Comparative assessment of framework conditions for biogas production in Norway and Denmark

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Comparative assessment of framework conditions for biogas production in Norway and Denmark

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Biogas production in Norway and Denmark

Ref: IEA task 37 2013
Biogas production in Norway and Denmark

Export of organic waste
Biogas production in Norway and Denmark

Feedstock in Denmark

- Sewage sludge
- Biowaste
- Agriculture
- Industrial
- Landfill

Biogas production:
- Norway
- Denmark

Graph showing biogas production in GWh/year for Norway and Denmark.
Biogas production in Norway and Denmark

Feedstock in Denmark
- Sewage sludge
- Biowaste
- Agriculture
- Industrial
- Landfill

Feedstock in Norway
- Sewage sludge
- Biowaste
- Agriculture
- Industrial
- Landfill
Utilization of biogas

Utilization of biogas, Denmark

- Electricity: 69%
- Heat: 21%
- Vehicle fuel: 10%
- Flare: Unknown

Comparison with Norway
Utilization of biogas

Approximately 60% of the biogas is used at the production plants.

Utilization of biogas, Denmark
- Electricity: 69%
- Heat: 21%
- Vehicle fuel: 10%
- Flare: 2%
- Unknown: 9%

Utilization of biogas, Norway
- Electricity: 53%
- Heat: 19%
- Vehicle fuel: 18%
- Flare: 9%
- Unknown: 2%
Utilization of digestate

No statistics found

General impression:

• Denmark: Fertilizer
  (restrictions on sewage sludge)

• Norway: Normally dewatered and composted
  New plants: Fertilizer
Framework conditions

- Demography (logistics) and population density
  - Norway: 13 inhabitants/km²
  - Denmark: 128 inhabitants/km²

- Farm sizes
  - Average livestock units per farm
    - Norway: Small farms: 23 Large farms: 61
    - Denmark: Small farms: 86 Large farms: 681

- Organic waste
  - Norway: about 2/3 of inhabitants have source separation of organic waste
  - Denmark: ?

Ref: Eurostat
Share of renewables in gross final energy consumption, 2012 and 2020 (%)

(1) Legally binding targets for 2020.
(2) 2012: estimate.
Source: Eurostat (online data code: t2020_31)
Share of renewable fuels for transport

Source: Eurostat (online data code: tsdcc340)
Transport fuel prices
Financing the biogas support in DK

- Support to biogas for CHP is provided as support for the electricity output, which is financed via the PSO payments of all electricity consumers - *main driver*
- Support to upgraded biogas will be financed via PSO payments of all natural gas consumers - *main driver*
- Investment support for manure based biogas plants is financed by the government budget (only temporary *main driver*)

- Indirect support is provided through the regulation of farmers input use and manure treatment (manure, fertilizer, nitrogen, phosphor) - *minor effect*
Regulatory incentives in Norway

• Banned landfilling of biodegradables from 2009.
• Investment support for biogas plants
• Tax exemption for transport purposes

• Local initiatives: Østfold County tender for bus transport: Biogas as fuel
Large scale biogas plant in DK based on manure and upgrading biogas to grid (BioChain case)

- Output related costs
- Opex
- Capex
- Transport
- Invest support
- Gas subsidy
- Net digestate-feedstock
- Market revenue (Gas, electricity, heat)

Average annual income Scale
500 000 t/annually input

Average annual cost Scale
500 000 t/annually input
Large scale biogas plant in NO (organic waste) – preliminary results

Average annual income

- Market revenue (gas, electricity, heat)
- Gas subsidy
- Net digestate feedstock
- Gate fee waste
- Invest support
- Transport
- Capex
- Opex
- Output related costs

Average annual cost

- Market revenue (gas, electricity, heat)
- Gas subsidy
- Net digestate feedstock
- Gate fee waste
- Invest support
- Transport
- Capex
- Opex
- Output related costs
Revenue composition in DK (BioChain case, new support) and Norway

- **DK**: Invest support (60%), Gas subsidy (20%), Net digestate feedstock (20%), Market revenue (gas, electricity, heat) (10%), Gate fee waste (0%)
- **NO**: Invest support (60%), Gas subsidy (20%), Net digestate feedstock (20%), Market revenue (gas, electricity, heat) (10%), Gate fee waste (0%)
Comparison on the drivers for biogas development in Norway and DK

• Biogas development in DK is driven by the high support level for upgraded biogas to natural gas grid
• The risk involved in CHP based projects are higher even though support is at similar level as for upgrade
• For a limited amount of time the additional investment subsidy (manure) triggered the fast expansion
## Biogas in Denmark and Norway

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