Biogas Situation in the Netherlands

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Focus on sustainability, innovation and international
Contents

- State of the art in biogas development; statistics
- Approach Green Gas production with Gas Grid injection
- Results of evaluation of the biogas sector in NL during 2011
- Legislation (feed-in tariff system and law on fertilizers)
Share and target Renewable Energy The Netherlands

- Av. 1990-2000 (Realisation): 1.2%
- Av. 2001-2002 (Realisation): 1.5%
- Av. 2003-2004 (Realisation): 1.7%
- Av. 2005-2006 (Realisation): 2.4%
- Av. 2007-2008 (Realisation): 3.1%
- Av. 2009 (Realisation): 3.7%
- Av. 2011-2012 (Target): 4.7%
- Av. 2013-2014 (Target): 5.9%
- Av. 2015-2016 (Target): 7.6%
- Av. 2017-2018 (Target): 9.9%
- 2020 (Target): 14.0%
Development of biogas production

- Co-digestion input contains a minimum of 50% of animal manure
- Sewage sludge
- Other biomass
- Landfill

Types of biomass:
- Stortplaatsen
- RWZI
- Co-vergisting van mest
- Overig

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Distribution of bioenergy projects (www.b-i-o.nl)
Ambition for Green Gas (vision document Dec. 2007 ppc group)

Short-term target: 1-3% replacement of natural gas by upgraded biogas
Mid-term target: 8-12% replacement of natural gas in 2020 (4 billion Nm3/y), inclusive SNG production from biomass
Long-term: Up-scaling to 50% replacement of natural gas by Green Gas in het gas grid
THE GREEN GAS CHAIN
20 ROUTES TO GREEN GAS
GREEN GAS WORKING GROUP / NEW GAS PLATFORM

1. FERMENTER
2. WASTE PROCESSOR
3. WATER PURIFICATION COMPANY
4. AGRICULTURE
5. GLASS HORTICULTURE
6. FARMER
7. FOOD INDUSTRY
8. BIOFUEL
9. MANURE
10. CO2 FROM GREENHOUSES
11. GREEN RESIDUE
12. USE HEAT LOCALLY
13. USE ELECTRICITY + HEAT LOCALLY
14. ELECTRICITY
15. COMPANY/ORGANISATION
16. HOUSEHOLDS
17. LOCAL BIOMASS
18. DIGESTATE
19. VIRTUAL
20. FILLING STATION

Biomass Gasification
High Pressure Network
Direct Supply
Importing Biomass

Virtual
Virtual
Virtual
Milestones in Green Gas production: Approach Green Gas development in NL

- Medio 2006: start of a working Group “Green Gas” in a public-private-cooperation model
- December 2007: Publication of a Vision Report with general conclusions on ambition and pre-conditions for the development of a Green Gas market
- April 2008: First Publication of a stimulation programme (SDE) with feed-in tariff for biogas upgrading and gas grid injection
- July 2009: Operation of virtual trade system for Green Gas certificates
- December 2009: Installation of a Governmental speed-up team to “solve” legislative barriers for Green Gas development
- January 2010: Publication of an Action Plan
- March 2011: first publication of the speed up team Green Gas
- December: 2011: second release report speed-up team
Approach of speed-up team Green Gas (in the production chain)

**Biomass**
- manure
- cosubstrates

**Digester**

**Biogas-upgrading**
- vpsa
- Gaswah
- Cryogenic
- membrane

**Gridaccess**

**Consumer Green Gas**
- Industry
- Horticulture
- Households
- Mobility

**Permits and spatial planning policy**

**SDE and gasgrid access**

**Access bioticket trade; excise duties**
Approach in legislation

**In fertilizer act:**
Positive list of biomass which can be used as co-substrate in co-digestion
Alternative route for proving avoidance of environmental risks of digestate application as fertilizer (summer 2012; based on a quality assurance system)

**Energy law:**
Feed-in subsidy: biogas in CHP application max. 15 €ct/kWh, but a bonus possible if produced heat is used effectively (until now about 140 MWe)
Feed-in tariff biogas upgrading with grid injection max. 62 €ct/Nm$^3$ co-digestion (until now: 300 miljon Nm$^3$/y).

New approach (2012): Support by government based on green deals approach (leading approach is the private initiative).
Evaluation of the biogas sector in the NL in 2011

class A: co-digestion < 500 kWe

class B: co-digestion between 500 and 1000 kWe

class C: co-digestion ≥ 1000 kWe

class D: other digestion (no co-digestion of manure)
Distribution of the average annual input in the AD-sector in NL
Input distribution only of co-digesters

- Manure: 35%
- Food waste: 52%
- Energy crops: 12%
- Industrial waste: 11%
- Agricultural waste: 14%
- Household waste: 23%
- Not defined: 6%

Outer ring: Distribution based on amount treated per year
Inner ring: Distribution based on contribution to total biogas production
Disposal routes for the different end products. The figure also represents the mass distribution of the different end products of AD.
Distribution of the end products over the different disposal routes per class

- For Class A, 62% is internal use, 38% is external use - the Netherlands, and 0% is external use - foreign countries.
- For Class B, 48% is internal use, 18% is external use - the Netherlands, and 2% is external use - foreign countries.
- For Class C, 54% is internal use, 22% is external use - the Netherlands, and 2% is external use - foreign countries.
- For Class D, 98% is internal use, 2% is external use - the Netherlands, and 0% is external use - foreign countries.
- For the Total sector, 25% is internal use, 60% is external use - the Netherlands, and 15% is external use - foreign countries.
## Tonnage disposed of in 2010 by the participating co-digesters as function of the input mixture

<table>
<thead>
<tr>
<th>Type of manure in input</th>
<th>Internal use (ton/year)</th>
<th>External use the Netherlands (ton/year)</th>
<th>External use foreign countries (ton/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 80% pig manure\textsuperscript{1}</td>
<td>77 701</td>
<td>347 523</td>
<td>196 677</td>
</tr>
<tr>
<td>&gt; 80% cattle manure\textsuperscript{1}</td>
<td>269 127</td>
<td>205 040</td>
<td>20 350</td>
</tr>
<tr>
<td>mix of pig and cattle manure</td>
<td>39 800</td>
<td>103 530</td>
<td>0</td>
</tr>
<tr>
<td>Sum of all co-digesters</td>
<td>386 628</td>
<td>656 093</td>
<td>217 027</td>
</tr>
</tbody>
</table>

\textsuperscript{1} expressed on total share of manure

\textsuperscript{1} Focus on sustainability, innovation and international
Distribution of the different operating costs in function of the year of construction of the installation
Profit/loss of the representative installations during the last 3 years
Overview of the most mentioned categories of bottlenecks with the participating AD-operators

- Quality of co-products: 9%
- Financing: 9%
- Knowledge: 12%
- Utilisation of heat: 12%
- Permits: 14%
- Electricity price: 21%
- Policy / issuing of rules: 28%
- Subsidy legislation: 55%
- Manure legislation: 64%
- Positive list: 87%
Distribution of main biomass resources

Legend for translation:

Pluimveemest = Chicken manure
Drijfmest = manure slurry (pigs en cows)
GFT = municipal biowaste

In NL: no focus on energy crops
Dutch approach to develop a competitive Green Gas sector

Developing innovation contracts:
- Digester type 1.0
  Optimisation of performance and sustainability
- Digester type 2.0:
  With combination of applications in the production chain, for example: biogas hubs or increasing efficiency in combination with district heating systems.
- Digestor type 3.0:
  Close the loop in the digestion chain (cradle to cradle approach) including fertilizers in manure and co-substrates.
Increasing E-efficiency by installing an ORC-unit
Good practice example
(Biogas project Polderwijk Zeewolde with 5 km biogas pipeline to the nearby village)
Concept

Manure → Anaerobic digestion → Separation → Reverse osmosis → Water

<table>
<thead>
<tr>
<th>Output</th>
<th>Solid fraction</th>
<th>Liquid fertilizer (N and K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Less transport</td>
<td>Nutrient recycling</td>
</tr>
<tr>
<td>Heat</td>
<td>Transport P-recycling</td>
<td>Water re-use</td>
</tr>
<tr>
<td>Green gas</td>
<td>Input bio-based economy</td>
<td></td>
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</tbody>
</table>

Revenues

<table>
<thead>
<tr>
<th>Renewable energy Production</th>
<th>Less transport P-recycling Input bio-based economy</th>
<th>Nutrient recycling Water re-use</th>
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</thead>
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<tr>
<td>Reduction Greenhouse gases</td>
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Vision Agriculture sector: Two possible pathways for the future
- small scale digestion on farms
- manure treatment with mineral recovery (including digestion?)
- Discussions of the use of recovered minerals as artificial fertilizer in the future (now in pilot phase)
Treatment of digestate UF and reverse osmosis
Small scale digester based on mono (manure) digestion (+/- 40 kWe)
Total view of the farm with a “microferm” digester
Other pathways for using biogas:
Filling stations biofuels (blue and green with gas supply)
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