



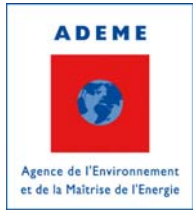
IEA Bioenergy Task 37

French Report

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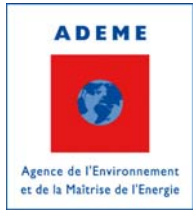
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Biogas Plant Inventory

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

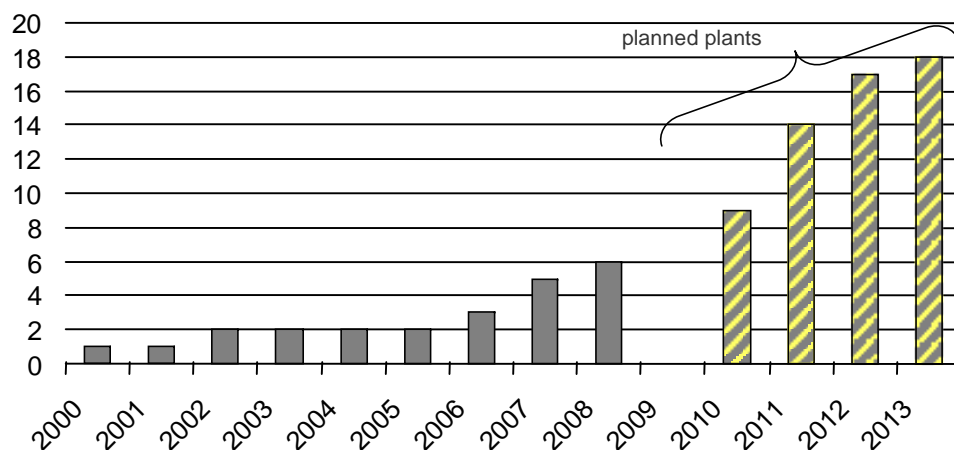


Up-grading plants in operation :

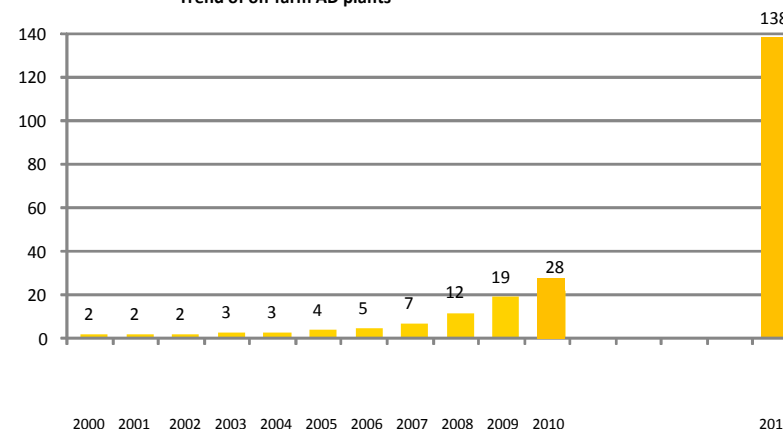
- 1 landfill : 200 m³/h (PSA and membranes)
- 1 biowaste (Lille) : 1.200 m³/h (water scrubber)
- 1 municipal sludge (Lille-Marquette) : 100 m³/h (water scrubber)

Trends of AD plants (E&Young study for ADEME, 2010) :

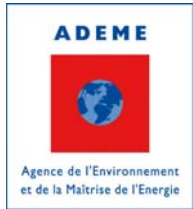
Trend of MSW AD plants since 2000



Trend of on-farm AD plants

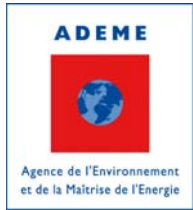


- Trends in numbers of others AD plants in **2020** :
+ 60 industrial (88 to 150)
+ 60 municipal sludge (74 to 134)
- Trends in numbers of up-grading plants : arr. 20
(landfill & on-farm)



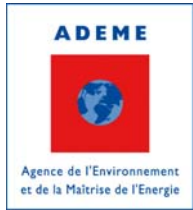
Gas production 2008 (French Ministry for Environment and Energy, 2009) :

- 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



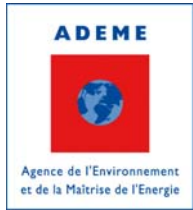
Performance data (French Ministry for Environment and Energy, 2009) :

- 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*



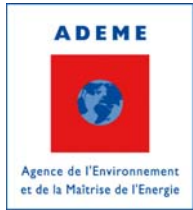
Economic Support Data :

- 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

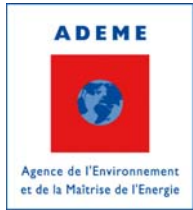
5 projects in 2009 : 500 k€

3 large AD (organic waste and sludge)

1 transport of raw biogas from landfill to a furnace

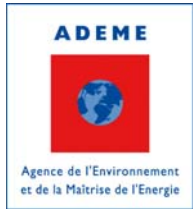
1 landfill biogas valorisation (in operation)

- **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 :

- Different AD projects :
 - evaluation of 11 AD plants (on farm, centralised, food industries, and sewage sludge)
 - extraction of organic matter 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
- Life Cycle Analysis on crop biogas production

etc.