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A SHOWCASE FOR RESILIENT AND SUSTAINABLE DISTRICT HEATING IN DENMARK

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Abstract – This presentation gives a description of the Danish district heating company, Hvide Sande District Heating, which has become independent of fossil fuels by using wind and solar energy. This has resulted in lower consumer heating prices in a time when other fossil fueled district heating plants are raising their heating prices due to higher fossil fuel prices. Besides participating in the Day-ahead market it also participates in the balancing markets. Hvide Sande is a small fishing town. The district heating plant provides heat to 1 700 consumers. From being a natural gas fired Combined Heat and Power plant, it has in recent years become more resilient by investing in a solar collector, wind turbines, a heat pump, an electrical boiler as well as more large thermal storages, and is now independent of natural gas. The two thermal storages of 2 000 m³ and 1 200 m³, respectively, can store around 200 MW h heat, which allows flexible marketbased productions of the different production units. The heat delivered to consumers can thus be produced many hours or days before delivery. Even in the Day-ahead market, the marketbased productions are a challenge to plan. Because of the large thermal storages, the manager must look more days ahead as well as consider the heat amount in the thermal storages when deciding the hourly bids for tomorrow. Biddings are based on forecasts more days ahead of wind velocity, solar radiation, ambient temperatures, and Day-ahead prices. Besides participating in the Day-ahead market it also participates in the balancing markets. However, to take advantage across more electricity markets of this flexibility, a vast digitalization of the plant using advanced bidding methods has been required. This presentation illustrates examples of the daily earnings the plant has had participating across more electricity markets. It is also important that the manager maintains a digital twin of the plant. The digital twin of the plant will in this presentation be used for simulating the resilience of the plant against large changes in electricity prices and fuel prices.

Keywords – *District Deating (DH); digital twin; electricity markets; independent of fossil fuels; resilience; using wind and solar energy*

