French Report

French Environment and Energy Management Agency
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Biogas Plant Inventory

**AD plants in operation** (ADEME, 2010):

- Industrial: 88
- Sewage sludge: 74
- MSW: 7 (3 biowaste & 4 grey waste)
- On-farm: 30 (average of 150 kWe, 7000 t)
- Centralised: 4 (average of 1,1 MWe, 25 000 t)
- Landfill: 262 inc. 71 with energy valorisation
On farm AD and centralised AD in France, 2010
Up-grading plants in operation:

- 1 landfill: 200 m³/h (PSA and membranes)
- 1 biowaste (Lille): 1,200 m³/h (water scrubber)
- 1 municipal sludge (Lille-Marquette): 100 m³/h (water scrubber)
Trends of AD plants (E&Young study for ADEME, 2010):

• Trends in numbers of up-grading plants: arr. 20 (landfill & on-farm)

- Trends in numbers of others AD plants in 2020:
  + 60 industrial (88 to 150)
  + 60 municipal sludge (74 to 134)

- Trends in numbers of up-grading plants: arr. 20 (landfill & on-farm)
Gas production 2008 (French Ministry for Environment and Energy, 2009):

- Raw biogas production: 3,300 GWh
- Energy production: 1,290 GWh
- Electricity production: 660 GWh inc. 77 GWh CHP
- Amount of heat recovered: 630 GWh inc. 70 GWh CHP
- Up-graded to biomethane (2010)
  - Amount injected to natural gas pipeline: 0 Lille: in some weeks of injection
  - Amount used as vehicle fuel: arr. 0
  10 vehicles and 1 MSW collecting truck
Performance data (French Ministry for Environment and Energy, 2009):

- electrical efficiency : 15,0 %

- total energy efficiency : 39,1 %

- emissions : nd
Economic Data:

- *Investment costs*
  - on-farm AD and centralised:
    - 8 600 €/kWe for 100kWe
    - 5 600 €/kWe for 500 kWe
    - 5 200 €/kWe for 1MWe
  - MSW AD: 540 €/t treated

- *Up-grading*

- *Operating Costs*
Economic Support Data:

- Electrical feed-in tariffs
  - between 8c€ to 15c€/kWh
  - In the future: between 8c€ to 20 c€/kWh → 2011?

- Up grading feed in tariffs
  - In the future: between 55 € to 123 €/MWh → 2011?

- Investment grants
  Environment agency: until 30% of the investment limited to 10 M€, namely 3 M€
  Agricultural ministry: until 375 k€/project on-farm AD
  European funds
National Strategy/Support for Exploitation of Biogas:

- **Waste fund (ADEME)** → new AD
  - **24 projects in 2009**: 6 millions €
    - mainly AD animal by-products and organic waste

- **Renewable Heat Fund (ADEME)** to promote
  - use of heat, biogas transport and grid injection
  - **5 projects in 2009**: 500 k€
    - 3 large AD (organic waste and sludge)
    - 1 transport of raw biogas from landfill to a furnace
    - 1 landfill biogas valorisation (in operation)

- **National Work Group** (ADEME and GrDF the national grid operator) on up-grading and grid injection: definition of technical specifications to inject biomethane into the grid and feed-in tariff
Challenges:

• Performances of AD plants

• Digestate utilisation

• Grid connections (electricity, heat, gas pipeline)
Research Activities:

- Differents AD projects:
  - evaluation of 11 AD plants (on farm, centralised, food industries, and sewage sludge)
  - extraction of organic mateer from nappies and utilisation in sewage sludge AD,
  - possibility to use waste from oil industries in AD

- Biogasmax with Lille City

- Up-grading by PSA and membranes: test for low and high capacities (landfill, on-farm), different kinds of membranes

- Technologies to remove siloxanes from landfill gas

- Lyfe Cycle Analysis on crop biogas production

Etc.