



## Danish Energy Islands

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# Danish Energy Islands

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E3S Meeting, Nicosia, Cyprus



# Danish Context

400 islands, 70 of which are inhabited

DK Island energy: ~40% heat, ~40% transport, ~20% electricity

1972: 92% of energy came from imported oil

1973: energy crisis

1979: energy crisis

1984: North Sea gas projects began

1997: Denmark was energy self-sufficient on oil and gas

2005: Oil and gas production peaked

2013: Denmark no longer energy self-sufficient



# Danish Context Continued



Today: ~40% electricity from renewable energy

Growing GDP while reducing energy consumption

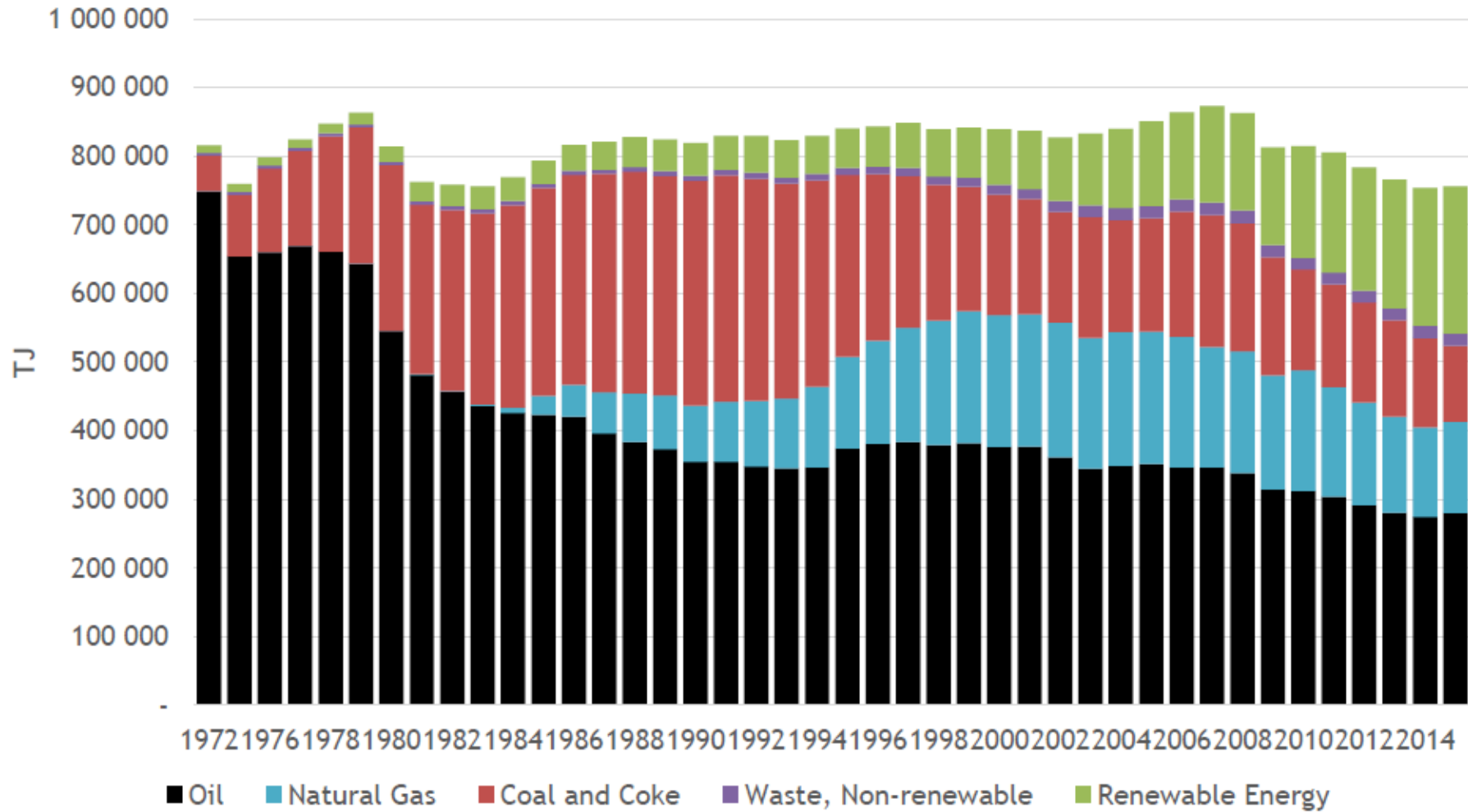
2035: Goal to have 100% fossil free electricity

2050: 100% fossil free in all sectors

Phase out of residential fuel oil heating

Current government has a more free-market approach and inconsistent support for sustainable energy

# Denmark: Primary Energy Consumption



# Case Studies

Samsø

Ærø

Orø





# Samsø



Søren Hermansen  
Director, Energy Academy, Samsø



Pop: 3724  
Area: 112 km<sup>2</sup>

1996: closing of slaughterhouse- largest private enterprise (100 jobs)

1997: declining population

1998: Put together a proposal to be the official *Danish Renewable Energy Island (REI)* – won

Danish Government looking for a showcase community

(Show Kyoto goal of 21% reduction was possible)

Government provided funds salary for Søren Hermansen (vegetable farmer) to come up with a 10-year plan

1999: Local engagement

Door-to-door meetings, public hearings

2000: 11 x 1MW wind turbines

2002: 10 offshore turbines

2002-2005: 3 District heating plants (biomass) 70% demand

Solar collectors, biomass burners for those not on district heating

Promotion of Electric Cars



# Samsø Energy Academy

Promotes strategies for RE, shares know-how

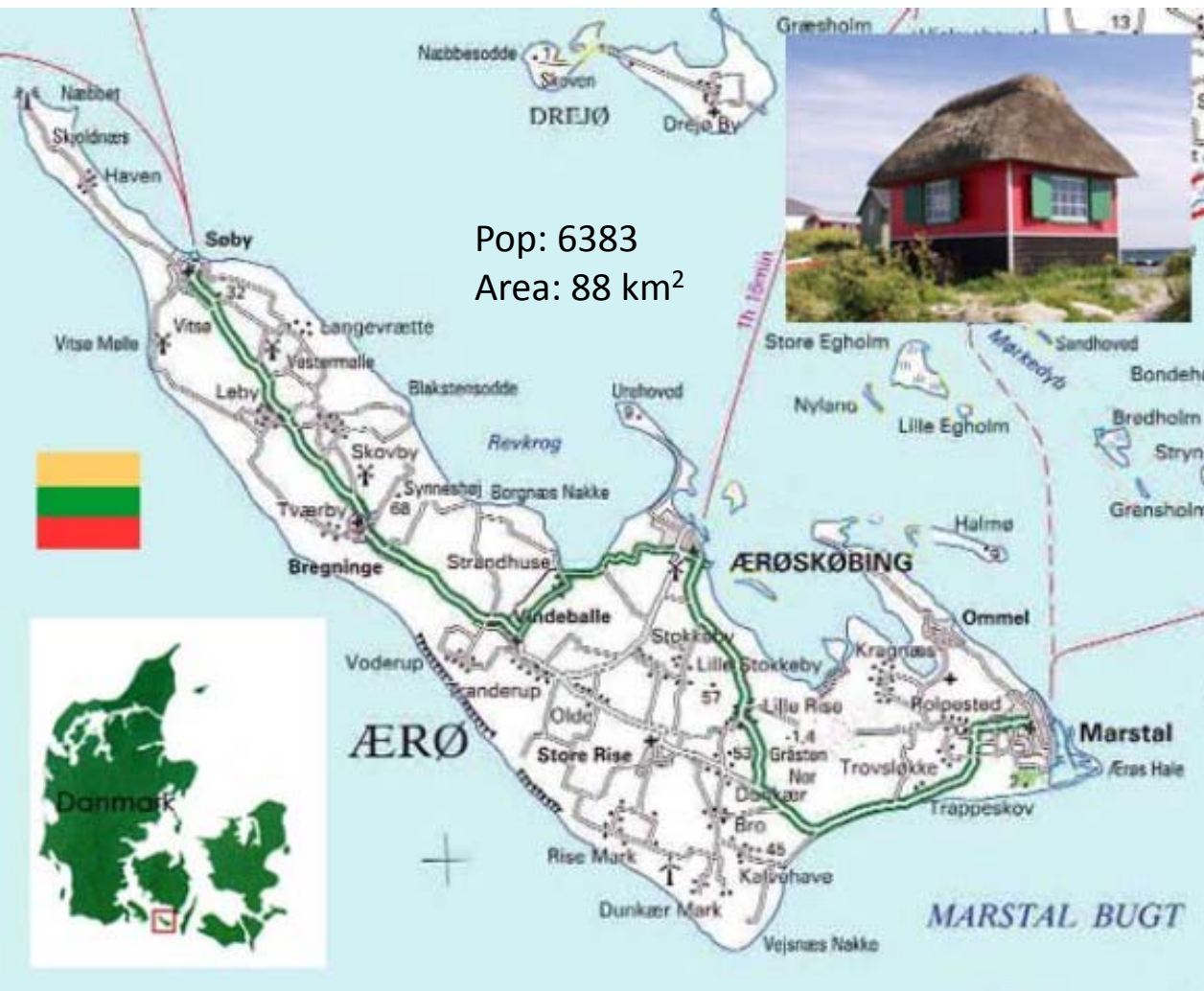
Works with other Danish islands and around the world



# Ærø



Rune Schmidt  
Manager and Energy Adviser  
Ærø Energy and Environment Office



Late 1970s:

Oil crisis, no natural gas connection, growing anti-nuclear sentiment  
Limited biomass resources

1981: Ærø Energy and Environment Office formed

Public lectures in local high school

Promote renewable energy and ecological living, no commercial interests

Planned a wind energy park- Ærø municipality gave money to hire engineers

1985: Wind park: 11 turbines 55kW

128 people owned- into 11 subgroups, ÆE&E maintained

1989: Ærøskøbing Energy Plant

Demonstration plant: Straw, solar heating , heat pumps, flue gas

Bankrupt 1992 (cheap oil) – reformed as 100% renewable district heating

1990s: Solar PV push

2000: Became *Danish Solar City*

2002: 2MW of Wind installed, Solar district heating plant



# Ærø Today

28,000 m<sup>2</sup> solar panels (over 4m<sup>2</sup>/person)

12MW installed wind

Produce 40GWh/year

Consume 32GWh/year

Export 8 GWh/year

3 RE District Heating (60% demand)

Electric Ferry Demonstration project

Goal to be 100% RE by 2035

(bigger challenge than Samsø)

(smaller island, more people)



*Solar district heating plant*

# Orø

Pop: 846  
 (1200 summer houses)  
 Area: 14 km<sup>2</sup>



Camilla Hay  
 Project Manager at Fors A/S





2015: Workshop on Bornholm about Orø, very successful

2015: Meeting with locals to make Orø a green demonstration island

Coordination between Holbæk municipality, Fors A/S, Orø citizens

Open forum- very ambitious (heat, water, sewage, removing oil boilers, heat pumps, ecological farming)

Main priority to replace fuel oil heaters

Expensive- especially for pensioners

Outside energy supplier working on a subscription business model for heat pumps

6 wind turbines(need to be replaced)- private company owns them

some want them removed

others want larger turbines

Rivalries and differences of opinion between north islanders and south islanders

Some want green island, some want cheap heat

Don't like people from outside to tell them what to do

Don't like big companies- nervous about big investment into island

# Orø Today

Cooperation broke down between main actors

- Municipality pulled out

- Key citizens moved away

Project is on hold

New strategy being explored



# Other Case Studies

- Bornholm
- Læsø
- Fur



# Strategies and Lessons Learned

## Bottom-up

Local education

Avoid the “imposed solution”

Citizens do not want to be Guinea Pigs – tech needs to work and be simple

Give some structure as to goals and realistic possibilities

Long-term vision, achieved through small steps (demo project, build support)

Each scale has unique challenges

## Partnership

Local Community

Research institutions

Energy suppliers – business model that promotes local ownership and control

Government

# Strategies and Lessons Learned, continued

## Local ownership

Avoids NIMBY from private land owners

Involve local people in managing and operating the energy plants

Promote local RE start-ups “imported fuel creates no jobs”

Export “know how”

Need tariffs for small-scale investment

(large scale firm can undercut local ownership)

## Identity

Climate change and global sustainability messages DO NOT resonate

Selling point- what does this mean for the island?

Heal rivalries and rifts

Government competitions and recognition

Tourism



Thank you!  
Tak!

