target of 1000 units built in 2020
- an other new target is “1,500 projects of AD plant in 3 years

→Revision of FIT for electricity (in discussion)

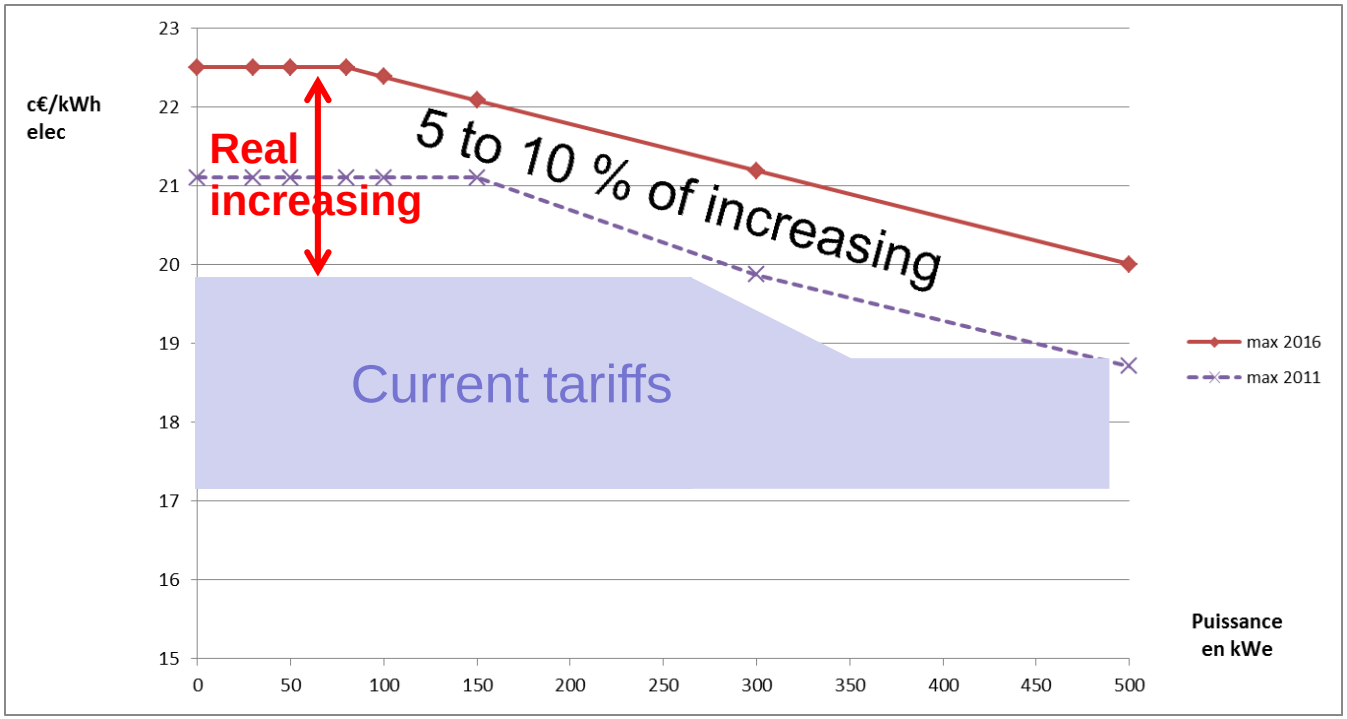
- contracts on 20 years
- increase the FIT to give a better return on investment
- cancellation of the energy recovery bonus
- priority to injection > 300 kWe

Change for electricity tariffs (in discussion)

Tariff elec 2011 = Basis Tariff (depending on the Elec. Power) + ~~Heat Bonus~~ Contract on 15 years + Bonus (taux d'effluent d'élevage)

New 2016 : increase of basis tariff and manure bonus, suppression of the heat bonus

Contract on 20 years



Performance and Economic Data

Investment costs AD

Economic study to obtain economics data (2013) from 34 plants for investment, and 23 plants for benefits and costs

- on-farm : 5,600 €/kWe
- centralized : 6,500 €/kWe

	On farm	Centralized
Costs/year		
€ HT/plant	90 126	696 700
€ HT/MWh élec.	67	102
€ HT/t/yr	13	22

	On farm	Centralized
Number of plant	26	8
Investment average (€ HT/plant)	**979 200**	**6 885 000**

	On farm	Centralized
Incomings/year		
€ HT/plant	202 051	1 275 479
€ HT/MWh élec.	149	186
€ HT/t/yr	30	39

Investment costs Upgrading (mean value observed on projects)

- 38,000 € Nm3/h

Obstacles and Challenges for the Biogas Development

- AD plant permitting :
  - 2 to 4 years between the first study and the operation
  - Sometimes the project stops before the operation
- Maturity of the biogas industry in France
- Adaptation of foreign technologies to the French context (ex : manure and waste in France against energy crops in Germany)
- Grid connections (electricity, heat, gas pipeline): injection of biomethane is depending on the grid gas consumption
- Digestate utilisation
- Sale of digestate

Biogas Research

Research Activities :

- Program “investments for the future” 2011&2014 :
  - LNG production from sewage sludge (BIOGNVAL project, CryoPur technology)
  - Injection of biomethane from landfill (WAGABOX1 project, Waga Energy technology)

- Call for tenders DOSTE 2015 : promote the use of digestate, organic elements and energy from biogas

- Call for tenders Sustainable Energy (Oct. 2015) : promote the production of energy from biogas and the cleaning of biogas (upgrading) by new technologies