HEATman

Alfred Heller, Civil engineer, PhD, Chief Consulting Engineer, NIRAS A/S, Denmark

HEATman is leading the digital agenda for the district heating sector. HEATman is a cooperation between private and public partners. The goal is an integrated and adaptable product platform for district heating companies. This open IT-platform is hosting a variety of data and different software tools. By combining these resources, new solutions are developed, and new values generated. The most promising tool is a cross-system optimisation for a data-intelligent holistic control.

HEATman is a toolbox and Swiss Army Knife for the district heating organisations. This knife consists of simple tools by single providers, and advanced solutions that combine individual tools from different providers to a common service. Enabling the monitoring of technical components is an example of a simple tool. More advanced is the standardized data collection solutions that open the internal IT of district heating plants to a secure cloud. Hereby, external services can support the organisation and the advanced solutions be developed.

The most advanced tool is probably the solution that combines a number of individual software that optimize each their separate part of the overall district heating system. This cross-system intelligence is further refined by models that are based on data collected across the whole system.

SOLUTIONS AND TOOLS FROM HEATMAN:

- Digitalization of district heating
  - and technical components
- Cloudification
- Cross-system optimization
- Data-intelligent optimization methodology
- Building integration approaches
- District heating – electricity-marked models and bidding tool
- IoT and metering for district heating
- Short- and long-term planning
- Screening of potential districts
- Baselining of existing DH

About HEATman

The lead consultant company, NIRAS, was the initiator of another project for the water utility sector, called LEAKman (LEAKman). A few partners involved in this project saw similarities between the water and district heating sectors.

In a parallel series of research-based innovation projects, a number of solutions were made ready for implementations. The solutions originate especially from CITIES, Smart Cities Accellerator and Energy Lab Nordhavn. HEATman takes this opportunity up and will implement an extensive backlog of results from these former research projects.

Missing research pieces will be carried out by the Technical University of Denmark and the Aarhus University as a part of the common activities.

The HEATman project can celebrate its 1st anniversary and the support from The Innovation Fund of Denmark . The Project consortium has 20 entities including private companies, public entities, universities, and the Danish District Heating Association. These partners bring in their skills from every angle of district heating, cooperation, technology, data, research, and business.

From best practice to next generation digital district heating
Three district heating companies, Bronderslev Forsyning, Hillerod Varme and Trefor enable collection of experience and build “living labs” for the HEATman developments. To be able to document the impact of HEATman, a baseline is established in autumn 2019 for the three plants. After the installation of state of art tools and software, a second performance is collected to be compared with the baseline. Hereby the project is able to document the overall impact of all improvements at the end of the project for the three living labs.

During 2019, the three living labs were prepared to be able to host the activities in HEATman. In this, all digital components and methods at the plants were revised and adjusted, leading to savings in unnecessary licenses and software, more consolidated data streams and other improvements. This was one digital service that was not expected to be valuable. NIRAS will promote this service under the term “consolidation”.

First new HEATman solutions will already be visible during 2020. More advanced solutions will be developed during 2020 and 2021 to be demonstrated during winter 2021. Hence, mature advanced solutions will be promoted during 2022, where the innovation pro-ject supported by the Innovation Fund Denmark will end in February 2022.

THE PROJECT PARTNERS:

- **NIRAS (Leader of the project)**
- **Dansk Fjernvarme**
- **Brønderslev Forsyning**
- **Trefor Varme**
- **Hillerød Varme**
- **Danfoss**
- **Logstor**
- **Kamstrup**
- **EMD International**
- **ENFOR**
- **Neogrid Technologies**
- **NorthQ**
- **Leanheat**
- **DESMI**
- **Technical University of Denmark**
- **Aarhus University.w**

– A smart digital toolbox for district heating

The vital platforms

The first vital platform is a private-public partnership that aims at a common promotion and branding of "HEATman" and its products for the district energy sector.

The second platform is a cloud that facilitates the cooperation with basic digital services such as data collection, sharing and standardization. This common digital resource is also the workbench on which the tools are developed, evaluated and demonstrated. In a first setup and existing cloud platform from a research and innovation project, CITIES is applied to show proof of concepts.

Mature solutions will be promoted on a commercial cloud setup under the lead of the partner NorthQ.

HEATman as a dynamic product and service platform

The HEATman toolbox/platform enables a wide variety of tools and services. A simple tool involves a single service by a single provider. Due to standardization, such tools can be from different providers. HEATman enables the shift of solution within the same framework and enabling competing sub-solutions. An example hereof is a forecast for the demand that can be provided by very different services, statistical lookups in local or national building databases to advanced commercial software solutions by the company ENFOR. The HEATman concept will enable the replacement of solutions within the same platform.

Another example of a single component service that will be implemented in the HEATman project is the integration of the "Smart Energy System". At first, such a solution will be based on existing software by the company EMD International. This package, EnergyPro, models and optimizes the operation of various thermal production systems. On basis of EnergyPro, the package EnergyTrade by the same company enables the betting on the electric markets.

A complete optimization tool across DH network and production

Some of the partners in the HEATman project were cooperating in the CITIES project. Here, first experiences were harvested on the methodology that could be applied for a system-wide optimization. This increased the chance that the HEATman project of being successful.

All relevant tools are installed in the "state of art" version on which the HEATman approach and improvements will be based.

For leakage detection, two very different approaches are tested.

1) The product "Heat Intelligence" from Kamstrup that utilizes the user demand data from their smart meters for the analysis of possible leakages within the DH-system.
2) Logstor is the provider of district heating pipes and connects a wire through the network that enables the system to find leakage through their solution "LOGSTOR Detect".

The two systems will be installed at the three living labs and improvements will be applied, partly by combining their abilities. The consultant company NIRAS will add their solutions and experiences from the abovementioned water platform LEAKman.

All products are installed in the three partner district heating plants: Bronderslev Forsyning, Hillerod Varme and TREFOR and will be in operation from spring 2020 - to be evaluated ultimo this year by the Danish District Heating Association (DDHA).

A smart platform adjusted for the future requirements and sustainability

HEATman takes an important leap into the future of supporting district heating to meet future trends and demands. Based on the above mentioned, state of art tools, we work through 2020 to find advanced and holistic solutions within the project. The outcome of the efforts is large energy and economical savings for the DH companies. Especially the holistic approach of the cross-system optimization is expected to drive these savings. The implementation is planned in two to three stages:

1) A simple communication approach where the involved software share information and the common "intelligence" utilizes basic logic assumptions. Here the common cloud infrastructure and standard communication will enable this effort.
2) In a more advanced version, the cross-component optimization will be done automatically and probably based on algorithmic approaches. This is a development project headed by the Technical University of Denmark.
3) In a parallel effort, big data will be applied to improve the involved component models. During 2020, the use of remote read e-meters will be mandatory. With these extensive data, we will be able to implement the results from other research projects, especially the CITIES project.

Partner	Optimization software for ...	Product name
EMD	Heating production	EnergyPro and EnergyTrade
ENFOR	District heating net	HeatTO and prediction software
Neogrid	Building Control	PreHEAT
Leanheat/Danfoss	Building Control	SmartLiving

In all this, the communication and cloud infrastructure will be the common infrastructure to be adjusted to carry the common tools and services in a "Proof of Concept" version. Hereby the HEATman concept can be developed fast and flexibly. A mature market-ready version will evolve in a parallel effort.

Digitization of industrial components

To increase the impact of HEATman, efforts are included to digitize industrial components. It is a prerequisite of HEATman that the involved components are able be monitored, to communicate digitally and be controlled remotely. Currently the following components are enabled for the HEATman concept:

1) heating units by Danfoss
2) pumps provider DESMI
3) monitoring equipment by the district heating pipe producer LOGSTOR
4) an MPC controller under development at the Aarhus University

Perspectivation

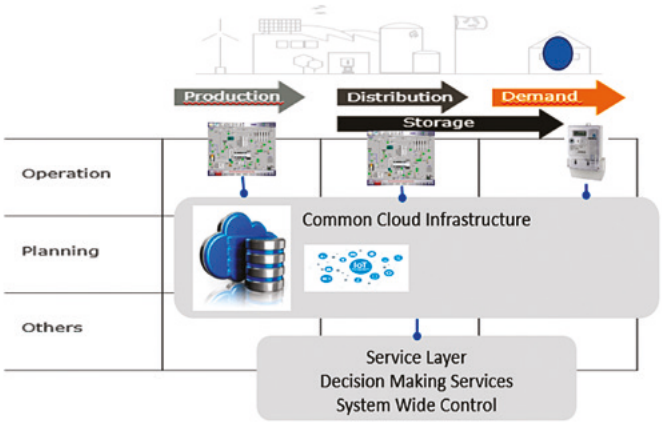
The three district heating cases are adjusting their digital tools and hereby improving their abilities. In the same time, the existing communication and ICT solutions are evaluated and improved trough simplification, standardization and improvements. It will be the key performance indicator for the evaluation of the project, what improvements there will be harvested.

The Danish District Heating Association provides a methodology for screening the feasibility of new areas for district heating and extension areas for the sector. In this digital lookups in public databases and other digital methodologies will play a central role.

For the long-term planning, the Technical University of Denmark aims at improving the software tool Balmorel and EMD International is refining their planning software, EnergyPro as a part of the HEATman project.

Together with the Danish District Heating Association and the other partners, NIRAS will lead the activities that evaluate the values of the HEATman concept and consider promotion to district heating plants on the international market.

February 2022, we will finalize the project and our expectation is to have an open holistic integration platform for both the district heating and cooling sector, that simplifies the daily load for system operators decisively. The whole idea with HEATman is to develop an intelligent IT tool that secures energy savings for DHC companies and creates the possibility to deliver sustainable energy worldwide.



For further information please contact:
AHR@niras.dk