

### Evaluation of the Samsø RE-energy project

#### RE-island conference 10-years status

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 Samsø, Denmark

[http://www.inforse.org/europe/seminar07\\_samso.htm](http://www.inforse.org/europe/seminar07_samso.htm)

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### Evaluation of the Samsø RE-energy project

#### Important award criteria for the master plan for the Danish Energy Agency in 1997

- A realistic and realizable plan
- Use of local resources
- Focus on energy savings in all sectors
- Great local participation
- Use of well-known technology
- New ways of organizing, financing and ownership
- Display window for Danish RE technology
- No extraordinary subsidies

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#### Energy balance for Samsø, TJ/Year

	1997 – Starting point	2005
Electricity import	99	-286
LPG and petroleum	3	2
Oil	133	74
Diesel	155	163
Petrol	42	49
Straw	52	79
Wood	7	41
Biogas	0	0
Solar heat	0	5
Wind turbines	6	386
<b>In all</b>	<b>497</b>	<b>513</b>

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### Evaluation of the Samsø RE-energy project

#### 1. RE-supply and use of local resources

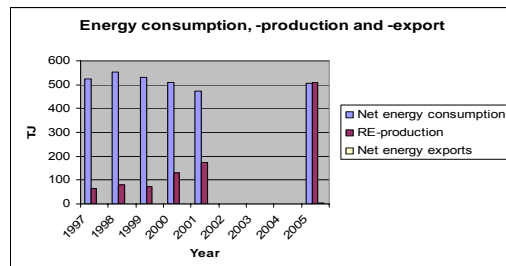
- From 13 to 99,6 % RE-supply in 8 years (1997 to 2005)
- 35 % use of local biomass resources
  - Straw 67 % (Still available: ~ 40 TJ)
  - Biogas 0 % (Still available: ~ 145 TJ)
  - Wood 100 % (Still available: ~ 0 TJ)
- Still room for improvement!

Completely successful

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#### 2. Supply and utilization of heat A: District heating

- Master plan: from 25 to 65% coverage (35 → 90 TJ)  
 4 new plants
  - Biogas/surplus heat/woodchips-plant
  - Straw/heat pumps-plant
  - Biogas/energy crops/wood chips-plant
  - Wood chips/solar heat-plant
- Obtained: 43 % coverage (60 TJ)  
 3 new plants - Wood chips/solar heat-plant  
 - 2 straw-plants

Mostly successful

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### 2. Supply and utilization of heat B: Individual heating

- Heating oil consumption reduced from 133 TJ to 74 TJ
- Half of the year-round houses in the countryside has installed RE systems to meet all or part of the heat demand
- Use of wood pellets has risen from zero to 21 TJ ~ demand 300 houses
- Few or no 'exotic' RE solutions for demonstration – wind turbines for heat production, farmyard biogas plant etc. - have been installed
- Very little change in heat supply of summer cottages

**Partly successful**

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### 2. Supply and utilization of heat C: Consumption and savings

- Master plan: 25 % reduction (140 TJ → 105 TJ)
- Obtained: 10 % increase (140 TJ → 155 TJ)  
5 campaigns have been held  
500 households have been involved  
Number of inhabitants reduced with 5 %

**Not successful**

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### 3. Electricity A: Consumption and savings

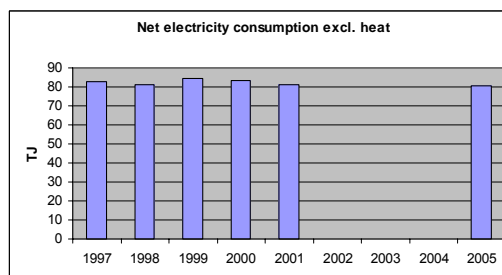
- Master plan: 15 % reduction (83 TJ → 70 TJ excl. heating)
- Obtained: 3-4 % reduction (83 TJ → 80 TJ excl. heating)  
A number of campaigns remains to be held

**Successful to a lesser extent**

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### 3. Electricity B: Production

- Master plan: On-shore wind turbines 11 (86 TJ)  
Offshore wind turbines 15 (260 TJ)
  - Obtained: On shore wind turbines 11 (100 TJ)  
Of shore wind turbines 10 (285 TJ)
- Production covers fully electricity consumption plus energy consumption for transportation
- Not established yet: household wind turbines and common biogas plants

**Completely successful**

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### 4. Transportation

- Master plan: Consumption 200 TJ, Savings 5 - 10 % (10 - 20 TJ)
- Obtained: Consumption 210 TJ, Increase 5 %  
Few projects:  
Electric cars in the public sector was given up because of bad batteries and insufficient services  
Surplus heat from ferries for district heating was technical realistic but organizing, ownership and taxes were complicated

The pragmatic solution of the master plan: increased wind turbine capacity has proven to be realistic

**Not successful**

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#### 5. Economy Investment, public subsidies and local savings

		Mill €	€ per inhabitant
• Master plan	Investment	78.7	17.900
	Public subsidies	9.1	2.070
	Savings	8.8	2.000
• Obtained	Investment	53.3	12.900
	Public subsidies	4.0	1.100
	Savings	6.0	1.450

Very successful

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#### 6. Employment

- No exact data available
- Great effect in the phase of construction (especially DH plants)
- Lesser effect in phase of operation
- More use of biomass would create more permanent jobs

Successful

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#### 7. Communication and RE tourism

- Local media have been effectively used in mobilizing the population
- The Samsø RE project is known all over the World
- Great numbers of RE tourists visits the Island every year

Very successful

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#### 8. Local involvement and participation

- Effective involvement of the population → widespread feeling of ownership for the project
- Pronounced willingness for individual investments in RE technology
- The Municipality of Samsø has invested in half of the offshore wind turbines
- Local firms have participated actively e.g. in educating their employees

Very successful

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#### 9. Environment

Kg per inhabitant	1997	2005
CO <sub>2</sub> -emission	10600	-4000
NO <sub>x</sub> -emission	78	- 2
SO <sub>2</sub> -emission	20	- 1
Particles	7	2

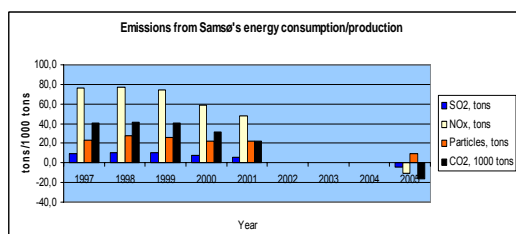
- National reduction of production of ashes approx. 4.500 t per year
- Remains: positive environmental effects of biogas production

Very successful

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### 10. Summary

- 100 % self-sufficiency is obtained using local resources within 8 (!) years
- Most of the intermediate aims have been achieved more or less in full
- Savings in consumption of both heat and electricity have failed almost completely
- Transforming transportation towards sustainable fuels have not succeed
- Demonstration of some 'exotic' RE technologies still remains

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### 11. Conclusion

#### A: Samsø results transferred to DK

- Average energy consumption is 25 % greater for DK as for Samsø per inhabitant
- Population density in DK is 4 times the density on Samsø
- A similar project for DK is correspondingly greater and a correspondingly greater effort should be used to ensure energy savings (as saved energy is of greater value than produced!)

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### 11. Conclusion

#### B: Samsø results transferred to DK

	Billion €	€ per inhabitant
• Total investment	90	16.300
• Saving pr. year	8	1.500
• Simple pay off time	11 years (excl. financing and interests)	

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## Corn as energy crop



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## Grass for ensiling



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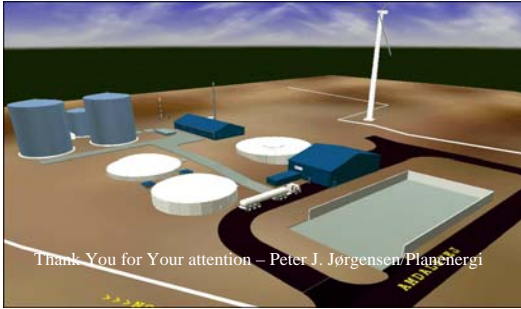
## Silage for biogas production



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**Common biogas plant**



Thank You for Your attention – Peter J. Jørgensen/PlanEnergi

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