

Preparing utilities for a datadriven future

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About Assens Fjernvarme

- Cooperative established in 1960
- 3.450 DH customers (“Shareholders”)
- 100% CO₂ neutral since 1988
 - Heat production 115.000 MWh/year
 - Power generation 35.000 MWh/year

Sector coupling due to project

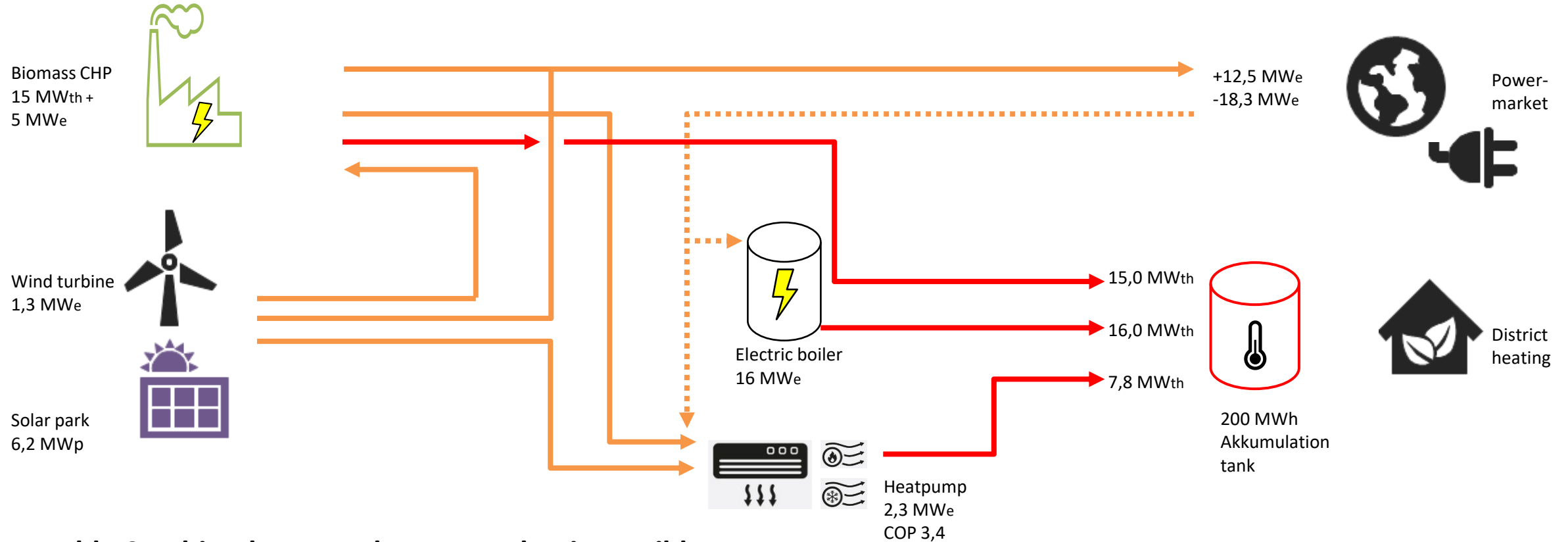
Renewable Combined Heat & Power

The business model benefits from fluctuating (sustainable) electricity prices due to:

- Biomass CHP (locally sourced woodchips)
- Wind turbine
- Solar park (east-west bound)
- Electric heatpump



Renewable Combined Heat and Power



Renewable Combined Heat and Power makes it possible to:

1. Produce amounts of sustainable energy. Reduce CO₂ emissions and (local) biomass by 40-50%
2. In combination with Heat Pump increase efficiency of the CHP to +150%
3. Trade on the power market:
 - a) Sell power when the price is high
 - b) Purchase power when the price is low (negative)
 - c) Use own power to gain efficiency when the price is middle
4. Impact on heatprice:
 - a) Low heatprice are reduced by ~12%
 - b) Stability. Less sensible to changes in spotprice, taxes, biomass cost etc.

— Electricity
— Heat

A complex system causes complex planning

- The system receives forecasts on a minute basis
 - Temperature data
 - Sun data
 - Wind data
 - Heat demand
 - Powermarket data
- The forecasts are used for energy optimization and production planning and based on 5-day cost optimization
- As the calculations are complex and constantly changing, an automated software solution is needed
- The software bids prices to the powermarket
- The software regulates heat and power production itself



Bud/planlagt produktion

Beregne day-ahead bud

12-12-2021

Døgnmængder

Udfold	Vindmølle	Solceller	Heat Pump	KVV
Beregne d	Beregne d	Beregne d	Beregne d	Beregne d
Tid	Spot price (prog) [DKK/MWh]	Prisuafhængig [MW]	Prisuafhængig [MW]	Beregne day-ahead bud
00-01	962,0	0,01	0,00	0,10
01-02	814,0	0,01	0,00	0,10
02-03	754,8	0,02	0,00	0,10
03-04	754,8	0,06	0,00	0,10
04-05	740,0	0,09	0,00	0,10
05-06	754,8	0,12	0,00	0,10
06-07		0,00	0,00	0,10
07-08		0,00	0,00	0,10
08-09		0,00	0,00	0,10
09-10		0,00	0,00	0,10
10-11		0,04	0,00	0,10
11-12		0,05	0,00	0,10
12-13	962,0	0,44	0,00	0,10
13-14	1036,0	0,41	0,00	0,10
14-15	1107,2	0,28	0,12	0,10
15-16	1088,1	0,15	0,04	0,10
16-17	1110,0	0,11	0,00	0,10
17-18	1110,0	0,08	0,00	0,10
18-19	1110,0	0,06	0,00	0,10
19-20	1076,6	0,06	0,00	0,10
20-21	1110,0	0,07	0,00	0,10
21-22	971,1	0,07	0,00	0,10
22-23	962,0	0,07	0,00	0,10
23-24	888,0	0,07	0,00	0,10

Spotprices

Bits to the powermarket

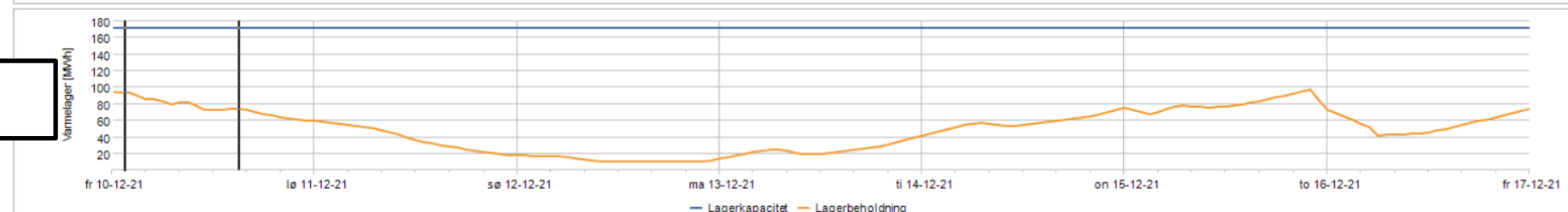
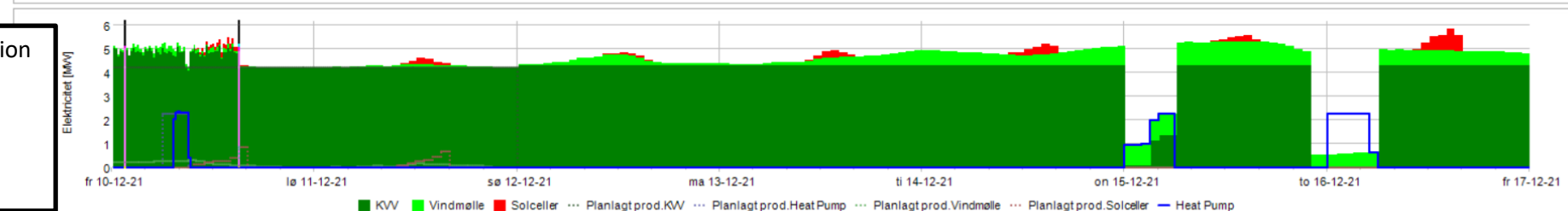
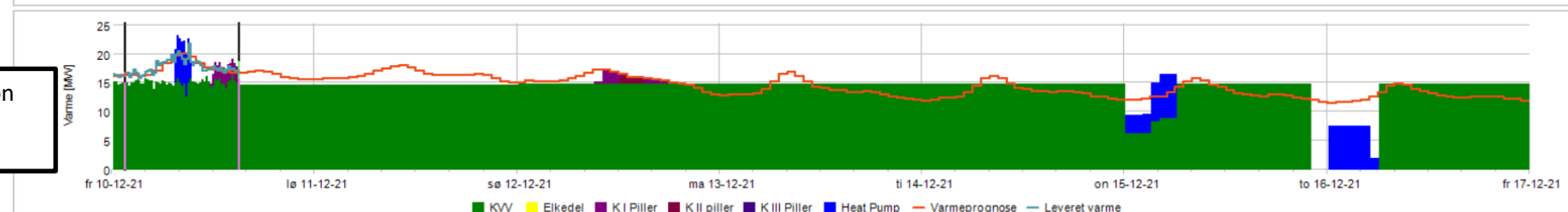
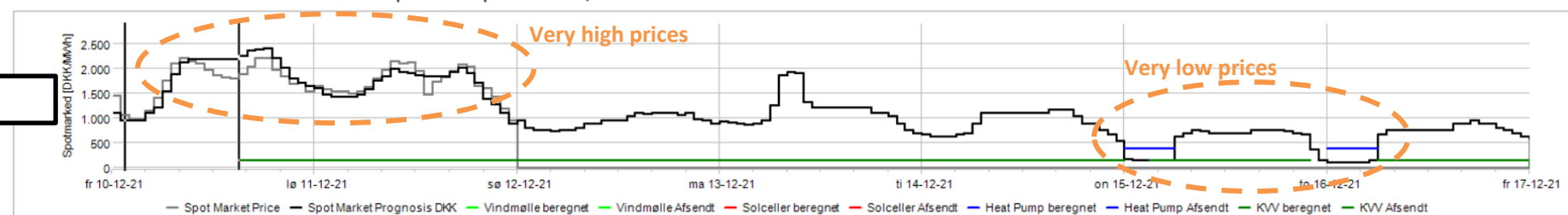
Heatproduction
CHP
Heatpump

Powerproduction
CHP
Wind
Sun
Heatpump
(consumption)

Heat-accumulation

Dage 7

Resultat af ordinær drift: 233.617 DKK Nettovarmeproduktionspris: -106 DKK/MWh



Key takeaways

- The green transition leads to far more unpredictability in the energy system. Consider this as a business opportunity!
- The unpredictability can be handled through sector coupling.
- The unpredictability requires that large amounts of data has to be handled
- Unpredictability can be profited from if there is a suitable business model.
- Advanced data driven systems are needed for forecasting and managing production facilities. The task is far too complex and dynamic for humans to handle.
- The datadriven systems must be developed on an interdisciplinary basis. It is necessary to involve highly competent specialists



Thank you
for listening

