Towards Efficient District Heating & Cooling in Europe

Overview of the UpgradeDH solutions

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the Upgrade DH Project
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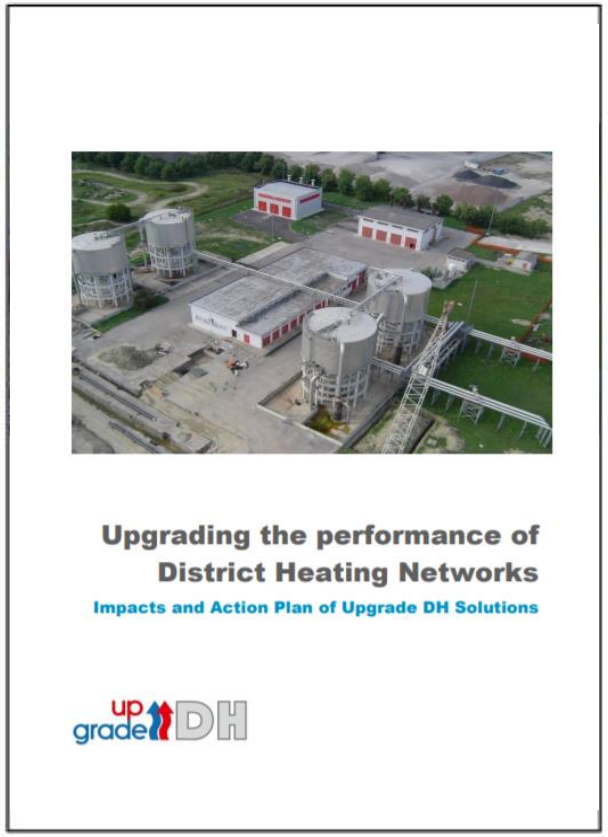
A wide range of upgrading measures…
… and a great example of effective collaboration



	Tuzla, BHZ	Middelfart, DK	Sisak, HR	Marburg, DE	Ferrara/Bologna, IT	Jalcininkai, LT	Grudziadz, PL	Purmerend, NL
FINAL USER (FSB)	X			X	X			X
DISTRIBUTION (COWI)	X	X		X		X	X	X
GENERATION (OPTIT)	X	X	X	X	X	X	X	X
Main Contributor	AGFW, OPTIT, solites	COWI	FSB	OPTIT	OPTIT	OPTIT, solites	COWI	COWI

Generation

Optimization & Advanced Analytics

- CHP Scheduling Optimization in Tuzla (BIH)
- Optimised Heat & Power dispatching in Italy (ITA)

Flexibility enhancement technologies

- Heat Storage integration in Sisak (CRO)
- Heat Pumps installation in Bologna (ITA)

Transition to RES

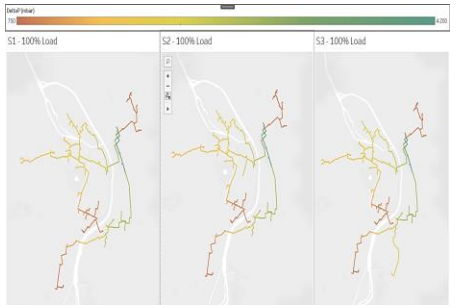
- Biomass plants in Purmerend (NED) & Grudziadz (POL)
- Solar Thermal in Tuzla (BIH) & Salcininkai (LIT)

Distribution

Lower Temperature Technologies

- New piping for lower temperature Ops in Middelfart (DEN)

Operational Network Optimization



- Thermal-hydraulic simulation modelling in Purmerend (NED)
- Hydraulic scenarios analysis in Marburg (GER)

Refurbishment & Expansion Strategy

- Long-term network refurbishment strategy in Salcininkai (LIT)
- Network expansion strategy in Grudziadz (POL)

Final user

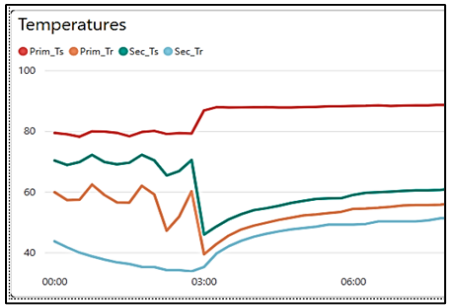
Consumer Engagement

- Switch to consumption-based billing in Tuzla (BIH)
- Cooperation with prominent consumer in Marburg (GER)

Regulation & Control Strategy

- Expert Coaching on Substations‘ design in Tuzla (BIH)

Digitalization & Analytics



- Smart Substation Analytics in Ferrara (ITA)
- Thermostatic valves at the users in Tuzla (BIH)

Environmental Impacts

The implementation of the various **upgrading measures** are estimated to yield significant results, in terms of **energy saving**, **emissions reduction**, **RES and Waste Heat integration increase**

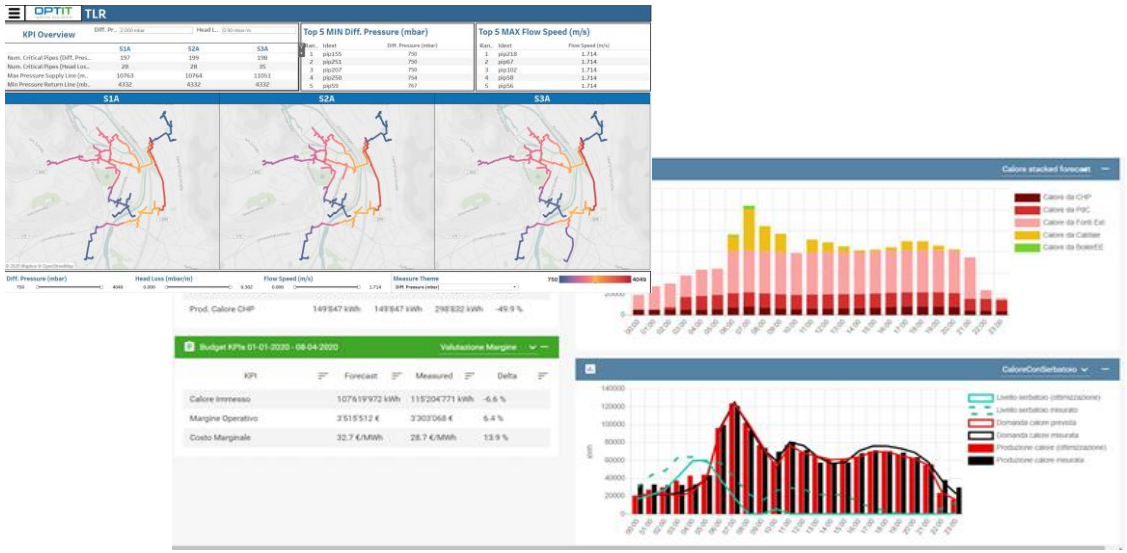
Project KPI	Baseline	After Upgrading Measures	Expected Impacts	
Primary Energy Demand (GWh/y)	1,451	1,206	**-245**	**(-17%)**
GHG Emissions (ton_{CO_2}/y)	290,661	145,687	**-144,974**	**(-50%)**
Share Waste Heat (%)	8%	10%	**+2%**	**(+25%)**
Share RES (%)	30%	51%	**+21%**	**(+70%)**

Economic Impacts

- Project calculated the impact of the various measures using standard financing indicators such as: IRR, NPV and payback period (PB)
- Future changes in legislation to fight climate change could impact the expected returns of many upgrading measure, making them more attractive financially

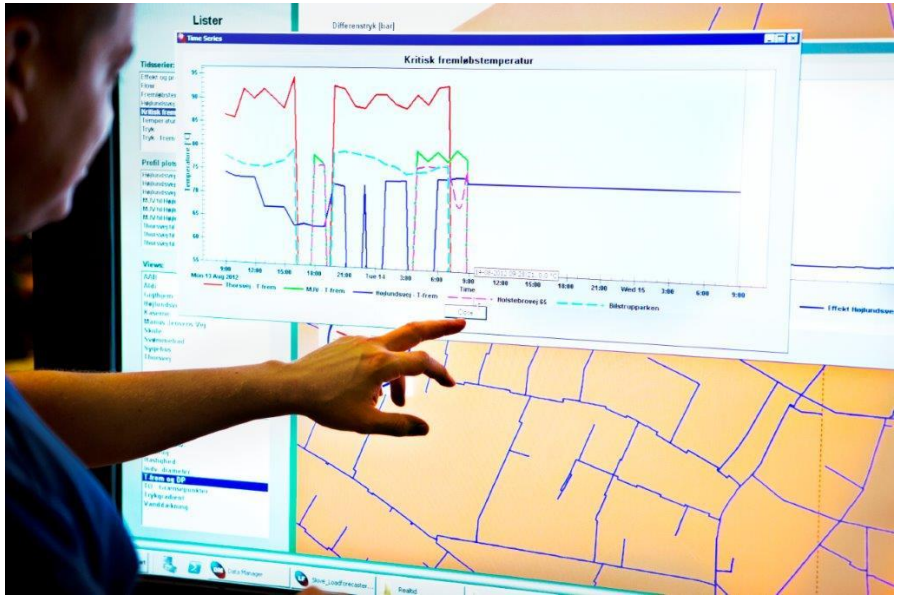
Upgrading Measure Category	Demo Case examples	Financial Indicators (order by PB)
Digital Optimization and Advanced analytics of generation and distribution	1. CHP scheduling optimization in Tuzla (BIH) 2. Simulation modelling in Purmerend (NED) 3. Hydraulic scenarios analysis in Marburg (GER)	PB between 1 and 1.5 years
Lower Temperature Technologies	New piping for lower temperature ops in Middelfart (DEN)	PB: 1.5 years
Flexibility enhancement technologies	1. Heat storage integration in Sisak (CRO) 2. Heat pumps installation in Bologna (ITA)	PB between 3 and 6 years
Transition to RES	1. Biomass plant Purmerend (NED) 2. Solar thermal in Tuzla (BIH)	PB > 20 years
Refurbishment & Expansion Strategy	Long-term network refurbishment strategy in Salcininkai (LIT)	PB > 10 years

The key role of digitalisation



- Monitoring
- Advanced data analytics
- Simulation
- Forecasting
- Optimisation

- The experience of the project highlighted how digitalization is becoming a key enabler for quick-return upgrading strategies, leading to modern advanced DHC systems



Final remarks

- All DH systems are, to some extent, peculiar to the local conditions and resources… yet, whatever the maturity level, there is a very high likelihood that performance can be enhanced significantly leveraging on proven, mature technologies (and sustainable business models), with positive environmental and economic impacts.
- UpgradeDH provides a vast Knowledge Base on tools, best practices and “good stories” to inspire practical replication, as already initiated within the project
- Collaboration and cross fertilisation is a key asset for the development of this industry. We are already networking with other DHC communities (Celsius, DHC+, …) to ensure that the momentum created by UpgradeDH can live on and contribute to the development of the industry