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Biomass

100% Renewable Energy in local Energy Autonomy

Preben Maegaard,

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President, World Wind Energy Institute, WWEI

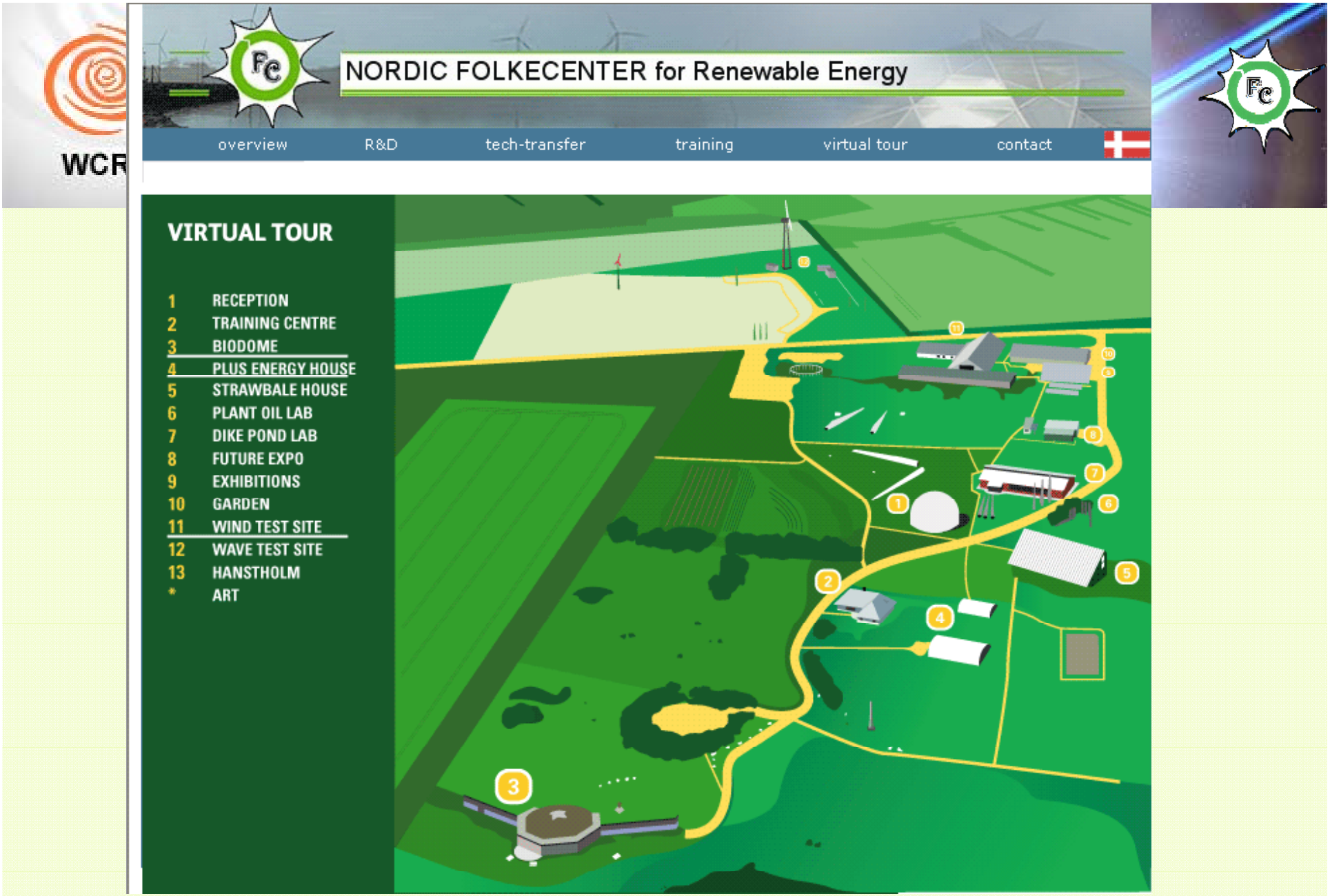
Chairman, WCRE, World Council for Renewable Energy,

TOLREC, Tokyo, 1st October 2009

Wind power 1909 in Ydby, domicile of Folkecenter

Folkecenter for Renewable Energy

Folkecenter for Renewable Energy



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Training center

Solcelleanlæg

wa


Plus Energy
House


Biodome

Transport on PPO

Solar heating systems

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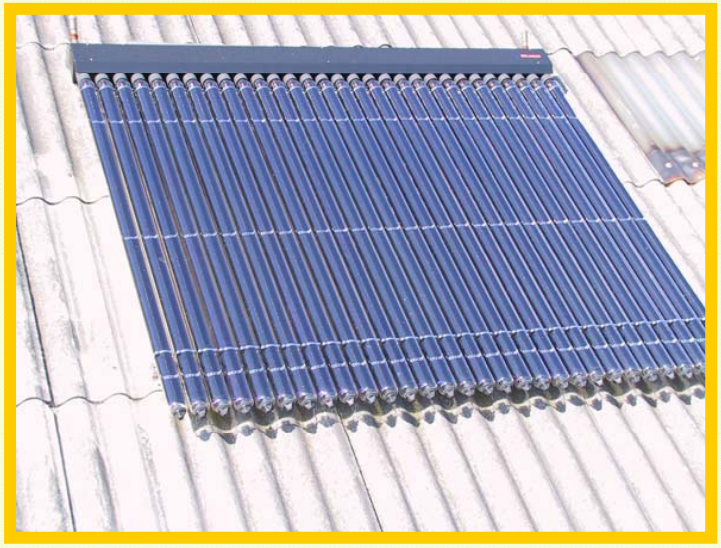
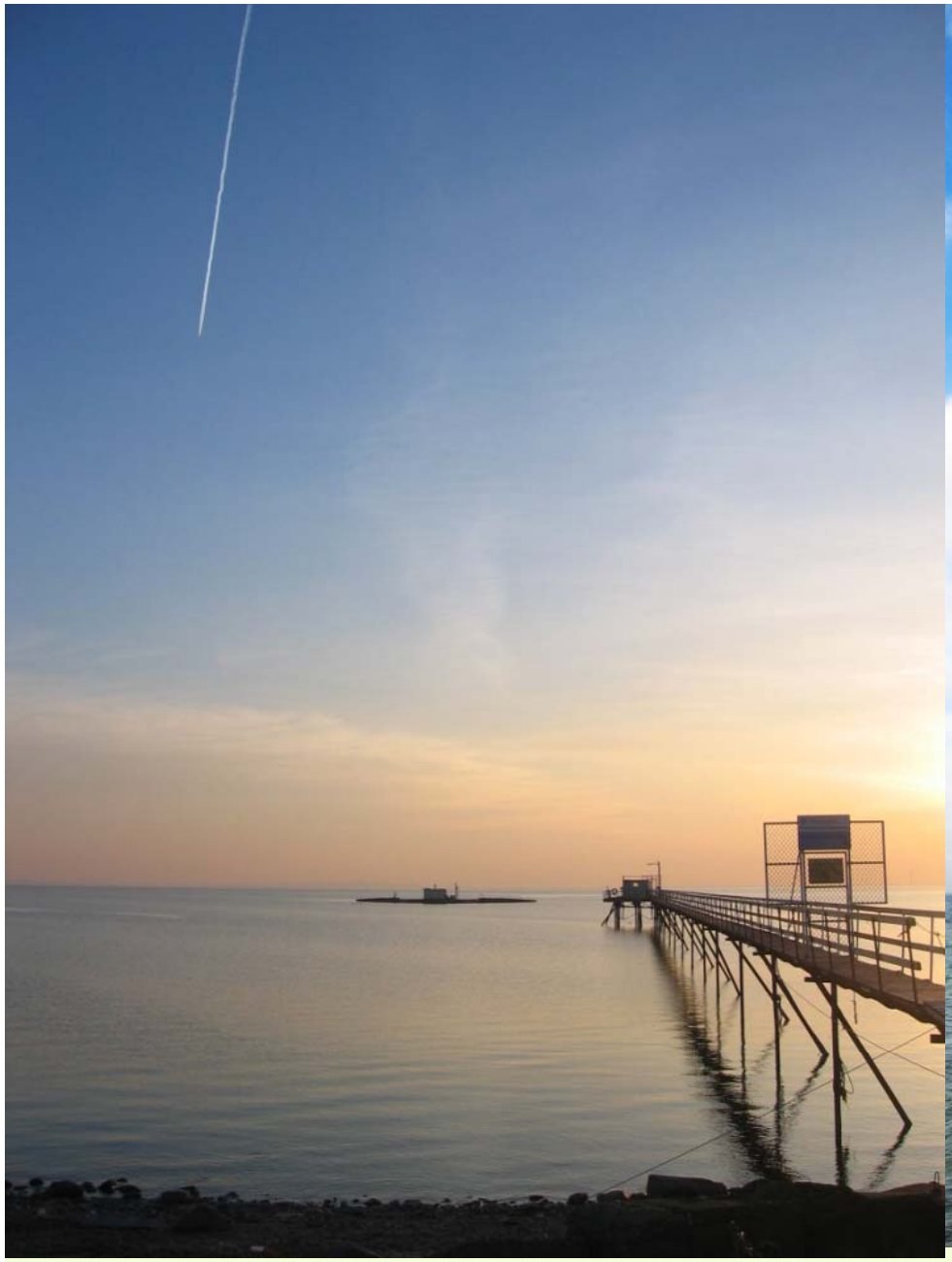
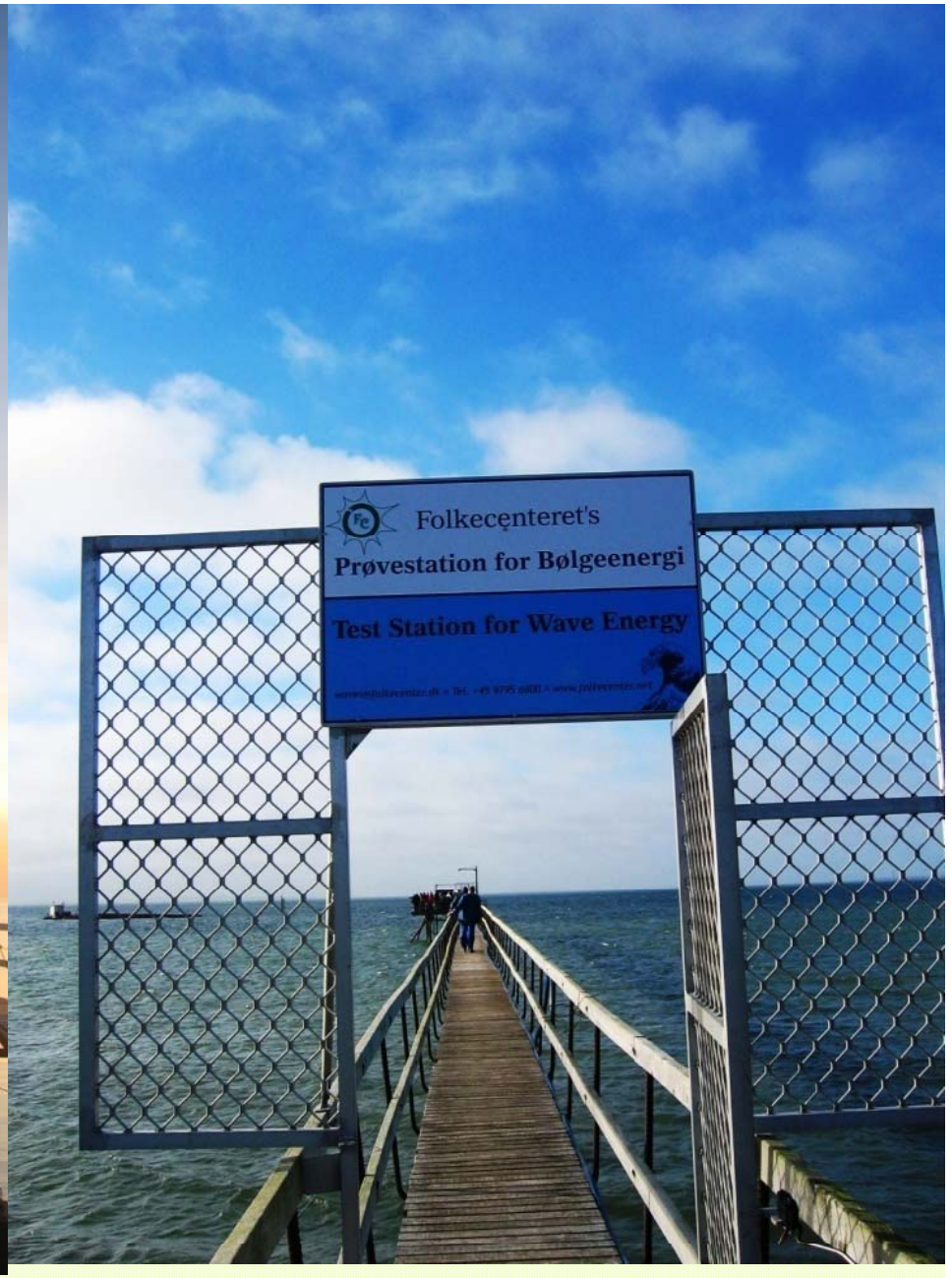
Solar thermal solutions



Wave energy





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Energy autonomous strawbale house

Waste Water as a resource

for E

Trainees and visitors come from the whole w

Biogas plant in Lithuania

Biogas in Japan

Village Solar Electricity in Mali

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Opening of solar energy training centre

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Evening school by solar lighting

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1980
Local CHP plants
Today
Local CHP plants
Non-local CHP plants
Wind turbines
Solar panels

DEN EUROPÆISKE UNION
Den Europæiske Fond for Regionaludvikling
Vi investerer i din fremtid

Thisted Municipality in Thy –

Electricity from renewables: 100%

Space heating from renewables: 86%

DEN EUROPÆISKE UNION
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“What we see in Thisted is a blueprint for adapting to climate change. It shows that people and communities really count.”

Jacqueline McGlade, Director, European Environmental Agency

Thisted Municipality

- Thisted municipality in Thy covers an area of 1.093 km2, with approx. 46,000 inhabitants
- One of the largest municipalities in Denmark
- Rural region characterised by nature
  - Rolling hills, farmland and gentle fjord landscape
- 100 km of unique coastline
- Great surfing '*Cold Hawaii*'
- First *National Park* in Denmark
- In 2007, Thy was awarded the *European Solar Prize* for its outstanding share of renewable energy.

EUROSOLAR
The European Association for Renewable Energy

Local mobilization

Three important parameters to remember about Thisted:

- Thisted involves its citizens actively
- Thisted involves local companies
- Thisted uses mature technology that exists in the field
- Achieve the best result when these interact in a sensible and economical way

Renewables for all energy needs

- For the last 30 years, farmers, industry, utilities and cooperatives in Thy have extensively invested in and used renewable energy resources.
- “In Thy we live and breathe renewable energy. That is the essence of the Thy model where people, economics and technology come together to create clean carbon neutral energy.” *Thisted Municipality*

- Biomass
- Biomass for district heating
- Biogas in small and
- large scale facilities
- Geothermic cooling
- Geothermic heat
- Waste incineration for district heating
- Wind Power
- Wind energy management
- CHP and Wind Heat & Power, WHP

Local supply of electricity

Thy:

- 226 windmills
- 114.640 KW installed wind capacity
- 35.830 KW installed CHP capacity
- 2008: power production from wind energy of **265 GWh**
- 2008: power consumption of **339 GWh**
- **Electricity Consumption**
- 80% from wind
- 20% from biogas and CHP waste
- a small amount of PV

Strong Local Support in Thy

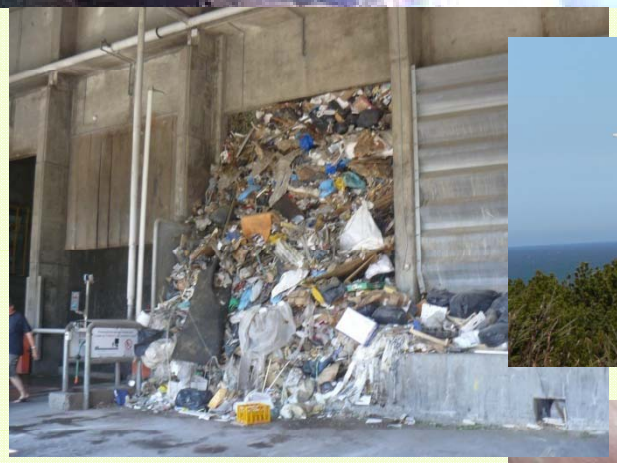
Strong local support is crucial; is obtained by

- Local ownership of windmills
- Local ownership of biogas plants by several farmers
- All the CHP plants and the district heating are not-for-profit consumer owned

Windmills in fields of barley.

Self-supplying

- **Heating:** Thisted, the main town and the other smaller towns in the municipality all have 100% district heating with 85% using biomass. 86% of the heating in the Thy region comes from renewable energy.
- **Electricity**: Thisted is self-supplying in terms of its electricity consumption. Wind energy covers 80% of Thisted's electricity needs. Biogas and CHP make up the balance.
- There are several CHP plants in the municipality. CHP plants use natural gas and also use other forms of renewable energy e.g. biomass such as straw, wood pellets, wood chips and waste material.



CO2 emissions saved: almost 90.000 tons per year

Thisted has community power

- Community power is typically owned and operated by the community
- Community power primarily takes the form of decentralised green power generation
- Wind power, solar power, biogas, biomass, and combined heat and power are examples of such infrastructure
- Financial benefits are returned to the community
- Community has a choice and may choose what infrastructure fits best with their needs and is efficient.

Benefits of community power

- Local Community Owns/Installs/Operates local green power producing infrastructure
- Benefits from the infrastructure are reaped by local community
- Local pollution reduction, CO2 reduction, job creation, business development, economic diversification and skill building.
- Once a community has experience with community power, that skill can be transferred to other communities.
- Sense of community and acceptance is reinforced by working on projects which benefit the community

Related impacts

The transformation to renewable energy led to the emergence of several new local industries:

- Bach composite, main supplier of nacelles for Vestas
- Cimbria SKET, leading producer of presses for treatment of oil seeds
- Several additional sub-suppliers for the wind mill industry
- TVT biogas plant builder
- Ideal Combi making energy-efficient windows

- Distinct economic benefits from locally owned turbines. Renewables create new prosperity and jobs for a considerable number of people. This foster local acceptance of wind power

Production one 2 MWwindmill: 8 Mio. kWh/y

Wind energy and industry

Shaping the landscape

Folkecenter for Renewable Energy

Windmill foundation for coastal protection

New income for the farmers

Powerfull simplicity

In harmony with nature

Family windpower and solar

Transportation

- There are about 17,000 private vehicles in Thisted municipality, driving 16,000 km per year at 10 km/l at 10 kWh/l.
- With this in mind, replacing these cars with electric cars which are at least 3 times more efficient than the average car, would require 90 GWh electricity from 21 additional 2 MW turbines.
- These turbines would be additional to the 226 windmills already existing in the area.

Two main supply forms: Wind and CHP

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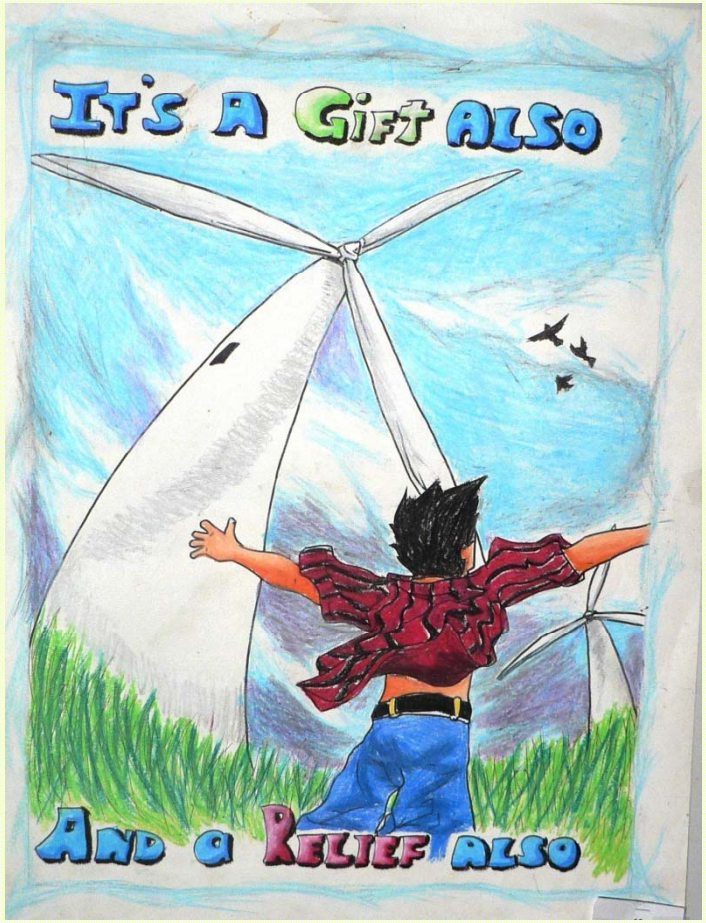
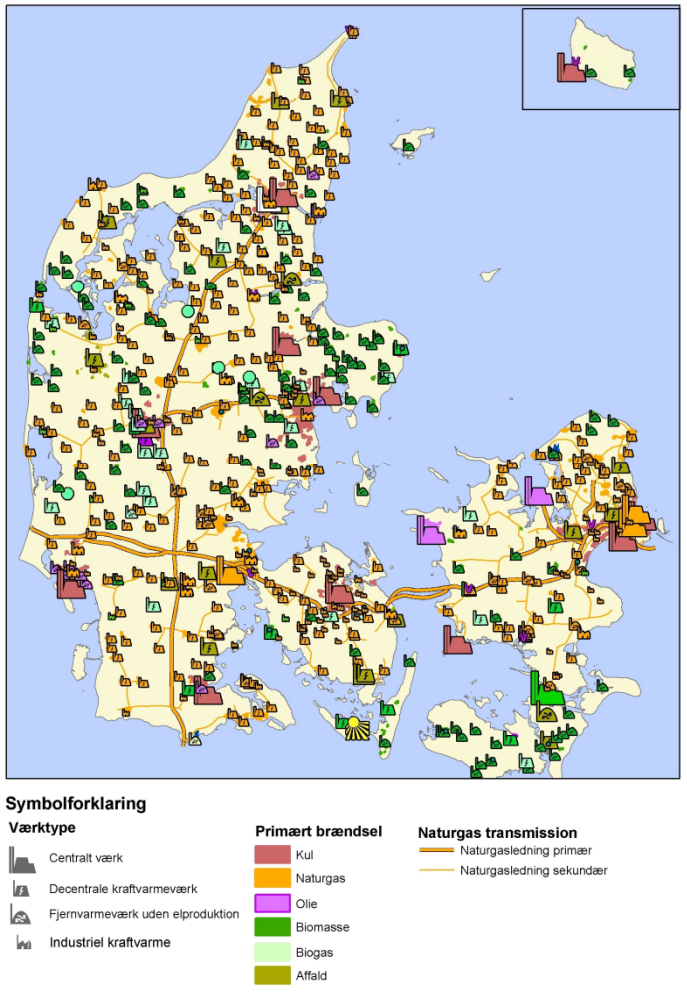
The Danish way: Clean and decentralized energy solutions

Wind Energy and Combined Heat and Power





Thisted Municipality Heating System

1. Heat fish co.
2. Waste wood
3. Waste wood
4. Waste wood
5. CHP (waste)
6. Geothermal
6a. Straw biomass
7. Wood pellets
8. Wood chips
9. Wood chips
10. CHP Nat Gas
11. Gas oven backup
12. Biofuel
13. CHP Nat. Gas
14, 15, 16. Back up
17. Malt Plant
18. CHP Nat Gas
19. CHP Nat Gas

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Geothermic heat Thisted

Biomass district heating

100% self sufficient heating from biomass district heating carried out in:

- Hurup
  - wood chips
- Vestervig
  - wood chips
- Bedsted
  - wood pellets
- Øsløs
  - wood chips
- Frøstrup
  - wood chips
- Sennels
  - wood pellets

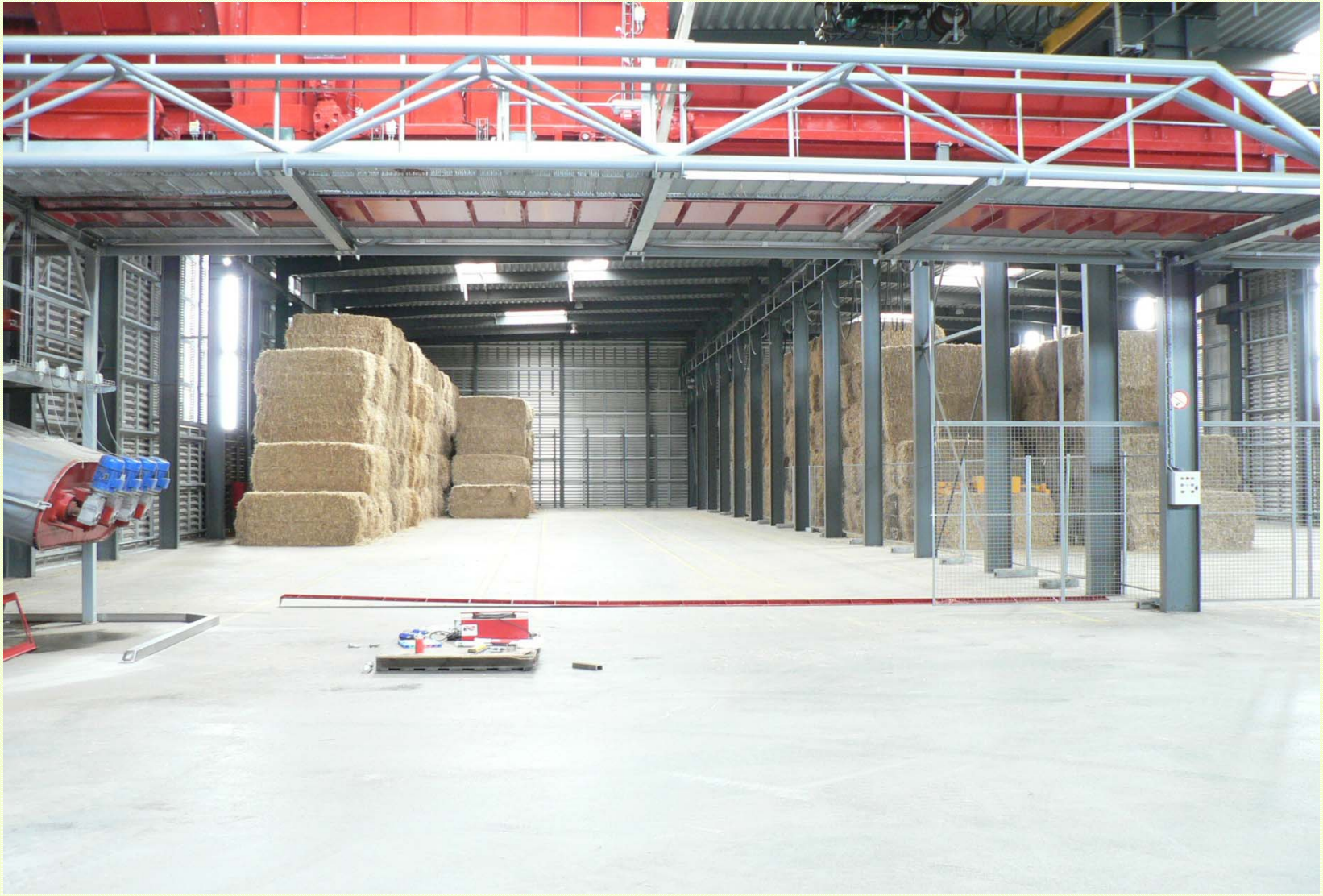
Renewable.

Carbon-neutral.

A domestic resource.

A source of economic development and job creation.

Biomass – heat from straw



Benefits of integration of CHP with WHP:

- No need for new transmission lines.
- Local acceptance of wind energy
- Better prices for peak wind power
- Replacement of fossil fuels in CHP stations
- Biomass as a cheap storage medium

Next step: Autonomous energy supply

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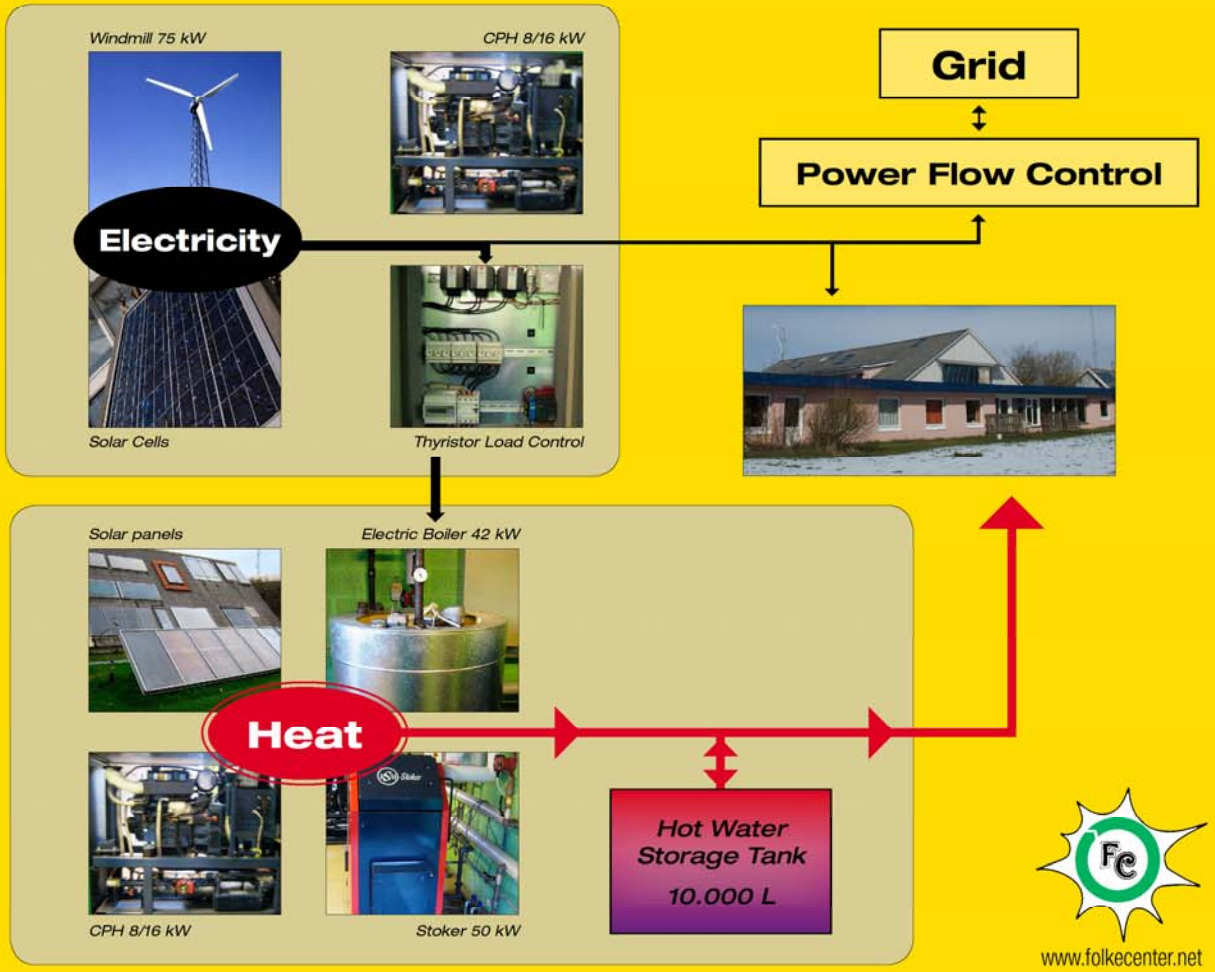
Folkecenter Autonomous Energy System



Strategi for det autonome vedvarende energisystem

- Vind- og solenergi udgør den primære forsyning af el og varme. Træpiller og planteolie kan lagres og bruges kun som back-up.
- Overskud af møllestrøm afsættes det til varmesystemet gennem tyristorerne og elkedlen.
- Mangler der kun varme kobler stokeren ind, som bruger træpiller.
- Er det vindstille og der er behov for både el og varme, kobles kraftvarmeenheden ind. Produktionen af el og varme dækker udgiften til rapsolie og drift.
- Overskudsvarme fra vindmølle og solfangere afsættes i varmelagertanken på 10.000 liter. Der tappes efterfølgende fra denne tank til forsyning af varme og varmt vand.

Strategy of the autonomous renewable energy system

- Wind and solar energy are the primary sources for heat and electricity. Biomass is used for back up.
- The power flow control directs surplus electricity through the thyristors to the electric boiler.
- When the electric boiler does not supply sufficient wind generated heat, the wood pellet stoker is activated.
- In case of no wind, and a need for heat and electricity, the combined heat and power unit, CHP, running on plant oil, is activated. The combined production of heat and electricity covers the cost of vegetable oil and operation.
- Over production of wind and solar generated heat is pumped into the 10.000 litres hot water storage tank to be used at a later time.

Summary

1. Wind, local biomass and waste are the primary resources
2. Wind now delivers 80 % of the electricity; biomass, waste 20 %
3. New municipal plan increases wind from 265 GWh/year to 445 GWh/year
4. Wind energy is a cheap resource; down to € 0,04/kWh
5. Tariffs: Some power producers get market prices some feed-in
6. District heating is the norm in the villages and towns
7. Combined heat and power, CHP, in most of the towns (total 30 MWel)
8. Hot water for district heating, liquid and solid biomass are used for storage
9. Power up- and down-regulating balances the system (new)

SUMMARY continued

1. Community ownership of all district heating and CHP
2. Municipal energy foundation will own future wind power
3. Capitalization of renewable energy resources is basically avoided.
4. Local ownership leads to local acceptance of wind power.
5. Local renewables pave the way for new industries and jobs
6. Institutional framework: The Municipality; Thy-Mors Energi; Nordic Folkecenter for Renewable Energy (since 1983); Nissum Bedning Test Station for Wave Energy (since 2000); The National Wind Power Test Station (2010).
7. Special Event: Thisted received the European Solar Prize in 2007 for its outstanding achievements.

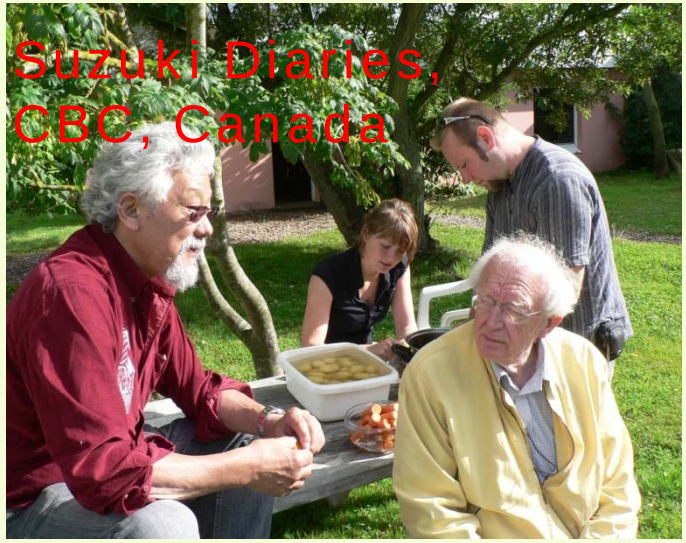
Expert‘s Statement

“The surprise is why isn’t everyone else doing what Thisted is doing? They are a lighthouse but this should be going on now all over the world”

***Jeremy Rifkin**, founder and president,*
Foundation on Economic Trends

Celebrities visit Thy to study renewable energy

Thy attracts international media and politicians in 2008



EUROPEAN SOLAR PRIZE 2007

- Mayor Erik Hove Olesen states:

"I am very proud and grateful that we today receive this award. Not us as authorities have the honour. Our 46.000 citizens, the Folkecenter and our 1700 local companies made the change. The many windmill owners, the farmers that have biogas plants and the community utilities, they have together made Thy self-sufficient with energy."

Dr. Hermann Scheer gives the Award to the Mayor

EUROPEAN SOLAR PRIZE 2007

- Thy in December 2007 got the esteemed EUROPEAN SOLAR PRIZE due to its outstanding share of renewable energy in the municipality.
- The mayor of Thisted gave a speech and said that Thisted would like to have even more renewable energy.

From the EUROSOLAR *award* ceremony at KfW in Berlin.

I thank you for your attention!

For further information please visit

www.folkecenter.net

www.klimalosninger.dk

Email: pm@folkecenter.dk