



**IEA- Bioenergy, Task 37
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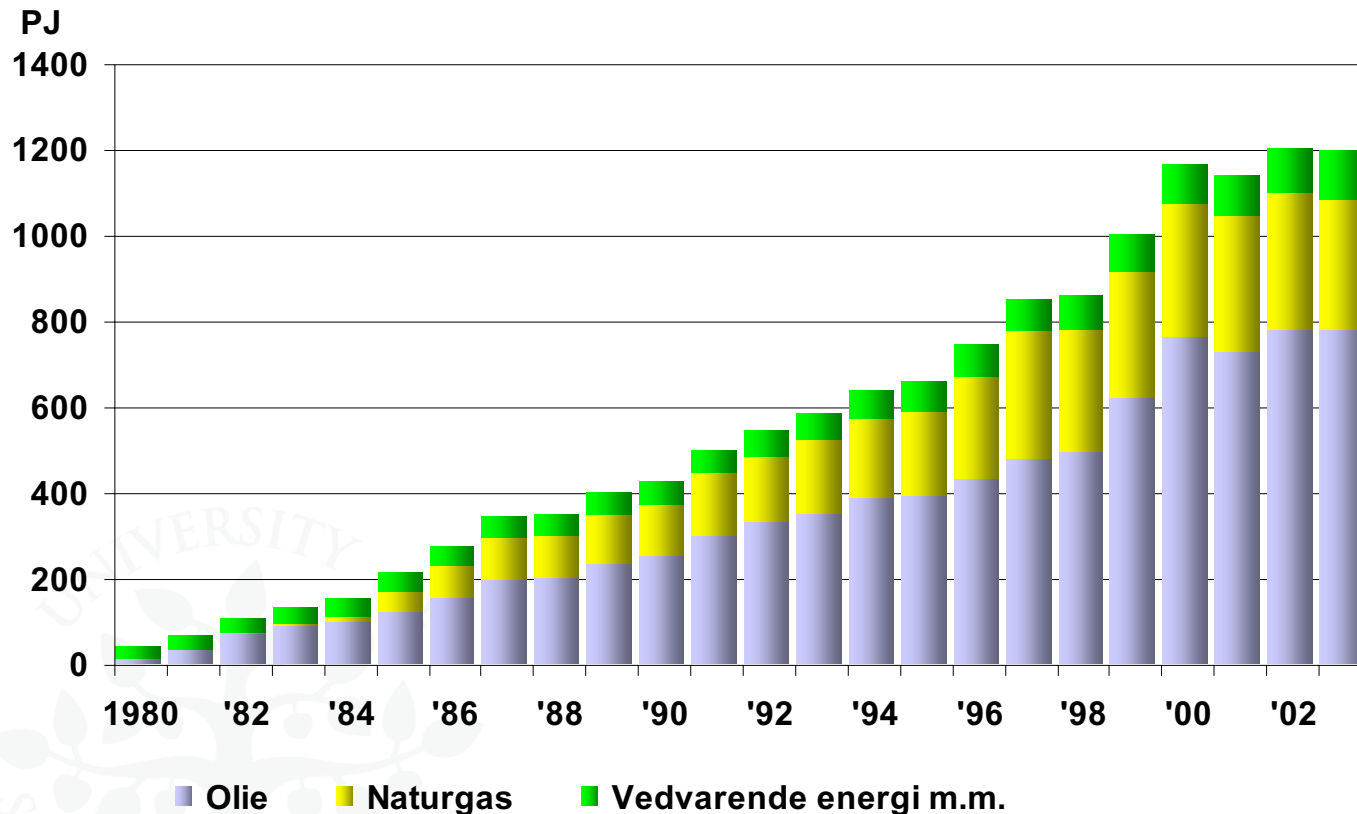
BIOGAS in DENMARK

Country up-date 2006

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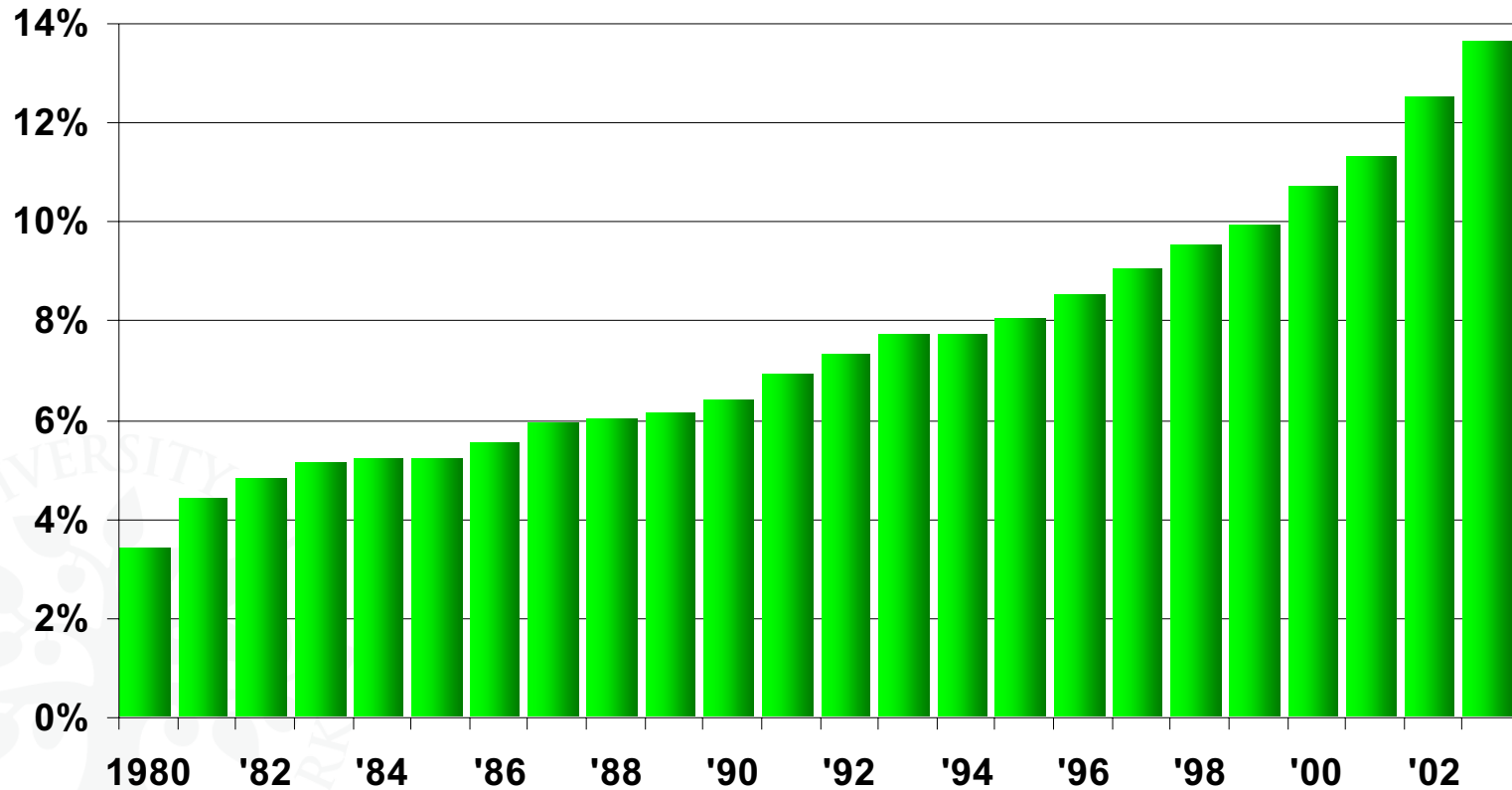
Primary energy production in Denmark



112,3 PJ renewable energy, 13,6% of gross energy consumption (850 PJ / year)

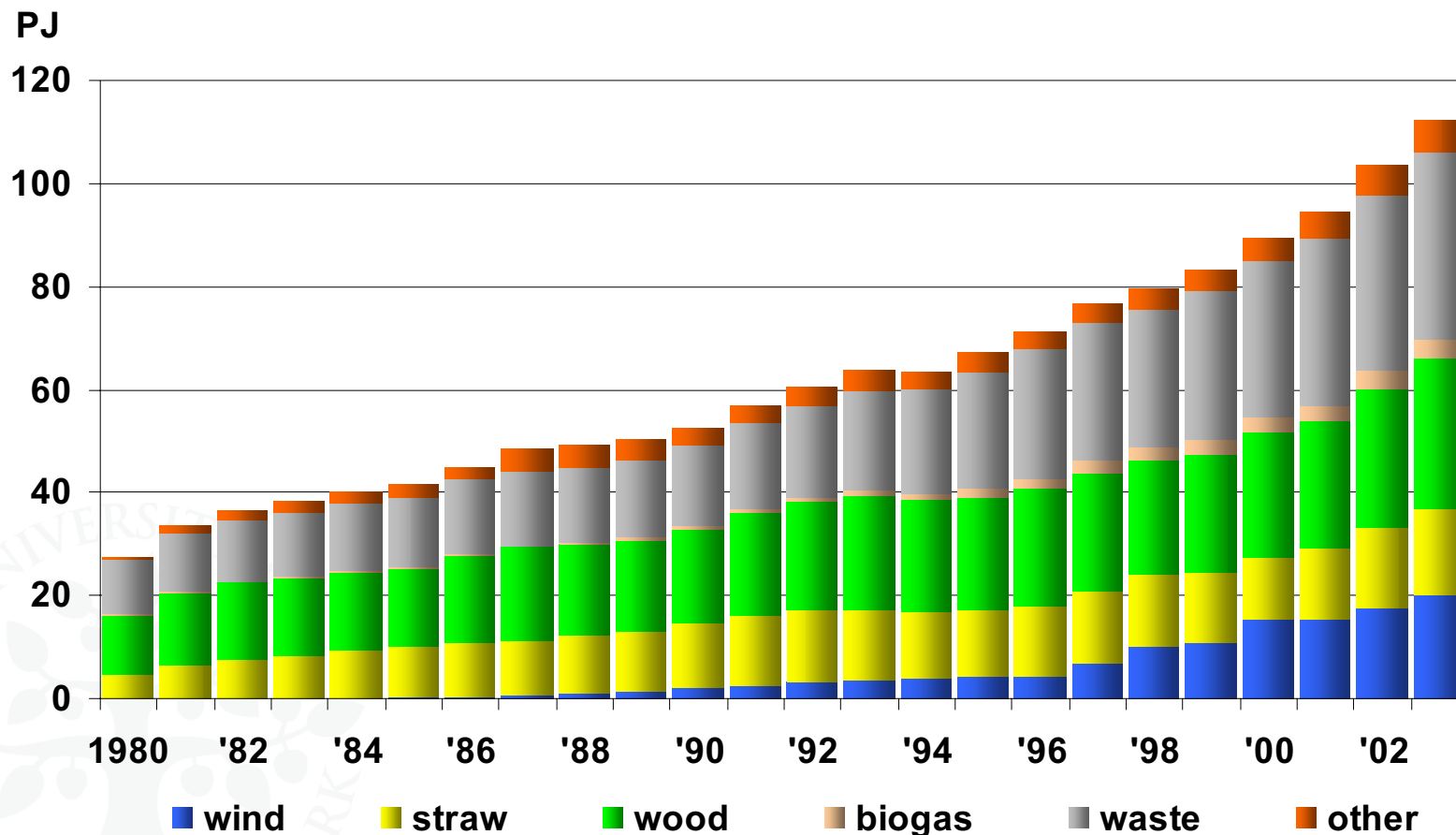


Production of renewable energy, % of gross energy consumption





Renewable energy production PJ/year



Biomass = 41% of the total renewable energy production



Denmark needs more biogas plants

Biogas plants and productions 2003:

Type of plant	Nr.	Production PJ
Centralised co-digestion	20	1,52
Farm scale plants	60	0,62
Waste water treatment plants	64	0,87
Industry plants	5	0,14
Landfill gas recovery plants	25	0,44
Total		3,58



Denmark needs more biogas plants

Manure based biogas plants:

20 centralised plants

- now new plants since 1997

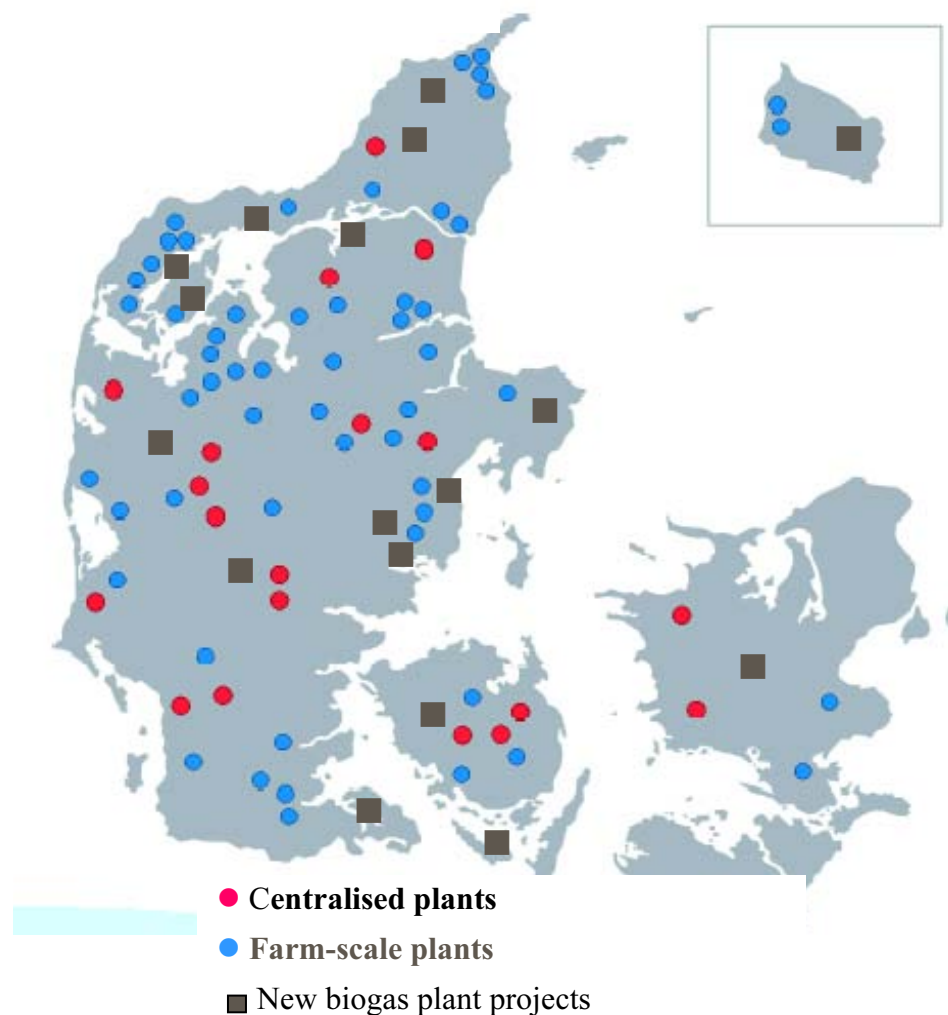
60 farm scale plants

- triple their number during last years

1.3 mill tonnes manure / year (5 % of total)

0,3 mill tonnes organic waste / year

A number of new projects





Denmark needs more biogas plants

- Manure based biogas is economically and socio – economically feasible when:
 - Organic waste is included
 - Environmental and economic externalities are taken into account
- Cost-efficient tool for Green House Gas reduction
- Beneficial for involved farmers
- Creates jobs and local activity

Political tasks:

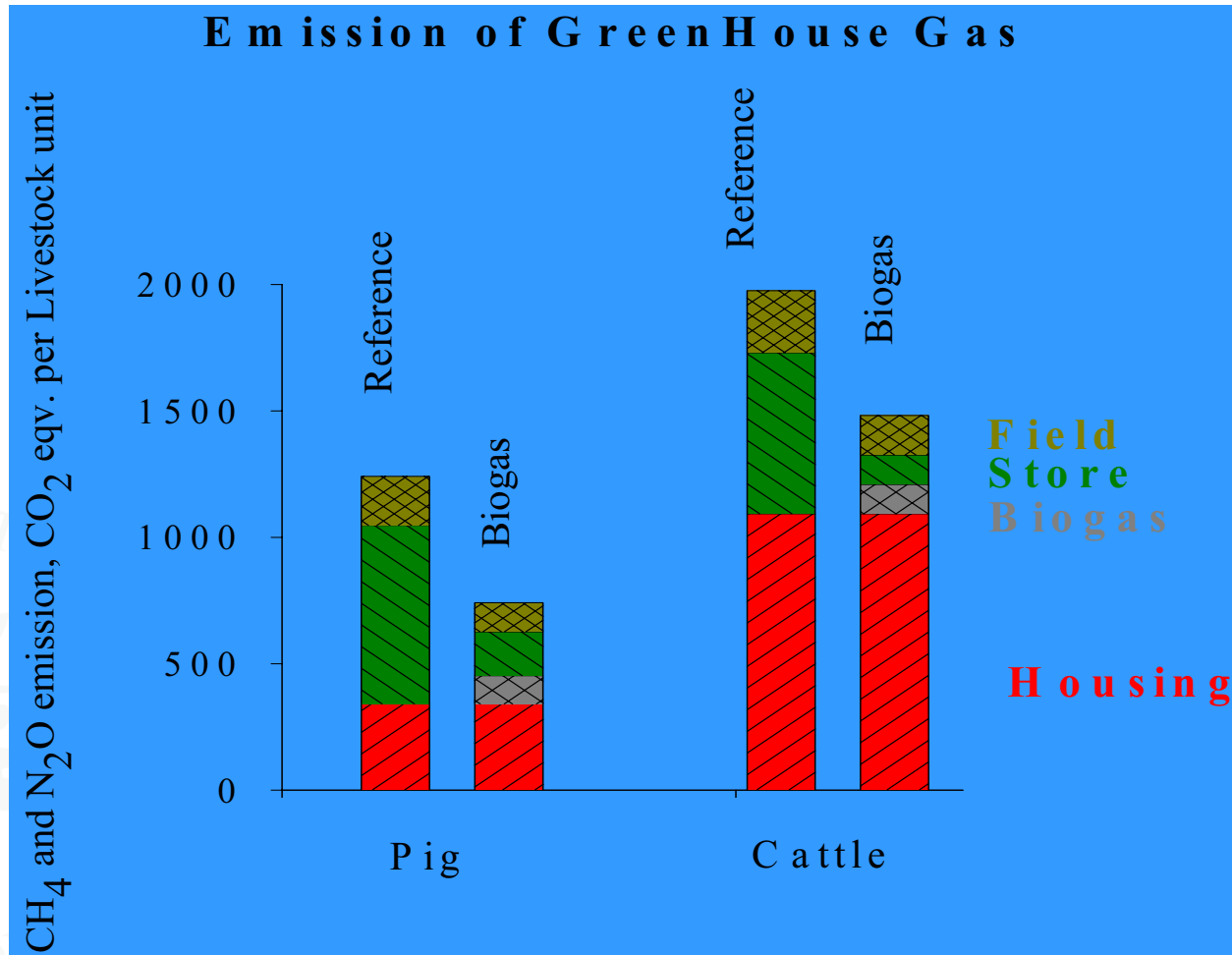
- **8 PJ from biogas and 40 new biogas plants established by 2008**
(doubling of present production means an increase of 1 PJ/ year)

Denmark needs more biogas plants

Actual incentives for establishment of new plants:

- **Socio-economic advantages of biogas production**
- **Fulfilment of environmental tasks**
 - cheap tool for reduction of CO₂ emissions (40 DKK/tons CO₂)
 - 90 kg CO₂ EQ. / t biomass treated
- **Agricultural benefits**
 - cheap slurry storage
 - less transport
 - less odours and flies at application and around the storage tanks
 - less CH₄ emissions from
 - cheap redistribution of slurry (centralised co-digestion)
 - sanitation and pathogens control
 - NPK declaration
 - high N-utilisation and less N- leaching
 - possibility of separation

Green House Gas emission, with and without biogas production





Biogas and slurry separation

Digestate



Decanter

Fibre fraction



Liquid fraction



70 % of total P

25 % of total N, organic compounds

15 % of initial volume

75 % of total N, mainly as ammonia

Sill no market fibre fraction. Costs of drying (50 eur/T) exceed nutrient value of fibres.

Heavy metals content could be a problem; removal expensive

Incineration seen like the only alternative; Documentation and approvals needed



Denmark needs more biogas plants

Existing framework:

- Price of produced/ sold m³ CH₄: 3DKK
- Heat production: exempted from energy and CO₂ taxation
- EI-production: price guaranty of 0,60 DKK/kwh the next 10 years and of 0,40DKK/ kwh further 10 years (only for plants established before 2007)
- Co-digestion of organic waste a “must” for balanced economy
- Decreasing => 0 grants

Limitations/barriers:

- Uncertain future el prices / low price guaranty
- Insufficient organic waste
- Frequently negative public image due to odours around the plants
- Complicated approval procedures for establishment



Denmark needs more biogas plants

The existing framework for biogas production in Denmark:

- Price of produced/ sold m³ CH₄: 3DKK
- Heat production: exempted from energy and CO₂ taxation
- Electricity production: price guaranty of 0,60 DKK/kwh the next 10 years and of 0,40DKK/ kwh the other 10 years (only for plants established before 2007)
- Co-digestion of organic waste a “must” for balanced economy
- Decreasing to zero investment grants



Denmark needs more biogas plants

Necessary framework to achieve the political tasks: (Danish Biogas Association)

- **Fair electricity prices / price guaranty**
- **Access to other co-digestion substrates than slurries**
- **Simpler rules for plant approvals and operation**
- **Environmental and veterinary framework**
- **Improved public perception of biogas: awareness campaign on-going (Danish Biogas Association)**
- **Founding for RD&D work (externalities, new substrates, pre/post treatment etc.)**



Building the world's largest bioenergy plant

More than 200 farmers, Arla Foods, Danish Crown, Vestforsyning and Elsam are the partners that stand behind this project that is estimated to cost around 200 million DKK.

- It is a bioenergy plant of so far unseen dimensions that during the next few years it is expected to be built north of Holstebro. According to the plans, Maabjerg BioEnergy must be able to handle large amounts of manure, industrial organic waste and dead animals.
- These bi-products will, through a complicated process, be transformed into heat, electricity and different total solids, that later are to be exported. In the process phosphorous and nitrogen will be separated as total solids.
- The residual product is a thin and clean fertilizer that will be sent back to the farmers
- The separated nutrients are to be exported to areas, where they are in demand
- The produced biogas is utilized at the CHP plant situated nearby.

Besides the big interest coming from the farmers, who all have invested money in this project, it also is expected that Maabjerg BioEnergy will be met with great interest from other farmers and scientists all over the world.

- Therefore a visitor's centre with teaching facilities, exhibitions and guided tours is being planned at the moment.



High-tech biogas plant on the island of Bornholm

- ØSTKRAFT Produktion A/S has built with the contractor Bioscan A/S a biogas plant on the island of Bornholm. The plant, dimensioned to digest 210.000 tones biomass per year, is already running and expected to operate at the entire capacity by the end of 2006.
- The plant will be one of Denmark's first high-tech biogas that will convert biowaste into fertiliser, water and green electricity.
- All the inhabitants and among them the slurry suppliers from Bornholm supported the project from the start, as they see it as an investment in their future.
- Apart from the mentioned quality products, they expect the biogas plant to bring jobs in agriculture and industry and have a positive effect on the tourism in the area.

*More information about the project can be obtained from:
Jannik Møller, tel.: +45 56 930 930 and on the web site: www.Biokraft.dk*