



**Introduktion til Biometan Regions – indtryk fra
Part 1 – Treforest, South Wales in Maj 2011
Part 2 – København, Denmark in November 2011**

Følgende slides viser hovedtendenserne indenfor
biogasudviklingen i Europa. se også

www.bio-methaneregions.eu

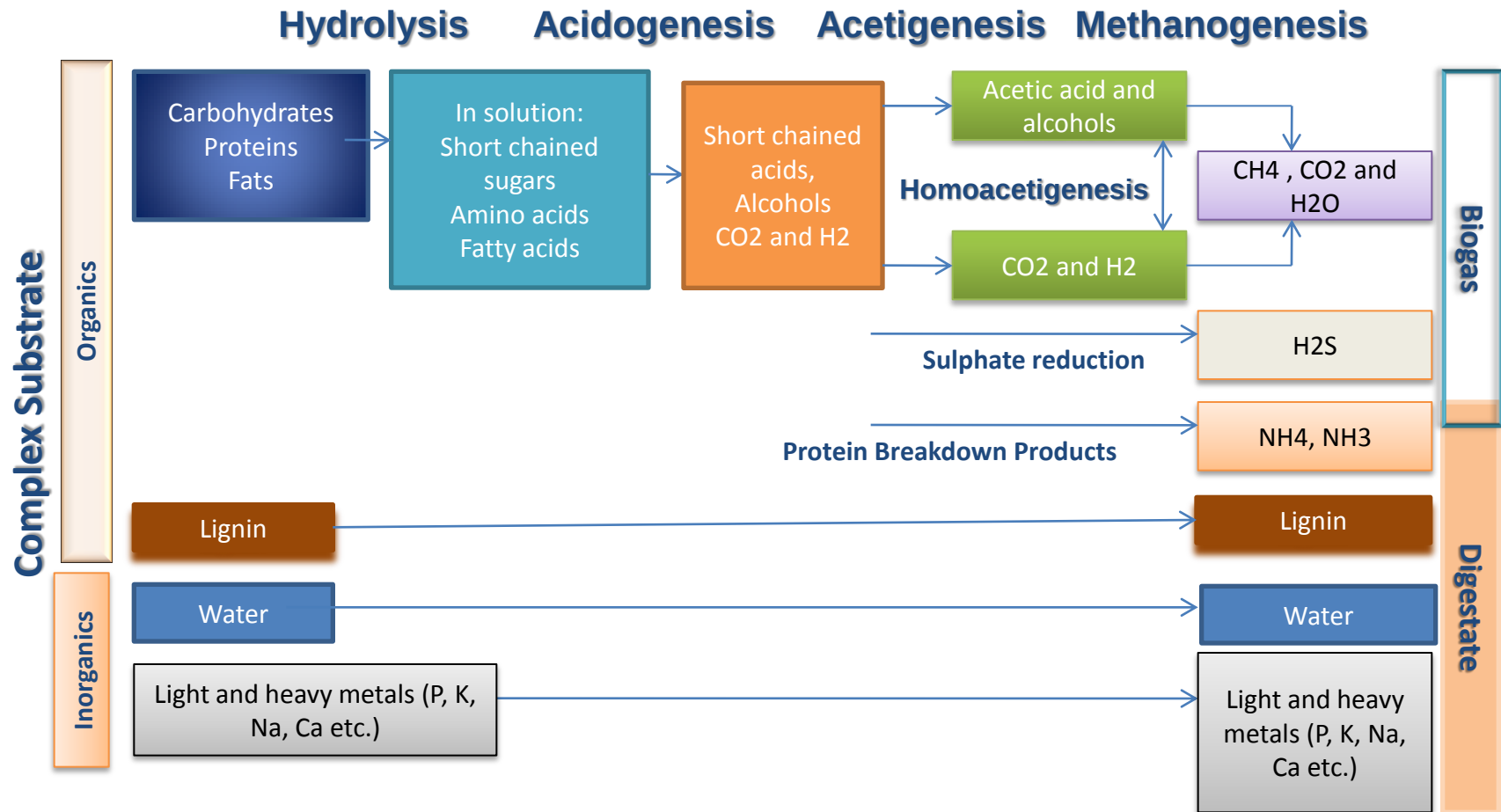
www.biomethan.dk



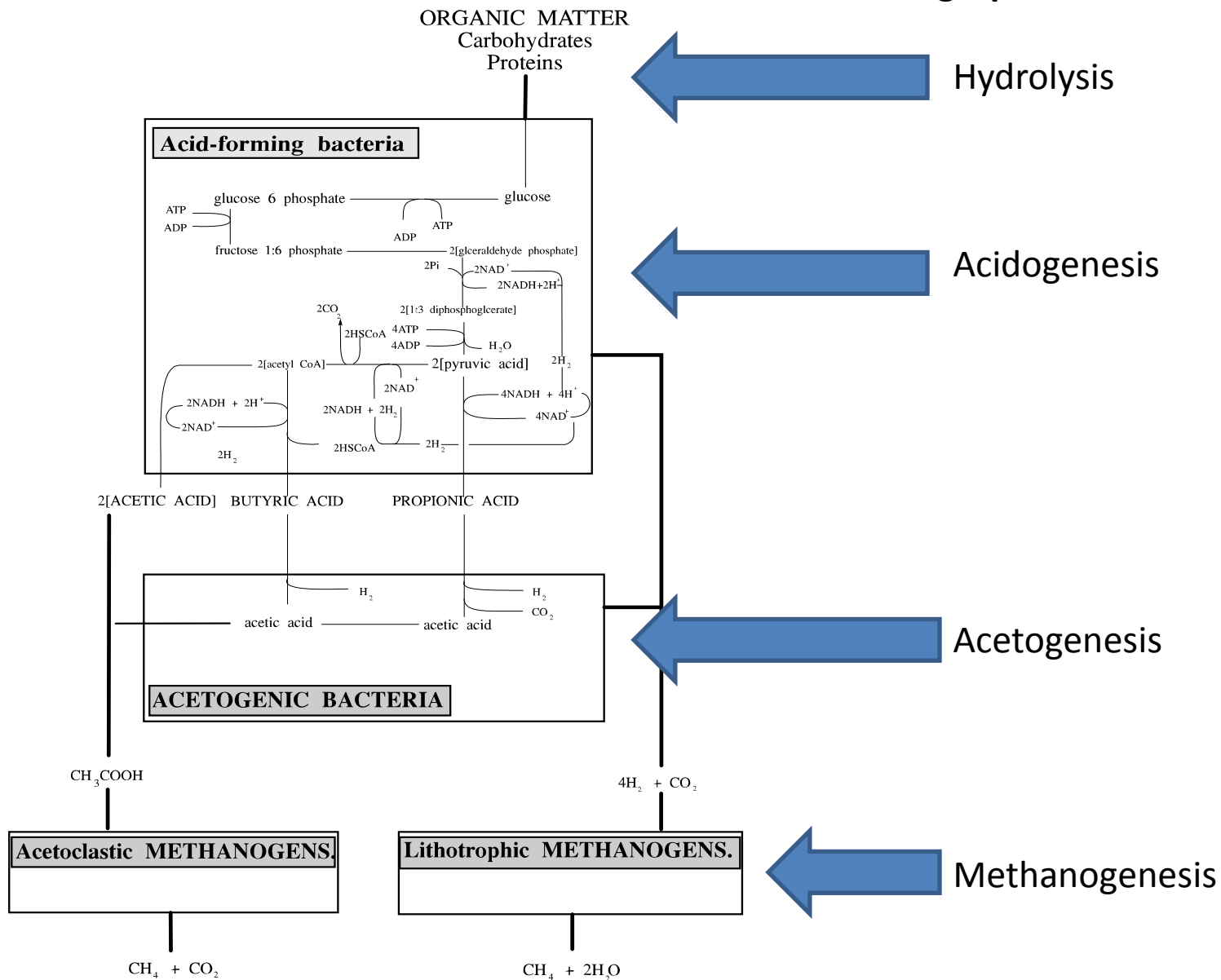
Indhold:

- a) Den grundlæggende kemi i biogasprocessen**
- b) Optimeringsmuligheder**
- c) Opgradering af biogas**
- d) Europæiske tendenser indenfor biogas**
- e) En dansk styrkeposition**

Anarob omsætning til biogas – en kompleks kemi



Trin i biogasprocessen

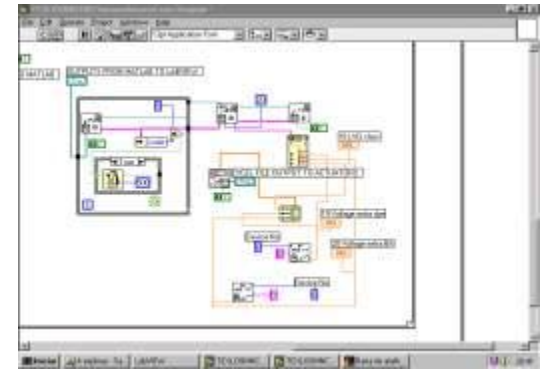


Taken from Guwy, (1996). Modified from Mosey, (1983)

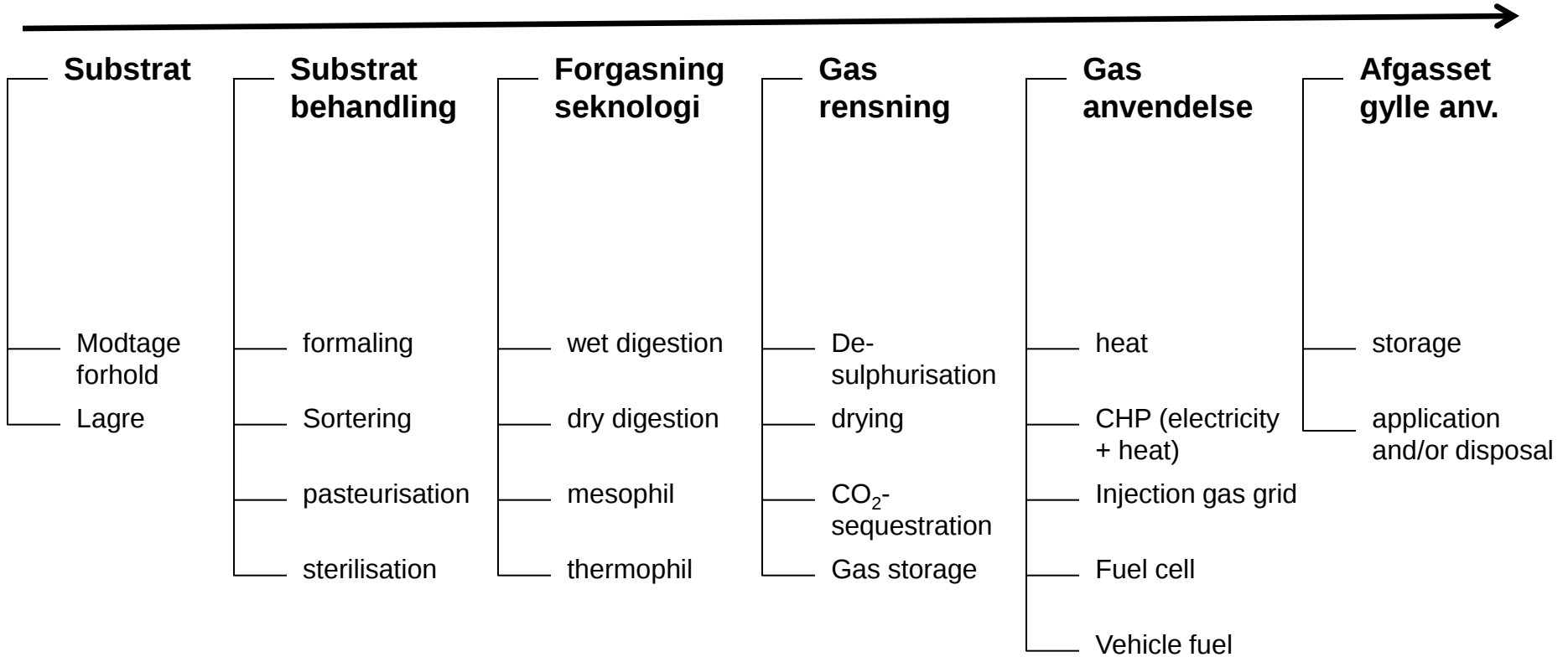


Optimeringsmuligheder for biogasprocessen

Kontrol og optimering af biogasprocessen



- Kontrol baseret på biomassekontrol og regulering af reaktorprocessen
 - Fastholde ensartede temperaturer
 - Kontrollere indførsel og opholdstid i reaktoren
 - <Sammensætning af en optimal “foderplan” for reaktoren
 - Tilsæt/fjern vand og recirkuler den flydende biomasse
 - Justering af pH
 - Tilsæt mikro- og makro-næringsstoffer f.eks. Jern kobolt nikkel molybdæn, selen, calcium, magnesium and vitamin B
 - Udfør forbehandling af biomassen



Forskelligt tørstofindhold: I Danmark anvendes højt biomasse/gylle vandindhold, mens tør forgasning ses i nogle europæiske lande.



Wet digestion

< 25% DM
continious digersters (flow through)
pumping
automatic



Dry fermentation

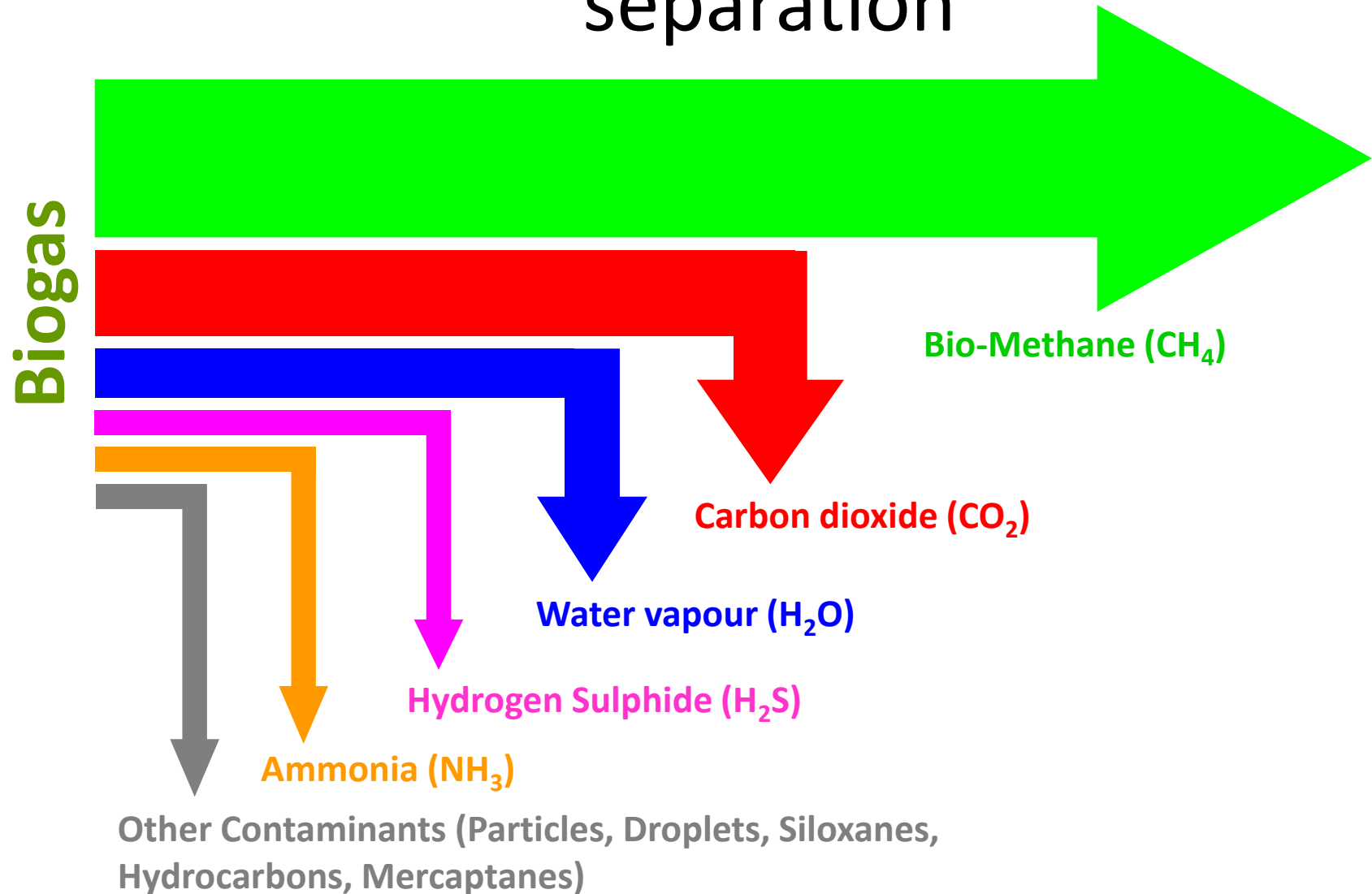
25% DM
no pumping
stackable
batch-type (semi automatic)





Biogasopgradering

Biogas opgradering – Et spørgsmål om separation



Biogas opgradering i faser

1

- Preconditioning / pretreatment
- Removal of particles, droplets, siloxanes, other trace components

2

- Biogas desulphurisation

3

- Compression

4

- Biogas upgrading
- Separation of CO₂ and H₂O

5

- Final conditioning
- Dewpoint control, adjustment of heating value, offgas treatment

Biogas opgraderingsteknologier

- ✓ **Various technologies available**
 - ✓ Pressure swing adsorption
 - ✓ Water scrubbing
 - ✓ Selexol absorption
 - ✓ Amine absorption
 - ✓ Membrane separation
 - ✓ Cryo separation
 - ✓ Hybrid systems
- ✓ **Decide for suitable technology primarily NOT by investment costs – remember: cheap can be expensive!!**
- ✓ **Select suitable technology according to:**
 - ✓ upgrading capacity
 - ✓ turn-down ratio
 - ✓ shut-down / start-up performance and ease of operation
 - ✓ product quality needed
 - ✓ Chemicals and energy consumption





Europæiske tendenser indenfor biogas



Typisk gårdbiogasanlæg baseret på
planteprodukter (Tyskland m.fl.)



A photograph of a biogas production facility. The central feature is a large, white, cylindrical storage tank with a blue, ribbed conical roof. To its right is a tall, rectangular, light-grey structure, possibly a digester or another storage tank. In the foreground, there are several smaller, grey, rectangular units, likely part of the gas processing or distribution system. The entire facility is enclosed by a concrete wall and a metal fence. In the background, there are green trees and a white residential building with a brown roof and a balcony. The sky is overcast.

Biogasfællesanlæg

Den svenske udvikling – Biogas i transportsektoren

2010:

127 offentlige fyldestationer for gas

45 private fyldstationer

30.100 personbiler

1.200 busser

500 lastbiler – især til renovation

Nyudvikling omkring flydende biogas til transport





Marketing methane as a vehicle fuel

- E.ON Gas Sverige AB sells compressed natural gas and biogas at 35 public filling stations in the south of Sweden
18 busdepots
The yearly volume is 400 GWh -
replacing about 40 million liters of gasoline/diesel
- 40 % is biogas

Target:

- Supply 2 000 GWh/year in 2020, of which biogas will account for 75-100 %



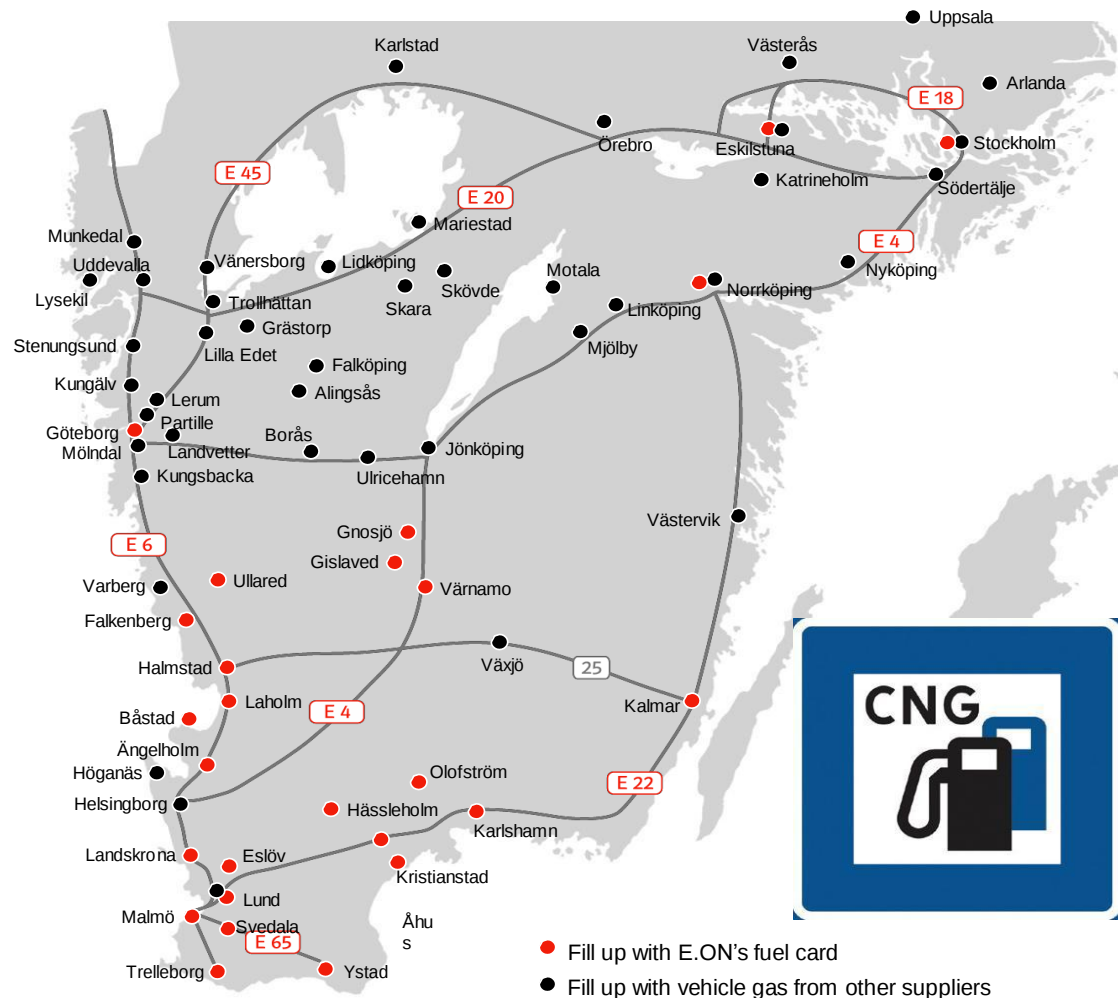


Vehicle gas filling stations

Filling stations in the north

- Östersund
- Boden
- Sundsvall
- Skellefteå

120 public filling stations
50 depots for heavy traffic
30,000 private cars
950 buses
350 trucks



Emerging demand and economy

EU directive for renewables

Developing the agriculture sector – new possibilities

High environmental benefit – global, local and regional

Technologies for producing and use are in place

Low or zero tax in many countries

Infrastructure in place

Huge potential – organic waste, manure, crops and in the future wood



Danske styrkepositioner

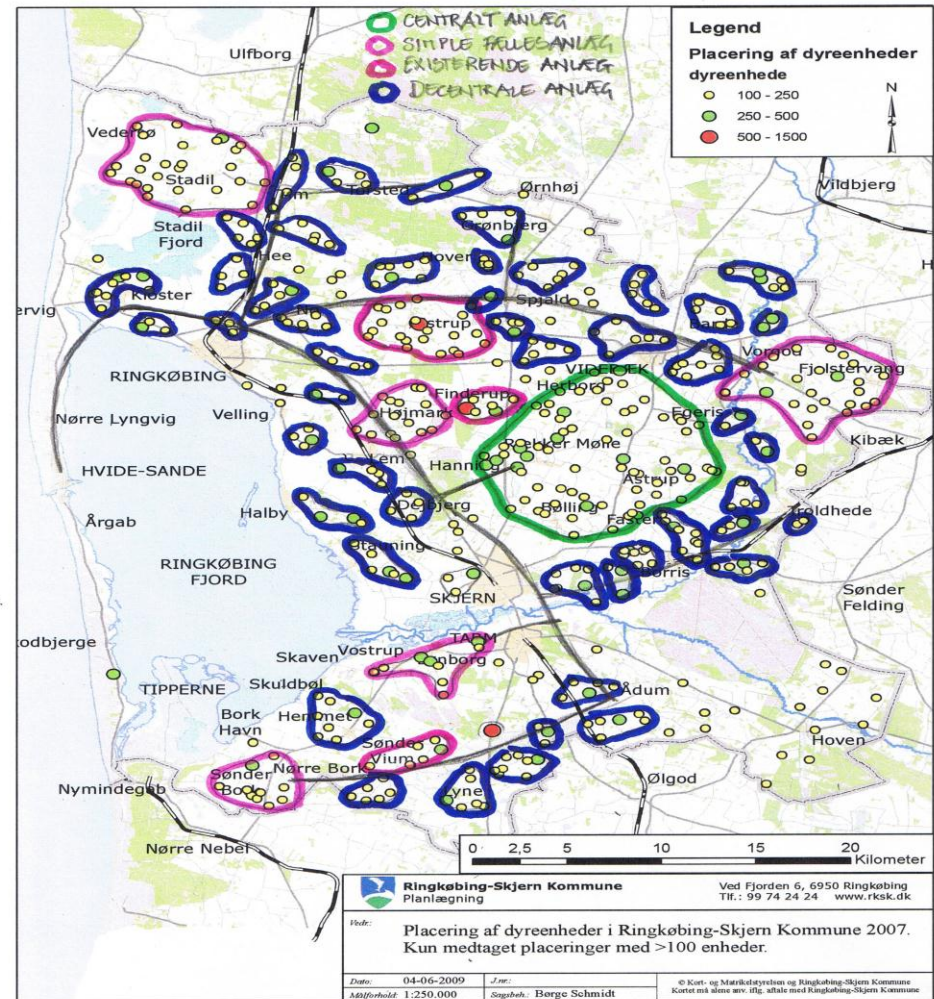
Working towards a CO2 neutral energy system

- Fossil free energy system 2050
- 50% wind 2020
- Smart grids as an intelligent power system
- Potential for gas in the transport sector
- LNG as a low carbon option for ships
- Interlinking wind and gas systems
- Renewable gases as a supplement to natural gas



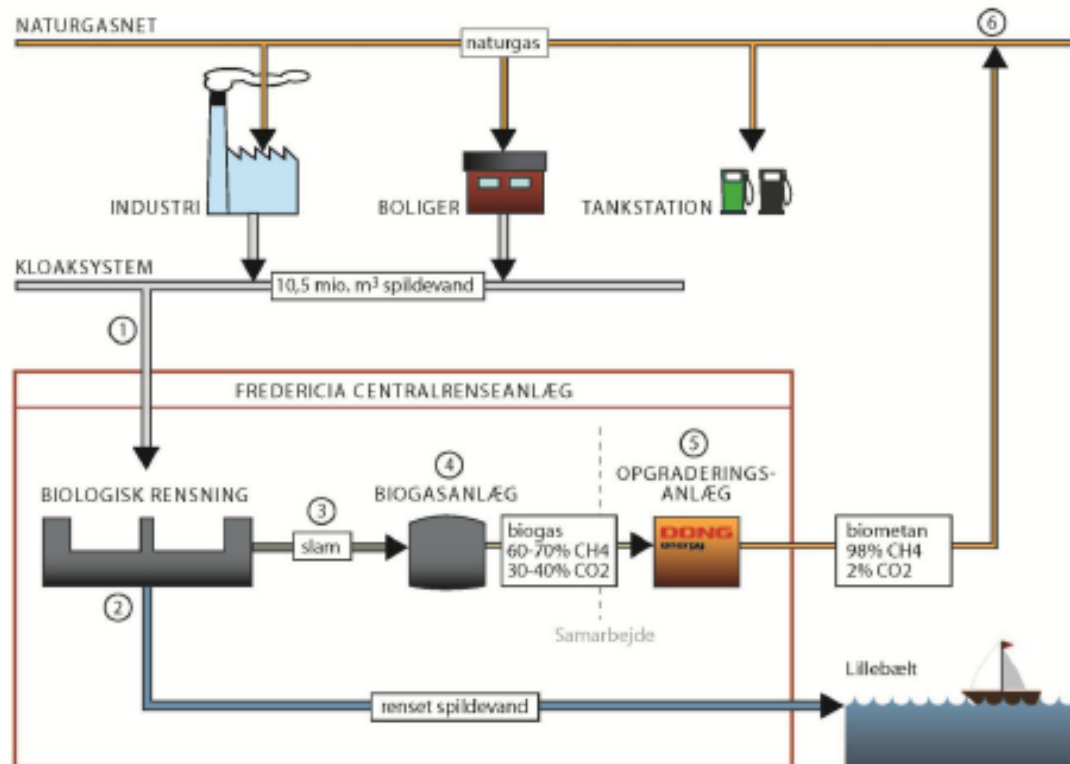
RKSK-model

- 30 – 90 Decentrale biogas plants
- 1 - 2 Centrale biogas plants
(service plants)
 - Fiber fraction
 - All kind of biomass



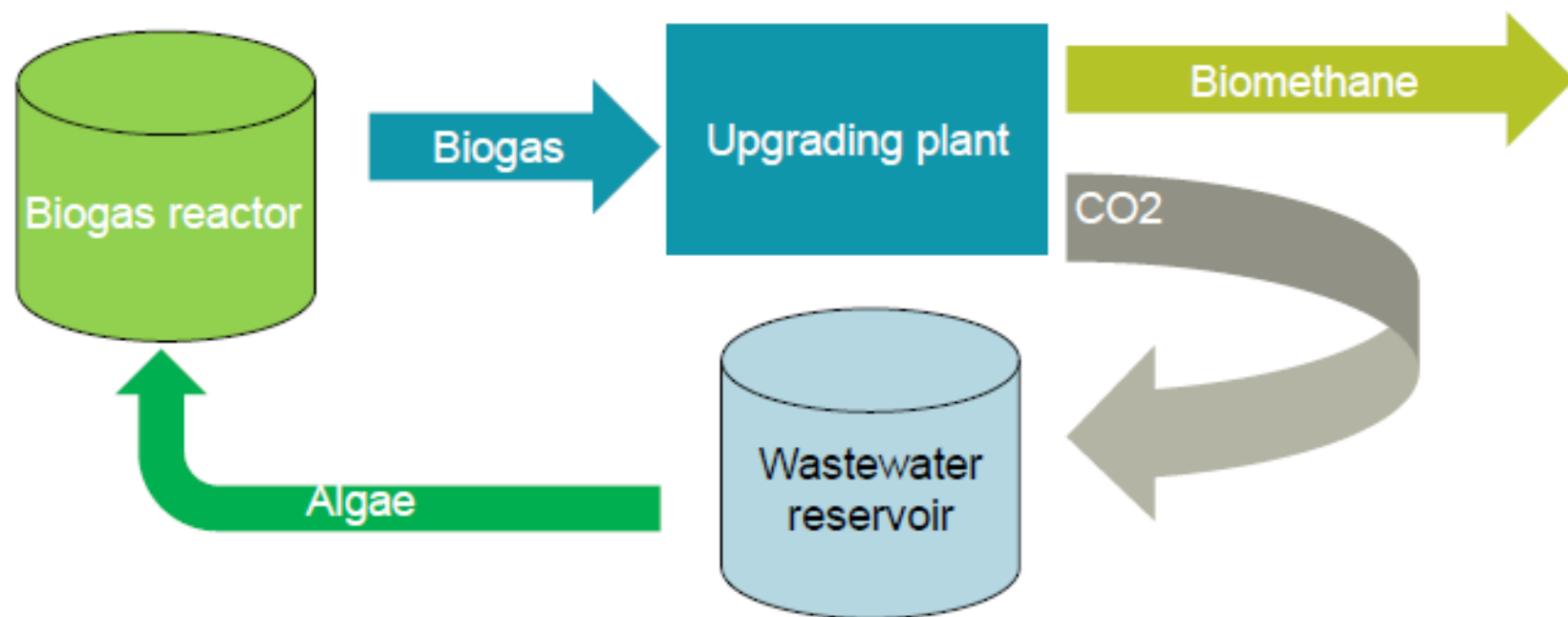
DONG Energy now distributes biogas through the natural gas grid for the first time in Denmark

- In operation from 15th September 2011
- Expected production: 8-10 GWh/year
- Based on biogas from wastewater treatment plant



Algae production and CO₂ reduction from upgrading plant in Fredericia

- Potential RTD project with Fredericia Spildevand as project manager
- CO₂ from the upgrading process will be used to stimulate algae production
- Improved CO₂ reduction effect of the biomethane





Establishing an European Green Gas Market
Knud Boesgaard
energinet dk

Facts about Energinet.dk



- Independent Public Enterprise
 - Owned by the Danish State
- Non-profit self sustainable company
- Owns and operates the backbone of the energy infrastructure
 - 400 kilovolt High voltage electricity grid
 - 80 bar high pressure gas lines
 - Nord Pool Spot
 - Nord Pool Gas
- Conveys a number of energy related public functions
 - Subsidies for green energy production
 - Funds energy research
- Member of The European Network of Transmission System Operators for Gas/ Electricity (ENTSOE/ ENTSOG)





Foto:  Schmack

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BIOGAS



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