District Heating in Copenhagen – challenges and perspectives

7. International Conference on

Smart Energy Systems

4th Generation District Heating, Electrification, Electrofuels and Energy Efficiency

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Agenda

HOFOR District Heating

Competitive District Heating

Smart Energy Systems / Digitalization Challenges

Digitalization of assets

Closing considerations

Examples

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HOFOR District Heating

Our ambition

Green, Safe and Competitive District Heating (DH)

- **Green DH** >> 100% CO2-neutrality by 2025
- **DH supply security** >> cost-balanced level of supply security
- **Competitive DH** >> Customers should prefer DH in comparison with other alternatives, based on price, CO2-neutrality and security of supply

HOFOR District Heating - Key Figures 2021		
Capacity demand in Copenhagen Region	**4.870**	**MW**
Base Load: CHP, incineration and heat pumps	2.130	MW
Peak Load: Heat-only boilers and turbine by-pass	2.740	MW
HOFOR District Heating		
DH network, length approx.	1.500	tracé km
Number of customers, approx.	35.000	[-]
number of citizens, approx.	625.000	[-]
Heat demand covered by DH	99	%
Degree days for planning purposes (degree days/year)	2.801	
Heat sold (2801 degree days), HOFOR	**4.500**	**GWh**
Heat loss in distribution, approx.	10%	
Heat loss in distribution, approx.	500	GWh
Heat demand an net, HOFOR	**5.000**	**GWh**

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Competitive District Heating

Our ambition

Customers should prefer DH in comparison with other alternatives, based on:
price, CO2-neutrality, security of supply and easiness

Our customers' expectations:

- CO2-neutrality
- Reliability
- Reasonable low District Heating price
- Operational easiness – digital interaction

In addition, some customers would like to be autoproducers (prosumers) – producing a part of the needed heat by themselves.

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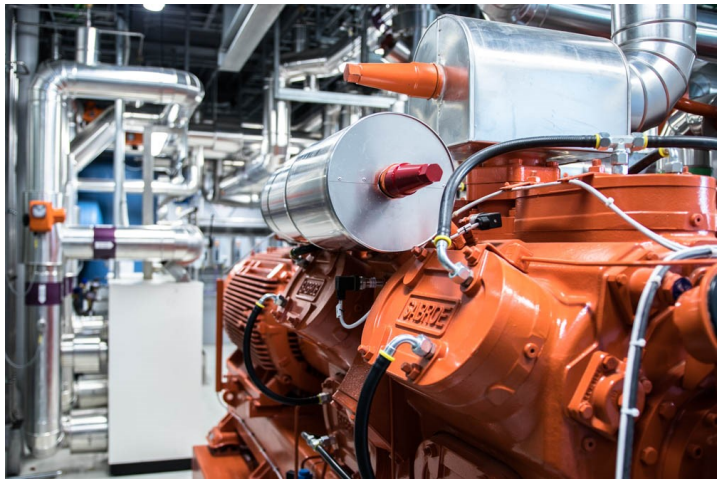
Competitive District Heating - continued



Our main challenge:
The heat density may be reduced in the future, due to changes in the regulatory framework:

- In the past, DH customers having a capacity demand of more than 250 kW were obliged to use district heating, only.
- This obligation was recently cancelled. Now these customers may use surplus heat or heat generated from renewable sources, if such solution will be better than district heating in socio-economic terms.

- The framework for investments in heat pumps has recently been improved significantly – as the taxes on electricity and surplus heat has been reduced, almost to zero.
- Although HOFOR is investing in heat pumps, it means that the competition from smaller individual heat pumps will be growing.

The consequence can be that the economic efficiency of district heating operations will deteriorate along with reduced heat density. In addition, our district heating tariff per MWh is the same all year round. If renewable energy or surplus energy is used during the summer season, we will lose money, and must increase the tariffs.

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Smart energy systems / digitalization challenges

Issue	Status 2021	Ambition 2025
Remote heat metering	11.000 customers	35.000 customer
Energy management based on remote heat metering (“Forsynometer”)	400 customers	Approx. 17.000 customers
Performance of customers substations	We have tested a model that is able to analyse the performance of substations	A system monitoring the performance of customers’ substations, enabling interventions
Performance-based renovation of DH pipelines	We are establishing a GIS database containing performance indicators/drivers	Calibrated model with drivers: technical data, failure data, data from pipe insulation water alarm wires, infrared measurements
Further use of operation data in the operation and control of the DH system	The network temperatures have been lowered considerably since 2010	Further reduction of temperatures, enabling higher efficiency of heat pumps
Reduction of the peak load	“Flexsumer” solutions are being tested Water and heat losses in the network have been reduces	Implementation of flexumer options Further reduction in water and heat losses
Sector coupling with heat pumps	We are testing and developing digital models optimizing the use of electricity in economic terms	Larger scale implementation of optimization models
Utilisation of CCS/CCU	We are engaged in the C4 cooperation initiated in 2021. Participants: ARC, ARGO, BIOFOS, CTR, VEKS, HOFOR Copenhagen Malmö Port, Vestforbrænding, and Ørsted	A CCS or CCU plant is in operation
Ways to success >>	Cooperation with universities, DH companies and other external partners	

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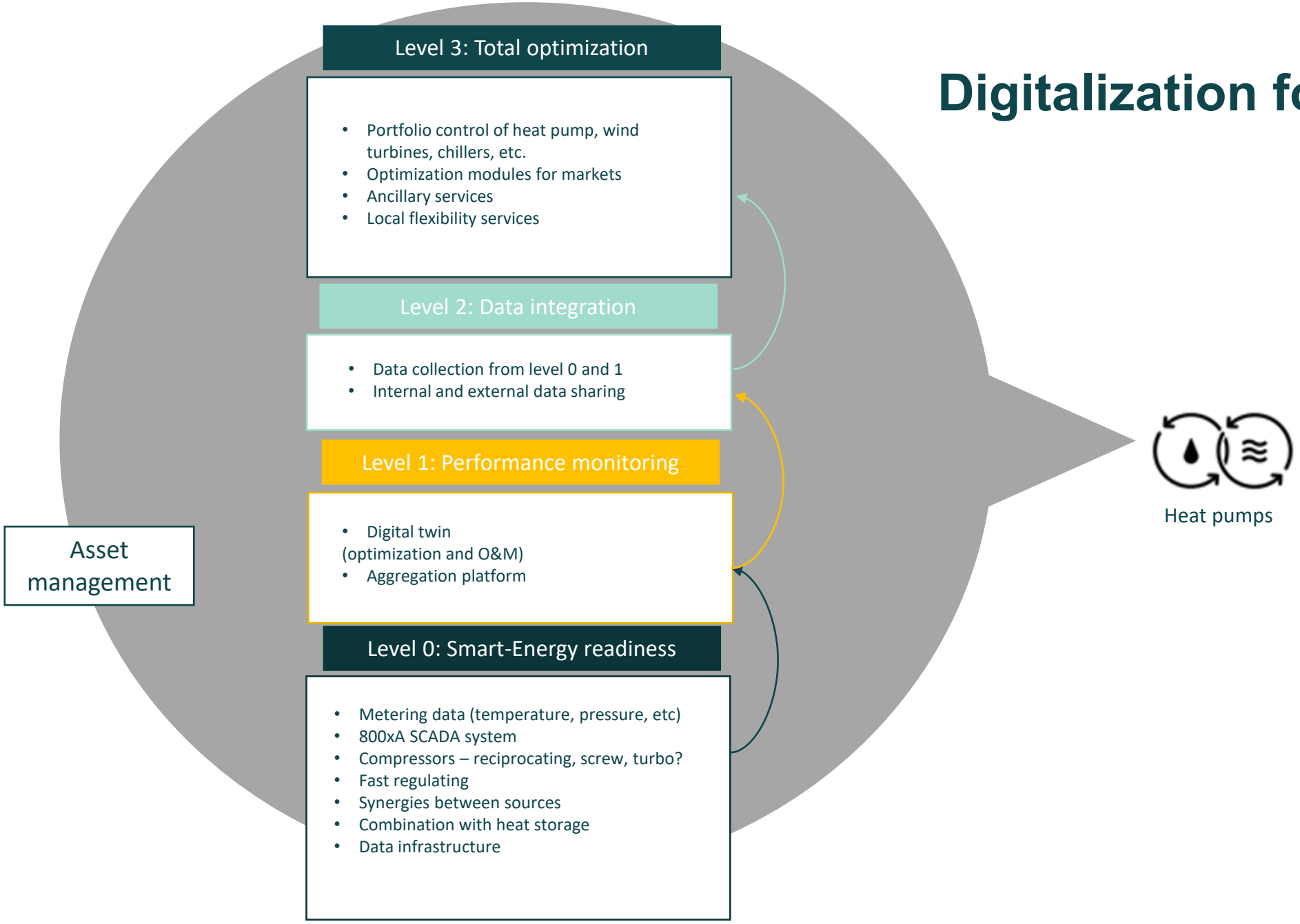
Digitalization focus on assets



Closing considerations

- Electricity is not yet CO2-neutral, having a CO2-emission for consumed electricity that is approximately 3.5 times more than district heating
- Reaching the last percentages of CO2-neutrality may be costly. The money might be better spent for investments in other parts of the world
- Some customer groupings tend to prefer small energy communities (islands). A DH Company, owned by the municipality, is in fact a large Energy Community

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