

# INFORSE-Europe Seminar, August 2021 Denmark – Guided Study Tours

Part of Proceedings: [www.inforse.org/europe/seminar\\_2021\\_INFORSE-Europe\\_DK.htm](http://www.inforse.org/europe/seminar_2021_INFORSE-Europe_DK.htm)



## INFORSE-Europe Seminar, August 2021 in Denmark – Study Tour 1

**Guided Tour at the Nordic Folkecenter for Renewable Energy (NFRE) by Jane Kruse, director of NFRE**

Demonstration sites of different type of solar cells, solar collectors, small windmills, wave energy, bio-dome, e-bicycles, cooking powered by solar cell, passive house architecture, straw house, tinny house, and much more...See More at: <https://www.folkecenter.eu/pages/About.html>

## INFORSE-Europe Seminar, August 2021 in Denmark - Study Tour 2

**Danish Test and Resource Center for Small Wind Turbines of Nordic Folkecenter for Renewable Energy**

The test site has place for 3 turbines, and it has tested turbines of various sizes for parts, power curves, noise measurements etc. The center is also testing non-approved wind turbines, which must be tested and approved to enter the market, by a wind turbine manufacturer or importer. In addition, the test center also offers testing of new ideas. More info: <https://smallwind.dk/>

**Snedsted Solar District Heating**

The consumer owned district heating was established in 1959 by 48 houses, which increased to 610 houses. In 2015, a solar thermal collector field of 6500 m<sup>2</sup> of 512 panels was installed, which provides 23 % of the heat demand of the town. More info: [www.snedstedvarme.dk/](http://www.snedstedvarme.dk/) [www.snedstedvarme.dk/solvarme/](http://www.snedstedvarme.dk/solvarme/)

**Test Center for Large Windmills in Østerild.**

There are 9 wind turbines, which are tested upto 250 meter heights, 5 of them can be tested upto 330 meter height. There is a Visitors Centre with exhibition with information on e.g., how a wind turbine is built, and see different wind turbine models. The visitor center opened in 2017 and visited by 30.000 guests annually. <https://windenergy.dtu.dk/english/test-centers/oesterild>

# INFORSE-Europe Seminar, August 2021 in Denmark

## – Study Tour 3

**THURSDAY 19. December, 2021 - SOUTH TOUR**

Guided Tour with bus by Henning Bo Madsen, INFORSE-Europe, visiting to sites in municipalities being at the front of transition to sustainable energy Local investments in wind energy and consumer owned district heating. All of these plants have been built on the initiative of local citizens. They are using locally available renewable energy sources to provide both energy and income to the local communities.

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### **Lemvig community biogas plant**

The biogas plant is owned by farmers and delivering gas to the towns CHP. The animal manure is delivered by local farmers. The end products are both biogas for production of heat and power and harmonized fluid fertilizer for the farmers.

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### **Hvide Sande District Heating**

The heating system is consumer owned cooperative, 3 x 3 MW windmills on beach, heat absorber for heat pump, combination with thermal solar.

#### **Demonstrating “The Danish Model” for district heating – about 350 local cooperatives.**

Hvide Sande District Heating A.m.b.A. is a limited liability company.

The company is consumer-owned and is generally managed by a board of 5 people. These board members are elected at the annual general meeting and sit for 2 years at a time. In even years, 3 are up for election, and in odd years, 2 are up for election.

On the personnel side, 3 operating employees, 1/2 office employees and 1/2 service employee. On duty are the three permanent employees.

#### **History – growth and innovation**

Hvide Sande District Heating A.m.b.a. is as a company from 1963 and has through the ages been through various types of fuel.

Since the oil crisis in 1973, attempts have been made to use the cheapest fuel at any given time. From heavy heating oil, via waste oil, coal, wood pellets, fish oil, to in 1994 establishing a natural gas-fired heating plant with 2 gas engines for cogeneration with supplementary gas boilers.

In January 2011, a 6 MW electric boiler was installed, which consumes electricity from the electricity grid when the price of this is advantageous.

In November 2014, **9,576 m<sup>2</sup> of solar panels** were installed on Beddingsvej. This system is connected directly to the already installed transmission network, and contributes more than 10% of the annual heat production.

In 2018, the two northernmost wind turbines were taken over, and the southernmost was taken over in 2019. **The wind turbines are 3 MW each. 150 m to wing tip in high position.**

A new boiler hall was built on Numitvej 25. In 2019, the electric boiler was moved to the new boiler hall and the electric power was increased to 10 MW. It was decided to build a **4.65 MW heat pump system**, which takes the energy from the air and delivers the energy at a higher temperature into the district heating system. Both the electric kettle and the heat pump are primarily powered by the three wind turbines on the beach.

In 2020, Hvide Sande District Heating (in Danish called Fjernvarme) was able to produce 92.4% of the heat on **real renewable energy, sun and wind.**

In October, Hvide Sande Fjernvarme received the District Heating Award 2020 - "for the implementation of a number of green initiatives since 2014, which within the coming year **will have reduced CO<sub>2</sub> emissions by 97%**".

See production data at [www.energyweb.dk/hvidesande](http://www.energyweb.dk/hvidesande)

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#### **Passing by on the way:**

- **Wind farms with 3 MW and 3.3 MW** wind turbines max. height 150 m.

- **Ringkøbing District Heating** using 30.000 m<sup>2</sup> thermal solar and air-water heat pump plus natural gas for engine and boilers, See production data at [Ringkøbing Fjernvarme \(energyweb.dk\)](http://Ringkøbing Fjernvarme (energyweb.dk))  
- **Vestjyllands Højskole** with a renewable energy system combining small wind turbine, thermal solar panels, ground heat pump run by power from wind mill, electric boilers and hot water storage tank.  
Driving through villages with people divided against and for project plans for big wind turbines 230 m, PV farm and Power to X plant.

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#### **Lem District Heating transition to RE**

Lem District Heating Plant with thermal solar and air-water heat pump. Combined with burning wood chips and gas. Consumer owned non-profit cooperative. Placed next to one of the Vestas production facilities in the municipality.

*Renewable energy capacity:*

6.140 m<sup>2</sup> thermal solar : 5,5 MW (max 36-40 Mwh pr. døgn); Heat pump - air-water: 4,2 MW ; Wood chip boiler: 5,0 MWh; Absorption heat pump: 400 kWh; Storage tanks - 2 hot water: 2.200 m<sup>3</sup> ; Consumers 720, but 45 big (industry, institutions) = 70% of consumption

Fossil fuel capacity: Gas engine - Caterpillar 3,8 MW electricity and 4,8 MWh heat; 12 MW + 5 MW gas boiler; 5 MW combi boiler gas / oil; Diesel generator 600 kW

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#### **Heat pumps in Danish district heating - Capacity is rising sharply**

An analysis from Dansk Fjernvarme (Danish District Heating) shows that the capacity of collective heat pumps during 2020 was increased by 350 MW heat, so that at the beginning of 2021 it was a total of 454 MW heat. This development will continue in 2021. In the spring support was given to a total of 12 heat pump establishments, which together provide an additional 66 MW of heat capacity.  
A new application round for grants starts in September 2021.

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#### **Wind Farm at Nørhede-Hjørtose**

The wind farm has 22 x 3.3 MW turbines from Vestas (over 100 mio. Euro local investment, 80% from 20 big local investors and 20% from many neighbors) - and PV farm (almost 17 mio. Euro, 16 local investors). Now application from farmers and developer company for an additional 255 ha PV farm is in the planning process in the Municipality of Ringkøbing-Skjern.

The Municipality, who has the planning authority, is currently planning for 1100 ha PV farms (without any state aid). But there are already applications for 2400 ha.

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***In this area – the Municipality of Ringkøbing-Skjern*** - the politically decided energy – and climate strategy aims at producing enough energy from wind, solar, biogas and small amount of local biomass to cover the total energy consumption of energy (power, heat, transport, industrial process) within the next two years and to reach carbon neutrality by 2040.

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#### **- Tvind International School Centre**

**A windmill, which is the longest operating modern windmill combined with electric water boilers, local heat pumps, PV, thermal solar at Tvind International School Centre.**

This pioneering self built **wind turbine of 1-MW** has been running for more than 40 years. Delivering electricity and heat to the many school buildings and surplus power to the grid.

The mill is connected to boilers that supply heat to the dining room and sports hall

Heat pumps in connection with the boilers - There are posters showing how the heat pumps work.

**Stand-alone system with small solar cells and a 400 Watt wind turbine** Solar system on 3 roofs - one system's converter is located so that it can be read outdoors **A "power thief"**: An approximately 240 watt solar panel that can be plugged directly into an electrical outlet with a meter on **A "solar cooker"**: A dish that can be cooked over. A bio waste water plant that handles all waste water from all over Tvind. Posters showing how it works

**Garden farming:** Vegetable garden, where we produce vegetables for Tvind

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**Returning to Folkecenter passing many big MW wind turbines and small 6 -25 kW at farms**

See more at: [https://www.inforse.org/europe/seminar\\_2021\\_INFORSE-Europe\\_DK.htm](https://www.inforse.org/europe/seminar_2021_INFORSE-Europe_DK.htm)