



ENFOR status

HEATMAN

Final monthly meeting 06-07-2022

ENFOR 

Overview

- Intro to HeatSolutions™
- ENFOR's developments during the project
- Heat load forecasting & temperature optimization
 - Brønderslev
 - Hillerød
 - Trefor
- Network's perspective on CSO

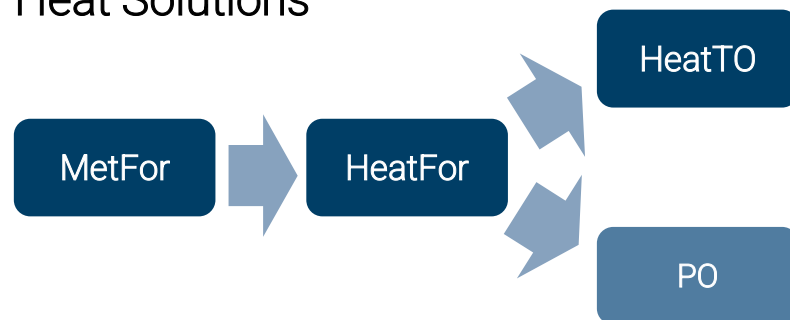
Heat Solutions™ - forecasting and optimization for district heating

Heat Solutions™ overview

Software platform with 4 modules for district heating

- *MetFor*™ - Locally optimized weather forecasts
- *HeatFor*™ – Heat demand forecasting
- *HeatTO*™ – Temperature optimization
- *Third party* – Production optimization

Heat Solutions™



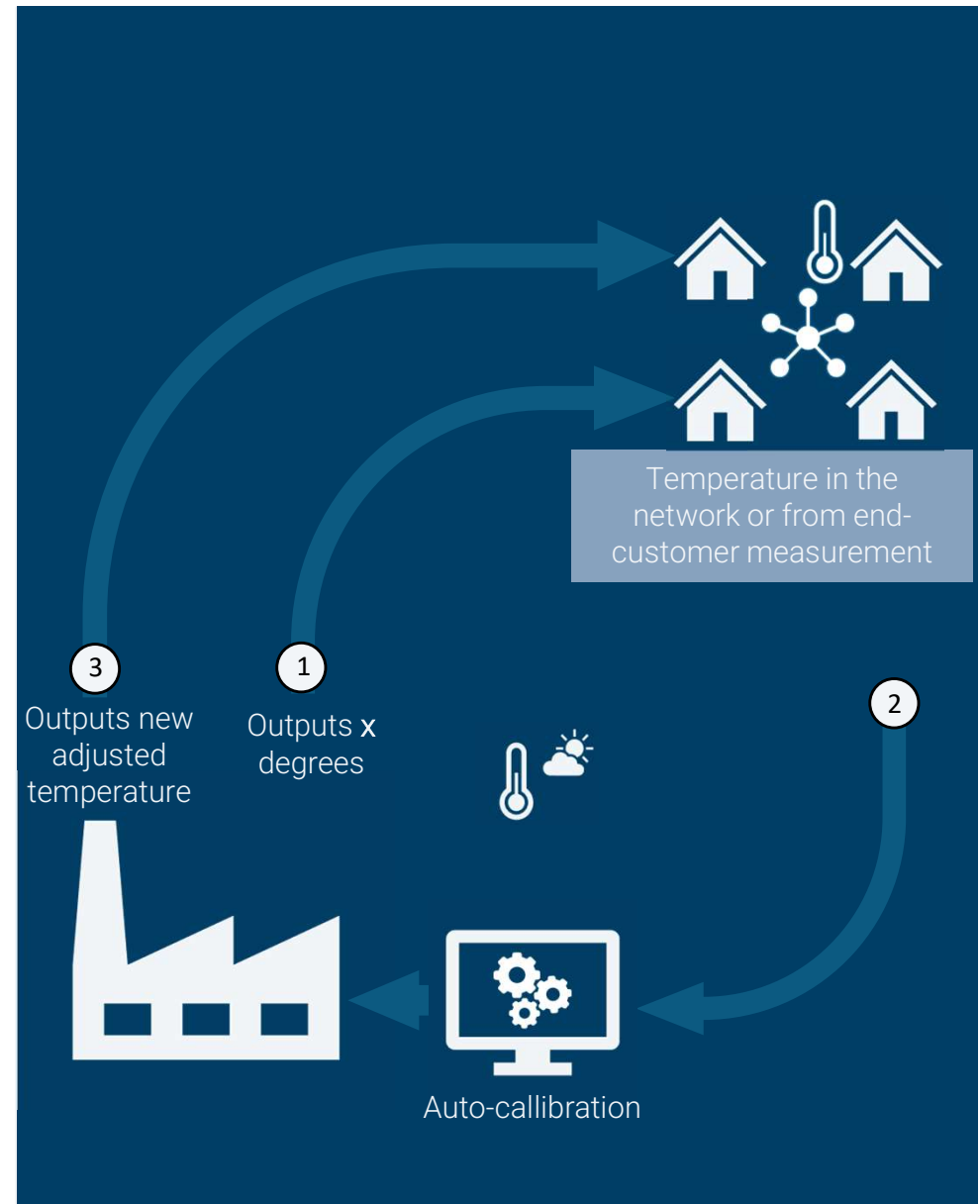
Heat Solutions™ benefits & highlights

- Attractive value proposition with short pay back based on savings on fuel and CO₂ emissions
- Robust and proven technology for both small and large scale district heating systems
- Fully automatic with low maintenance and low operational costs
- Based on machine learning algorithms which automatically adapt based on data inputs
- Integrates easily with existing operational systems
- Available as a software package installed locally at the customer or as a service hosted by ENFOR

HeatTO™ - temperature optimization

HeatTO™ benefits and highlights

- Use heat demand forecast, flow and temperature measurements to optimize supply temperature in the heating network while ensuring that:
 - the hydraulic capacity of the system is respected, and
 - the critical areas of the distribution network have a sufficient level of supply temperature
- Fully automated system
- Reduces supply temperature, heat losses, fuel and heat costs
- For extraction CHP plants more electricity can be produced if temperature can be reduced
- Decrease CO₂ emissions
- Increases security of supply for heat customers
- Can shave morning peak effectively
- Increase lifetime of the network pipes



Improvements of ENFOR's systems based on partner/project needs

- Improved weather forecast setup
- Artificial critical netpoints (Hillerød)
- Artificial critical temperature based on smart meter data (Sindal)
- Improved seasonal transition
- Improvement of hydraulic capacity consideration (Brønderslev)
- Pump balancing (Brønderslev)
- Peak load boiler handling
- Temporal hierarchical modelling
- Controller for peak shaving

HeatSolutions™ implementation on demo DH systems

Results summary

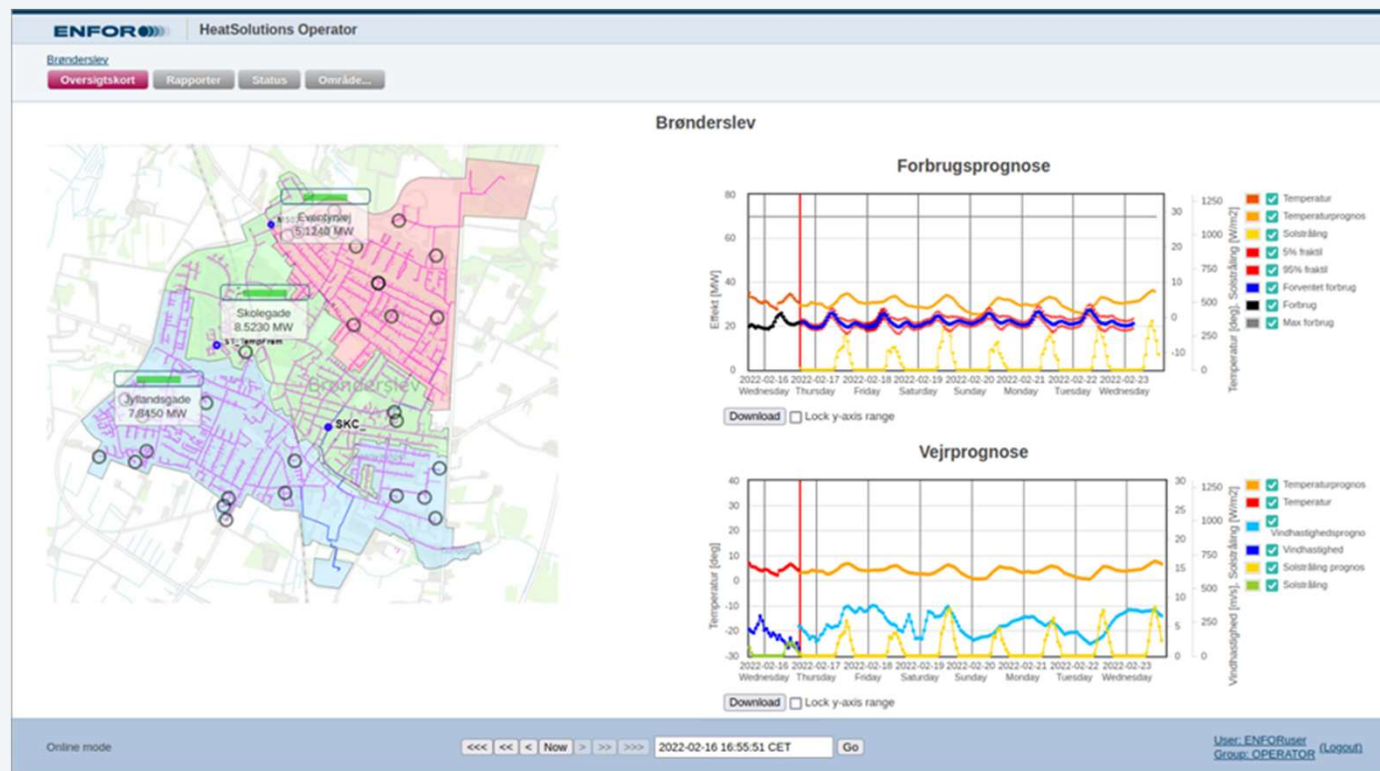
- The supply temperature at all three district heating systems was reduced. For the selected networks and examined periods, the reductions were between 3-5°C for Brønderslev, 4-5.5°C in Hillerød and 4°C for the Trefor case.
- The supply temperature optimization didn't adversely affect the return temperature in the respective networks.
- The reduction of supply temperature in the distribution network can bring direct heat cost reductions to the district heating systems.

HeatSolutions™ implementation on demo DH systems

Brønderslev

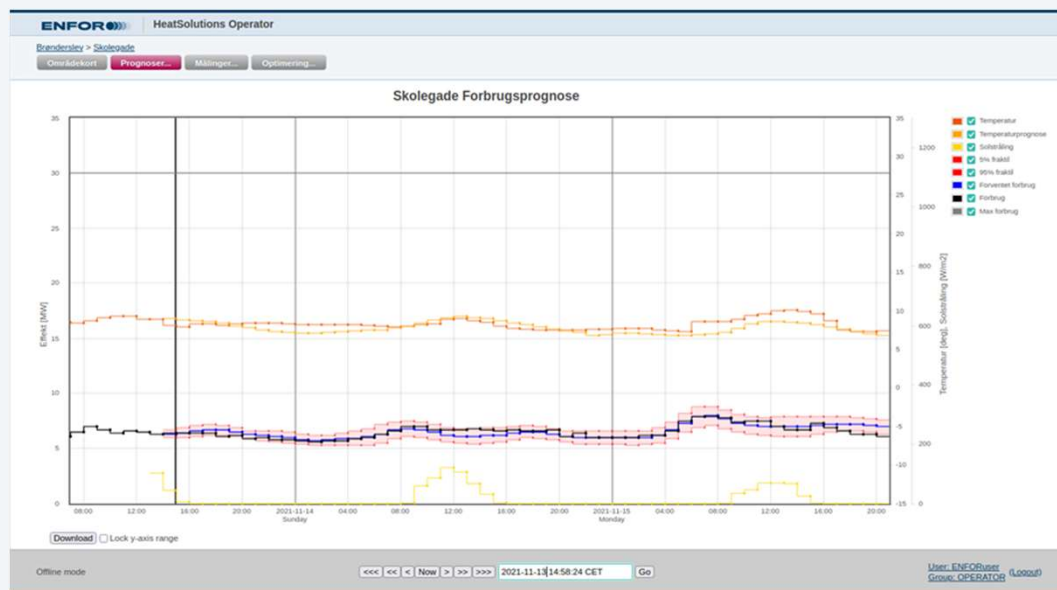
MetFor
HeatFor
HeatTO

- Tested in Skolegade during 2019/2020.
- Installed in all networks spring 2021.
- Further developed to include pump control in spring 2022.

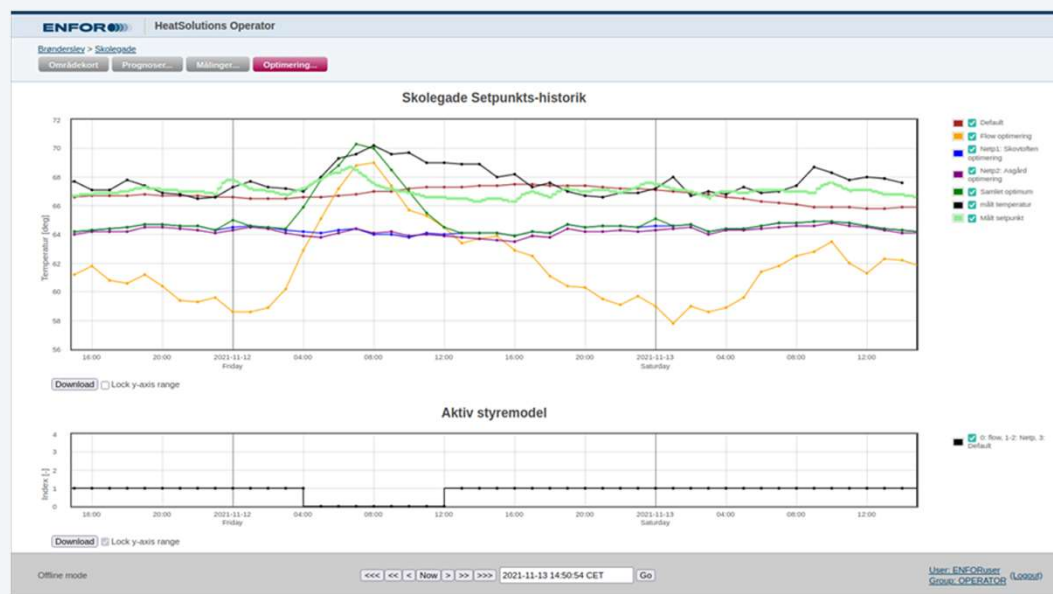


HeatSolutions™ implementation on demo DH systems

Brønderslev

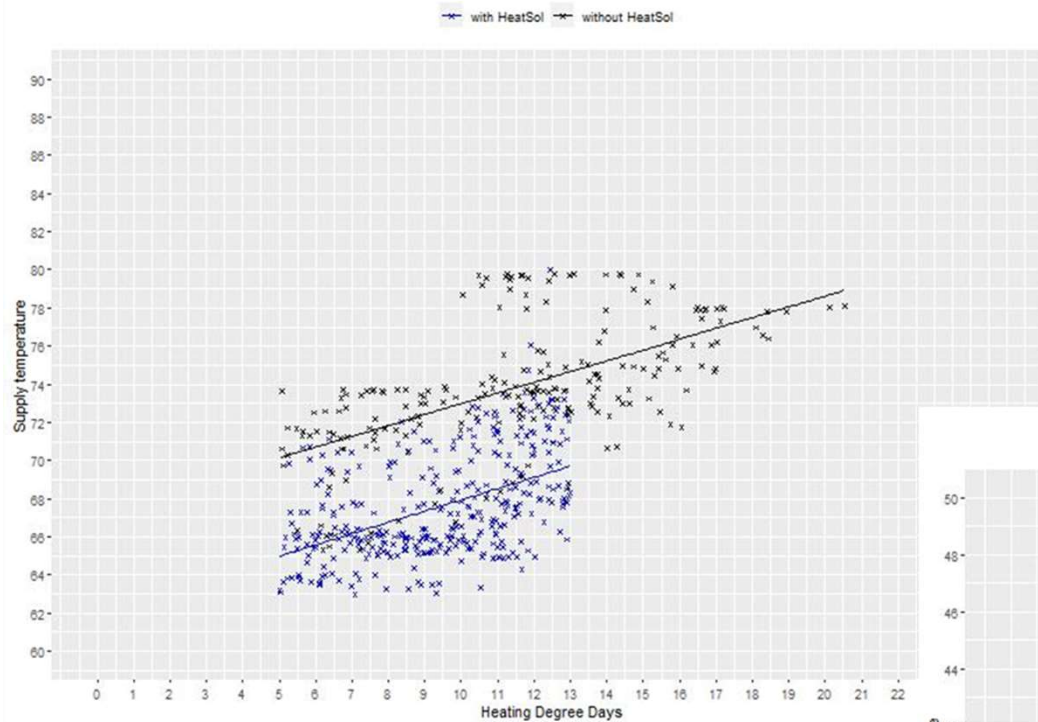


Example forecasts

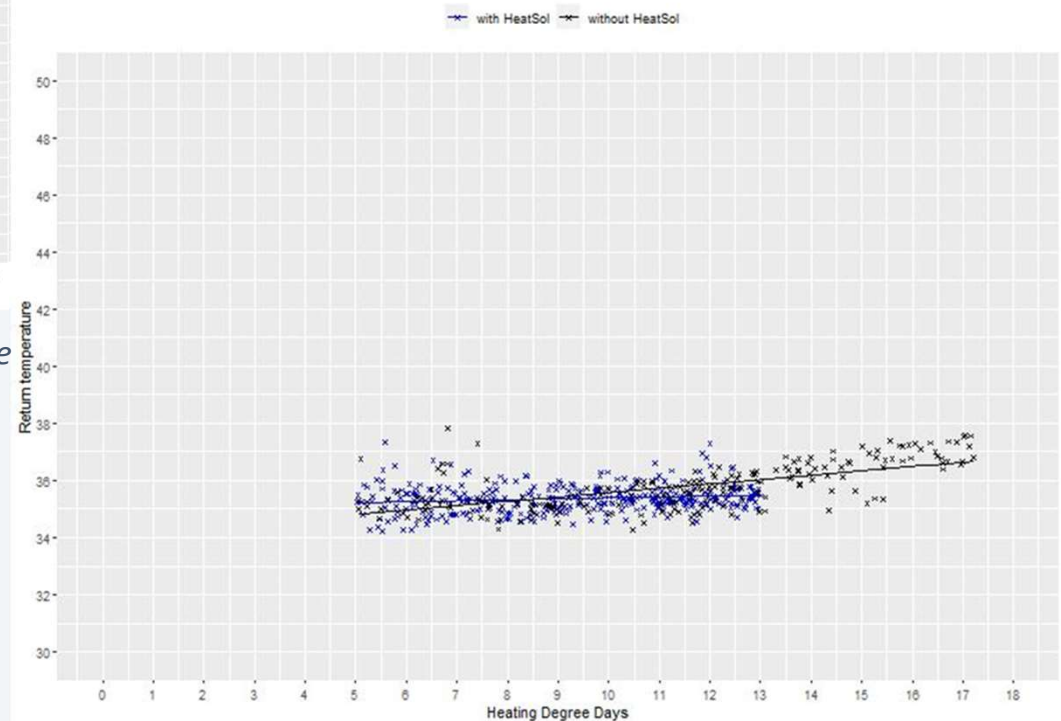


HeatSolutions™ implementation on demo DH systems

Brønderslev



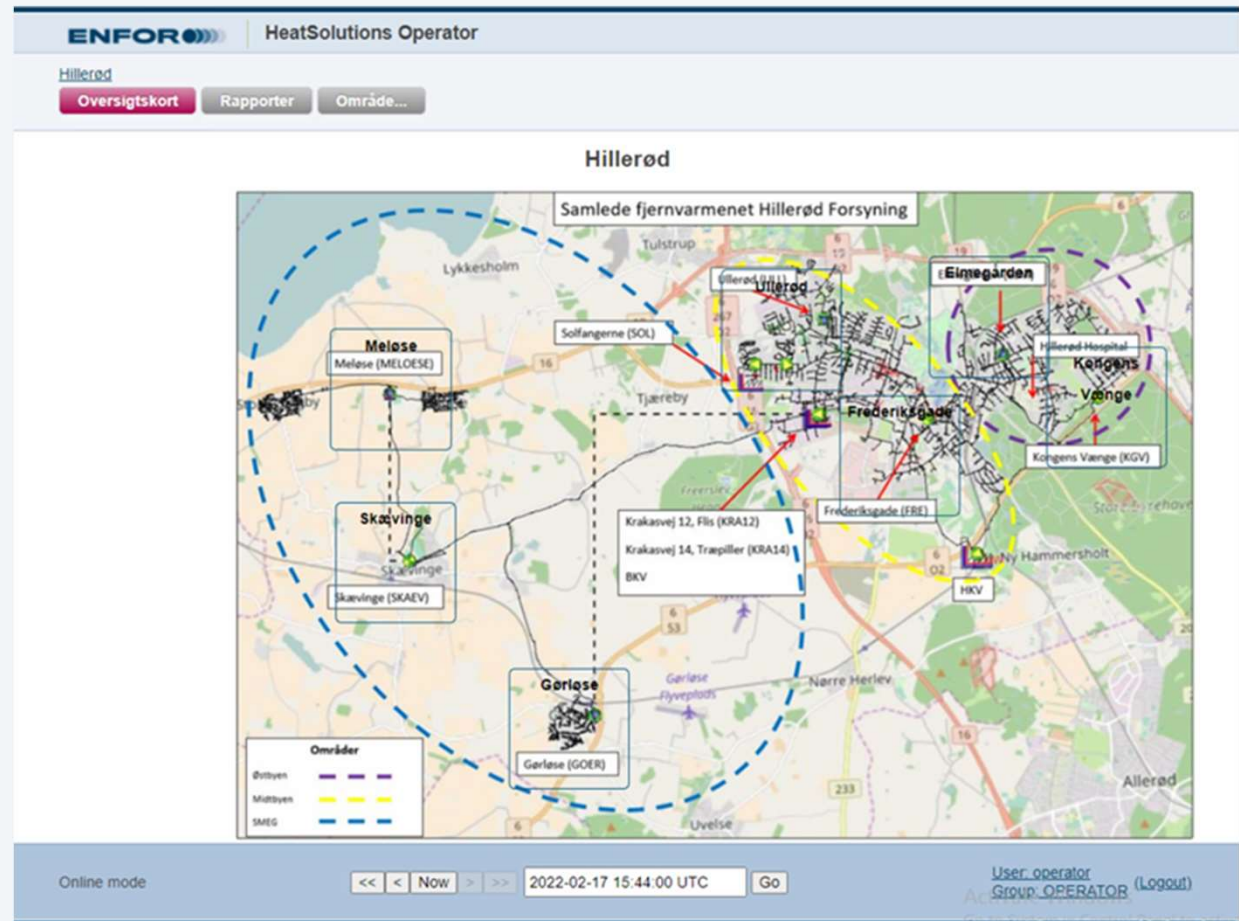
Supply temperature Vs daily heating degree days for Skolegade



Return temperature Vs daily heating degree days for Skolegade

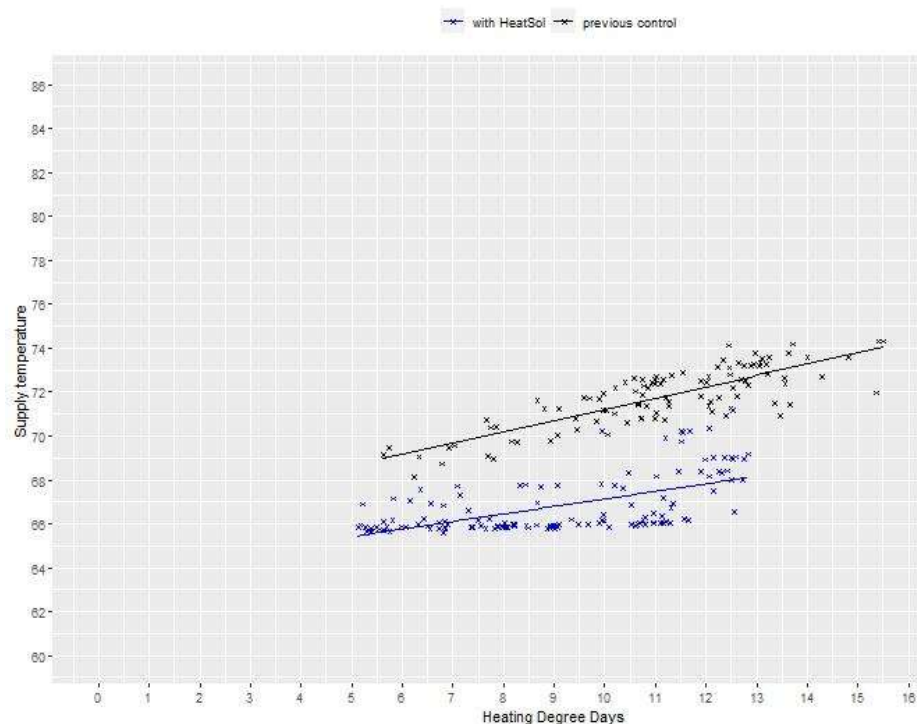
HeatSolutions™ implementation on demo DH systems

MetFor
HeatFor
HeatTO

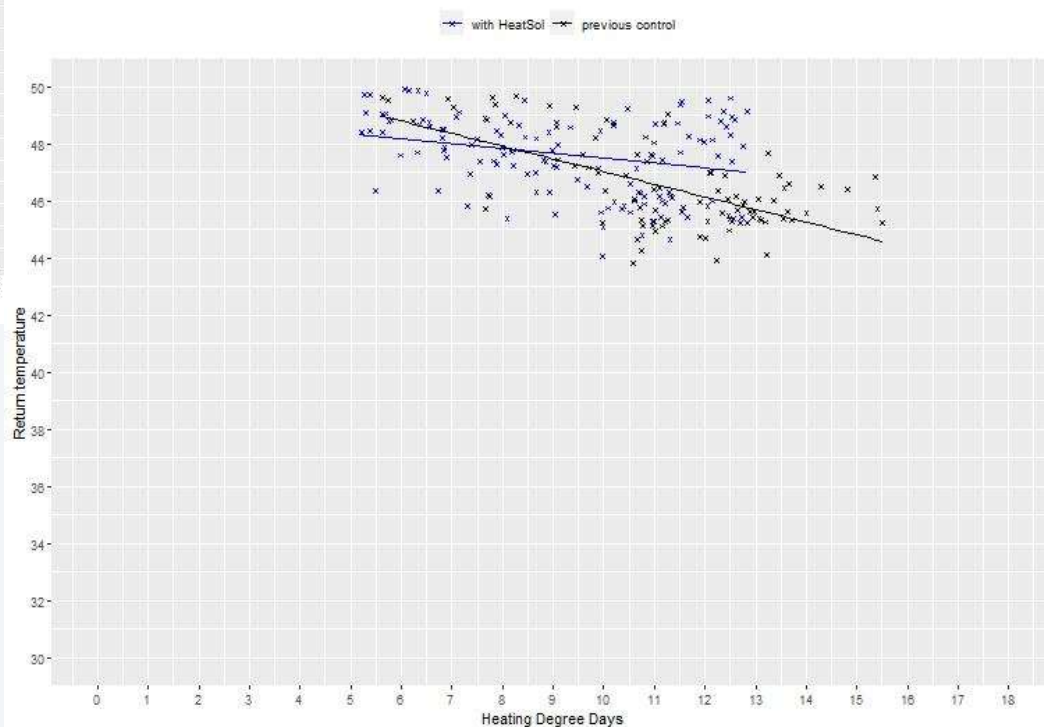


HeatSolutions™ implementation on demo DH systems

Hillerød



Supply temperature Vs daily heating degree days for Gørløse



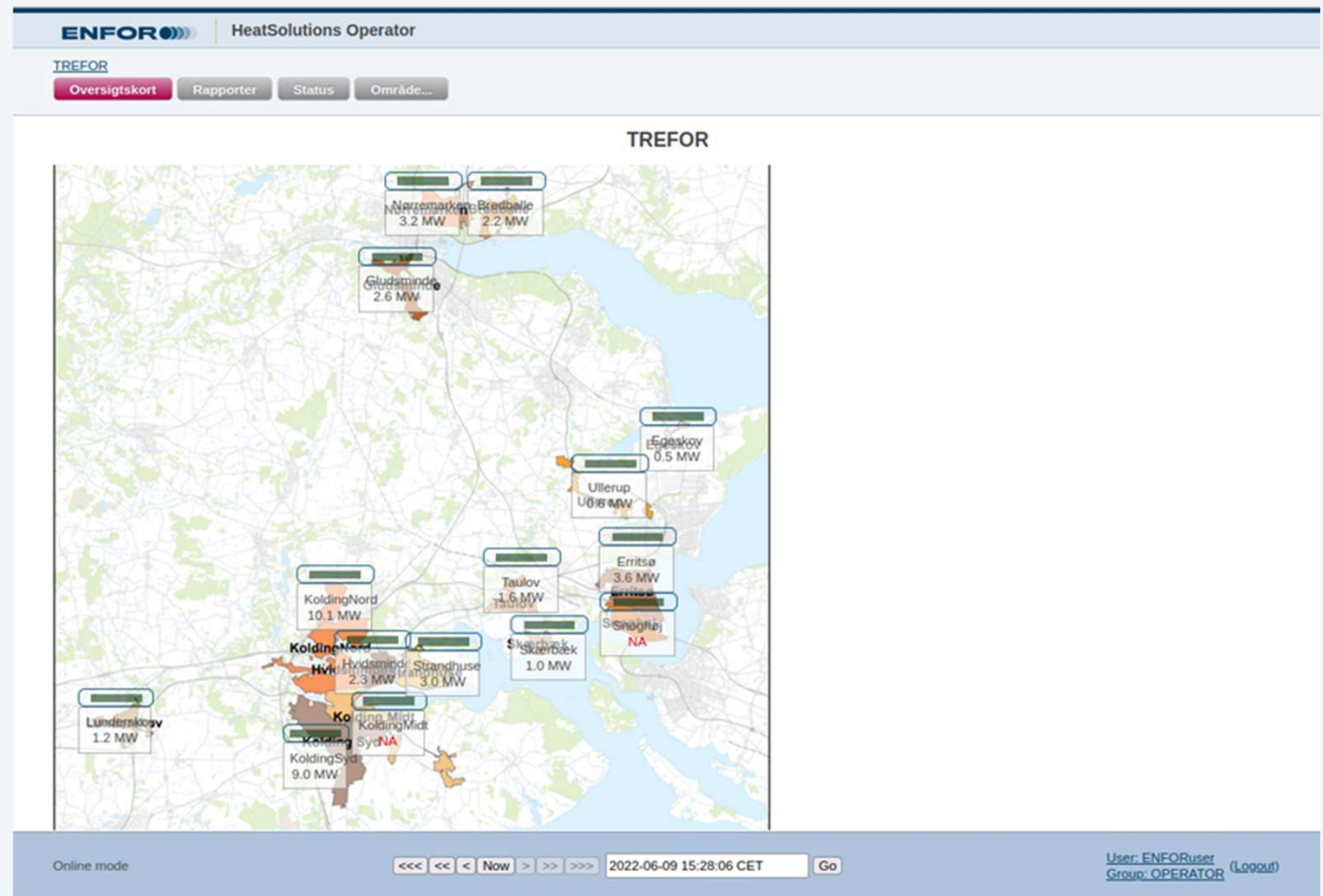
Return temperature Vs daily heating degree days for Gørløse

HeatSolutions™ implementation on demo DH systems

TREFOR

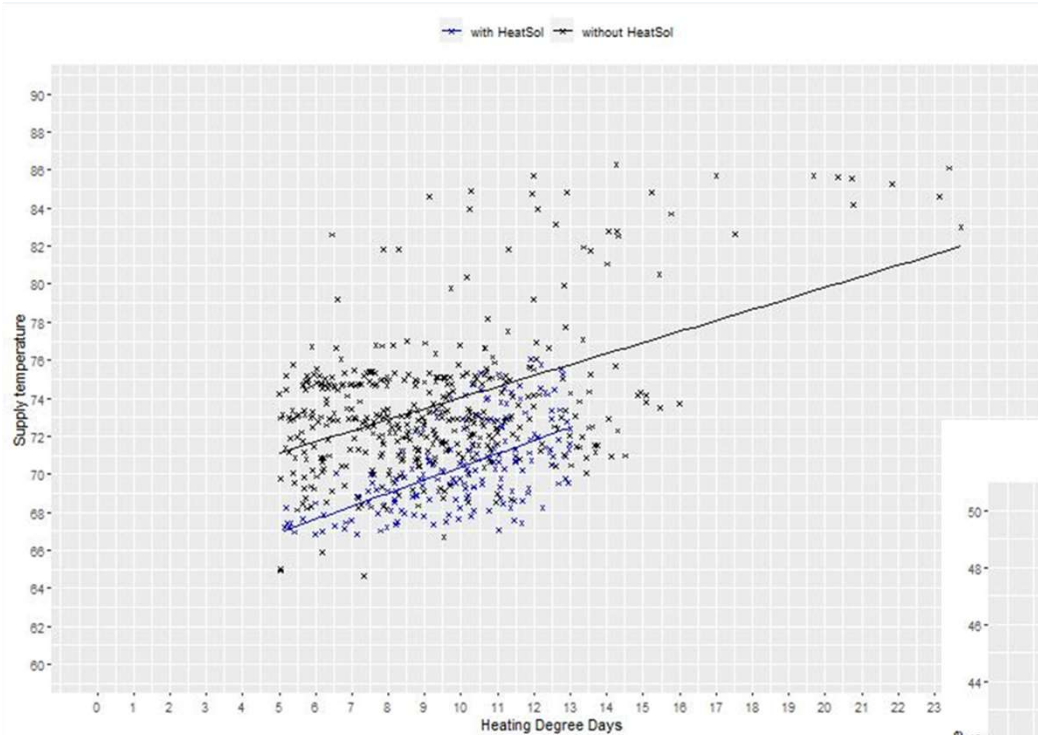
MetFor
HeatFor
HeatTO

- Tested in Kolding Syd during 2020/2021.
- Installed in all 15 networks spring 2022.

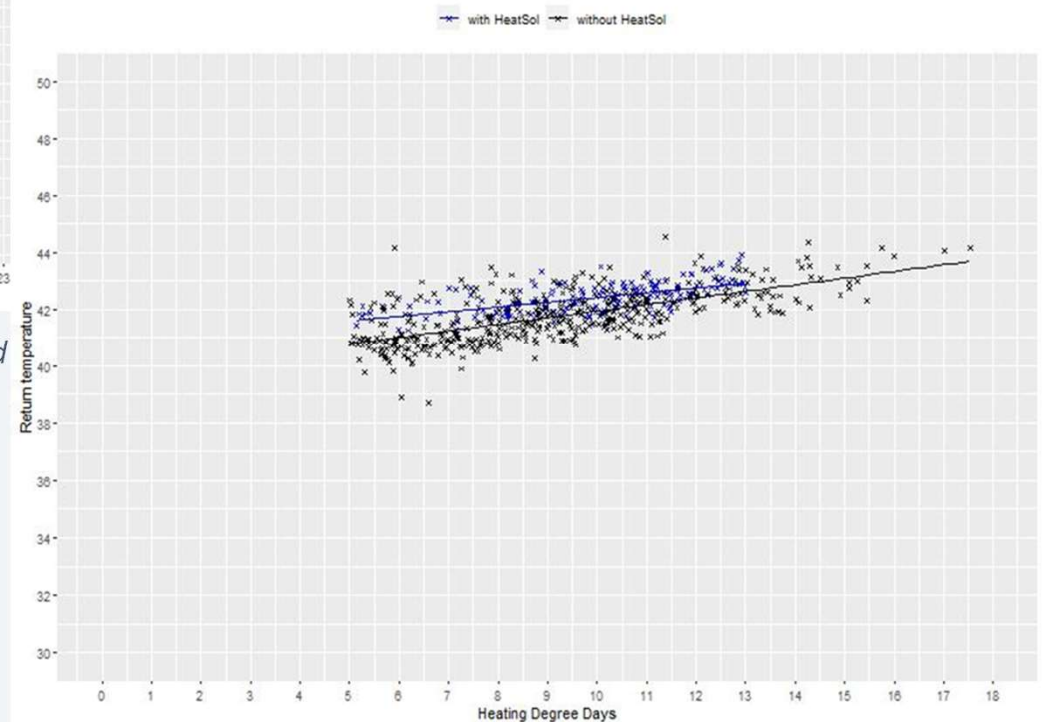


HeatSolutions™ implementation on demo DH systems

TREFOR



Supply temperature Vs daily heating degree days for Kolding Syd



Return temperature Vs daily heating degree days for Kolding Syd

Network's learnings from CSO activities

Summary

- Not only the weather forecasts and heat load forecasts, but also the supply temperature forecasts are very important for production optimization.
- Quantifiable savings can be achieved at the production side, when lowering (/optimizing) the supply temperature at the network.
- Network flexibility is available and can be activated without any further investments, when HeatSolutions software is installed.

Thank you



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