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) Individuell farm biogas plant
  3) Industrial plants
  4) Wastewater treatment plants
Unlocking the potential of biogas for Cities and Regions

Case study: Solrød Biogas
The 12 December 2018

Regional actions
Now and in the future • Region Zealand

Existing biogas plants
Estimated production
2017: 280.000 MWh

Biogas plants
Biogas fællesanlæg
Hashøj
Nysted
Snertinge
Solrød
Kalundborg

Industrial plants
Novo, CPKelco, Sugarfactory

Landfield biogas
Farm biogas
Wastewater

250.000
200.000
150.000
100.000
50.000
0

North Sugar
Gasfabio
CPKelco
Varpelev
Lolland
Nysted Biogas
Nordic
Novo Nordisk
Hashøj
Kalundborg
Snertinge
Ringsted
Solrød Biogas
Vordingborg
AP Grønt

National strong support

Existing plants
Industrial plants
New plants?
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

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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

Organisation and involvement

Companies
- Private companies
- Municipal company
- Associations

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

Triple helix:
- not created in advance
- but developed through the process

See the timeline and the Involvement schemes at next page:

Unlocking the potential of biogas for Cities and Regions
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The biogas plant in Solrød was a collaboration of local farmers and the municipality. The plant was initially researched and funded through grants from the Regional Fund. The research was conducted at the Research Center Foulum, Aarhus University. The plant was built by Bigadan A/S and operated by VEKS. The project received subsidies from the EU for preparing turnkey contracts, and the cost was covered by the Regional Fund. The plant was officially opened in 2014, and operations started in 2015.

Timeline:
- **2008**: Initial research of seaweed. Grants from Regional Fund.
- **2009**: New climate plan in Solrød (55%). Biogas on seaweed.
- **2010**: Results of survey: Large gas yield. Additional biogas surveys.
- **2014**: Solrød Biogas formed as A/S Contract concluded.
- **2015**: Bigadan selected as total contractor plus 5 years operation. Production starts.

**Stakeholders**
- Solrød Kommune
- Minister
- Mayor
- Commission
- Operation & Ownership:
  - Owned by the Municipality
  - Operated by Bigadan A/S
  - Biogas engine owned and operated by VEKS
- Local farmers pig & cattle
- Roskilde University
- Foulum, Aarhus University
- District heating transmission company
- Solrød Biogas - helt naturligt
- CHR Hansen
- CP Kelco
- Bregentved
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>Ialt</td>
<td>191,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Eluate from lactic acid production
Supplies - involvement

Landbruget skal levere gyllle og aftage afgasset biomasse fra Solrød Biogas

CPKelco skal levere restprodukter fra pektinproduktionen til Solrød Biogas
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Important support - district heating

Solrød District heating
Biogas engine
Heat and power

Solrød Biogas
CPKelco
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
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
The local benefit - removing the seaweed.
The local benefit

The same day - after ....

Thank you for your attention