Case study: Solrød Biogas

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Solrod / Solrød
Experience of Solrod Municipality

- **Background**
  - National and regional support
  - Political

- **Development of the plant**
  - Local energy leadership and
  - Triple helix - multi stakeholder

- **The biogas plant**
  - The process and the organization

- **Basic principle**
  - Mutual benefits
Strong expansion of biogas plant in Denmark

- **Larger plants**
  - From less than 50 TJ/year to typically 200-400 TJ/year
  - Or:
    - From 14,000 MWh/year to typical 56,000-112,000 MWh/Y
  - The biggest:
    - Around 348,000 MWh/year

- **Several types of installations:**
  1. Biogas joint plant
     - Manure
     - Industrial plants
     - Mix plant
  2. Individuel farm biogas plant
  3. Industrial plants
  4. Wastewater treatment plants
Unlocking the potential of biogas for Cities and Regions

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The 12 December 2018

Regional actions
Now and in the future • Region Zealand

Existing biogas plants
Estimated production
2017: 280,000 MWh

250,000

200,000

150,000

100,000

50,000

0

Landfield biogas
Farm biogas
Wastewater
Industrial plants
Novo, CPKelco, Sugarfactory

Biogas plants
Biogas fællesanlæg
Hashøj
Nysted
Snertinge
Solrød
Kalundborg

72%
Local energy leadership
From Heating plan — Climate action Plan / SEAP — To a number of projects

Continuous processes .......

A starter
COM Action Plan
Actions: COM projects
Solrod: The CoM action plan

Greenhouse gas reduction in short (2014) and long term (2025):
- Starting point: 143,800 tons
- Without doing nothing: 161,700 tons (in 2025)
- Goal for 2025: 72,800 tons (in 2025)

Reduction of greenhouse gases
Solrød Municipality (whole)

Emissions in 2007: 133,900 tons
Business as usual: 161,700 tons

Reduction:
Objective:
Emission in 2025: 72,800 tons
Reduction 2007-2025: 61,100 tons
Achieved reduction:
From 2007-2016: 52,028 tons
Missing:
Period 2017-2025: 9,072 tons
Triple helix - creation of local involvement

- Authority (municipality)
- Enterprises (energy, etc.)
- Knowledge institutions

The municipality
Three main roles
- Authority
  (State Representative)
- Entrepreneur
- Energy producer and consumer

Companies
- Private companies
- Municipal company
- Associations

Knowledge
- Knowledge institution
- Advisors
- R & D institutions (universities)

See the timeline and the Involvement schemes at next page:
### Stakeholders

- Creating stakeholder involvement through the planning & construction process

### Operation & Ownership:
- Owned by the Municipality
- Operated by Bigadan A/S
- Biogas engine owned and operated by VEKS

### Results of survey:
- Large gas yield. Additional biogas surveys

### Authority approval 2010-14. Grants from the Regional Fund

### Subsidies from the EU for preparing turnkey contracts PDA

### The plant completed
- Official opening
- Production starts
**Biogas - raw materials**

**Designed for 191,000 tons**

<table>
<thead>
<tr>
<th>Biomass</th>
<th>Amount (tons)</th>
<th>Biogas (%)</th>
<th>Main contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure (cattle, pig)</td>
<td>44,200</td>
<td>9.5%</td>
<td>Gas production and process stability</td>
</tr>
<tr>
<td>Seaweed - local beach</td>
<td>7,400</td>
<td>0.5%</td>
<td>Nutrients and improved water quality</td>
</tr>
<tr>
<td>CPKelco: Pectin, carrageenan</td>
<td>79,400</td>
<td>75.0%</td>
<td>Gas production</td>
</tr>
<tr>
<td>Chr.Hansen: Eluat *</td>
<td>60,000</td>
<td>15.0%</td>
<td>Gas production og nutrients</td>
</tr>
<tr>
<td><strong>Ialt</strong></td>
<td><strong>191,000</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Eluate from lactic acid production
Supplies - involvement

Landbruget skal levere gylle og aftage afgasset biomasse fra Solrød Biogas

CPKelco skal levere restprodukter fra pektinproduktionen til Solrød Biogas
Supply from CPKelco - involvement of companies

- Lemon
  - Juice (100 g)
- Lemon Peel
  - (100 g)
- Fried Peel
  - (13 g)
- Pectin
  - (3 g)
- Marmelade
  - (1500 g)

Restprodukt (10 g)
91,000 tons to Solrød Biogas

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District heating system - local support

**Goal** from 68% fossil today to 0% in 2025

New heat sources
- CHP Køge (wood)
- Biogas Solrød
- Wood pellets
- Industrial sources

30% more district heating

**Fuel:** Going from abroad to the hinterland
The biogas plant
From feasibility to plant

The process was organized in three phases

**Phase 1**
Initial phase
- possible ideas
- possible potential
- possible needs
- determination of cooperative relationships

Completed for the mentioned project proposals

Next phase →

**Phase 2**
Project development
- Specification of plant design
- Permits and regulatory approvals:
  - The Danish Planning Act
  - The Danish Environmental Protection Act
  - The Danish Heat Supply Act, etc.
- Supplier contracts (raw materials and output (gas, power, heat, by-products, etc.))
- Ownership – clarification

→ Possible tender → Next phase

**Phase 3**
Construction contract
- construction of plant
- construction inspection
- initialisation
- guarantees
- etc.

Solrød Biogas Ltd.

PUBLIC-PRIVATE COOPERATION

COMPANY-PRIVATE
Process and flow - biogas Solrød
From feasibility to plant

--- Phase 1 ---
Feasibility study 2010

--- Phase 2 ---
EIA, Permit, local plan 2011-12
Fase 2a - public approvals
Fase 2b - design & tender

--- Phase 3 ---
Solrød Biogas plant
Building period 2014-2015
Organized as a limited company
with public and private partners

Public private partnership - From public to private
Benefit of the biogas plant
Win-win situation for all stakeholders

First of all: Production of renewable energy

Local benefits form the biogas plant:
- Odors: Solve problems with odors from seaweed & algae by removing the seaweed and use it in a biogas plant
- Climate: Contribution to solve the climate problem: Using seaweed and organic waste from Kelco in a biogas plant will contribute to reduce the use of fossil fuels in the energy consumption in the area
- Nutrients: Contributing to solve problems with marine pollution. Removing the seaweed of the Køge Bay will diminish the load of nutrients, which today is a major problem of the aquatic environment
- Fertilizer: Contribute to useful nutrients. The residues from the gas plant will be used for fertilizer to replace chemical fertilizer.

Company benefits form the biogas plant:
- Two of the involved companies will benefit from use of more renewable energy, because of the restrictions caused by CO2 allowances and energy taxation
- And all companies will of course also benefit from community reputation from their contribution to mitigate the greenhouse gasses
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The local benefit - removing the seaweed.
The same day - after ....

Thank you for your attention