Digitalisation makes district heating smart

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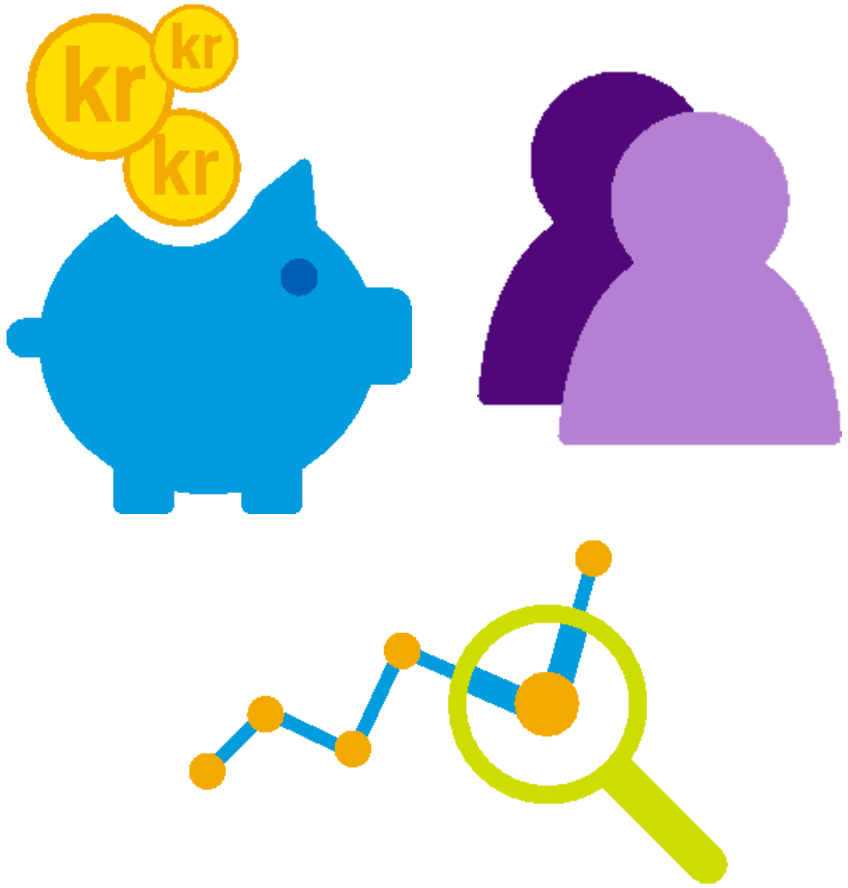


Challenged by complexity … the future of district energy

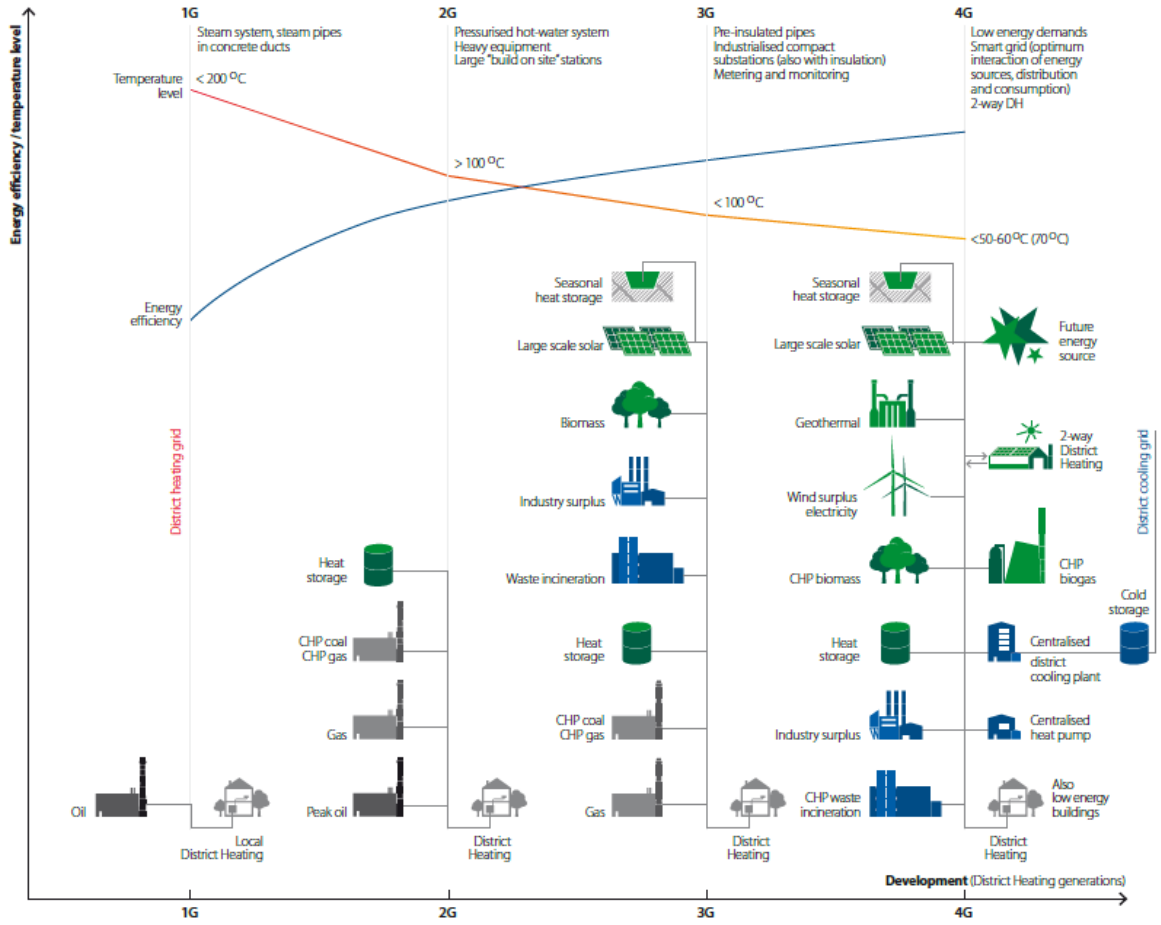
District heating holds the potential to decarbonise heating of buildings, which counts for 40% of the total EU energy consumption

Increased energy efficiency and a fully optimised system is necessary to support the green transition of district heating

More sustainable
- More renewable energy and waste heat
- Sector coupling

More efficient
- Lower temperatures, reduce losses, run closer to limits
- Improve heat installations and take use of building flexibility

More profitable and competitive
- Lower operational cost (OPEX)
- Improved asset management (CAPEX)



The digitial (R)evolution is here

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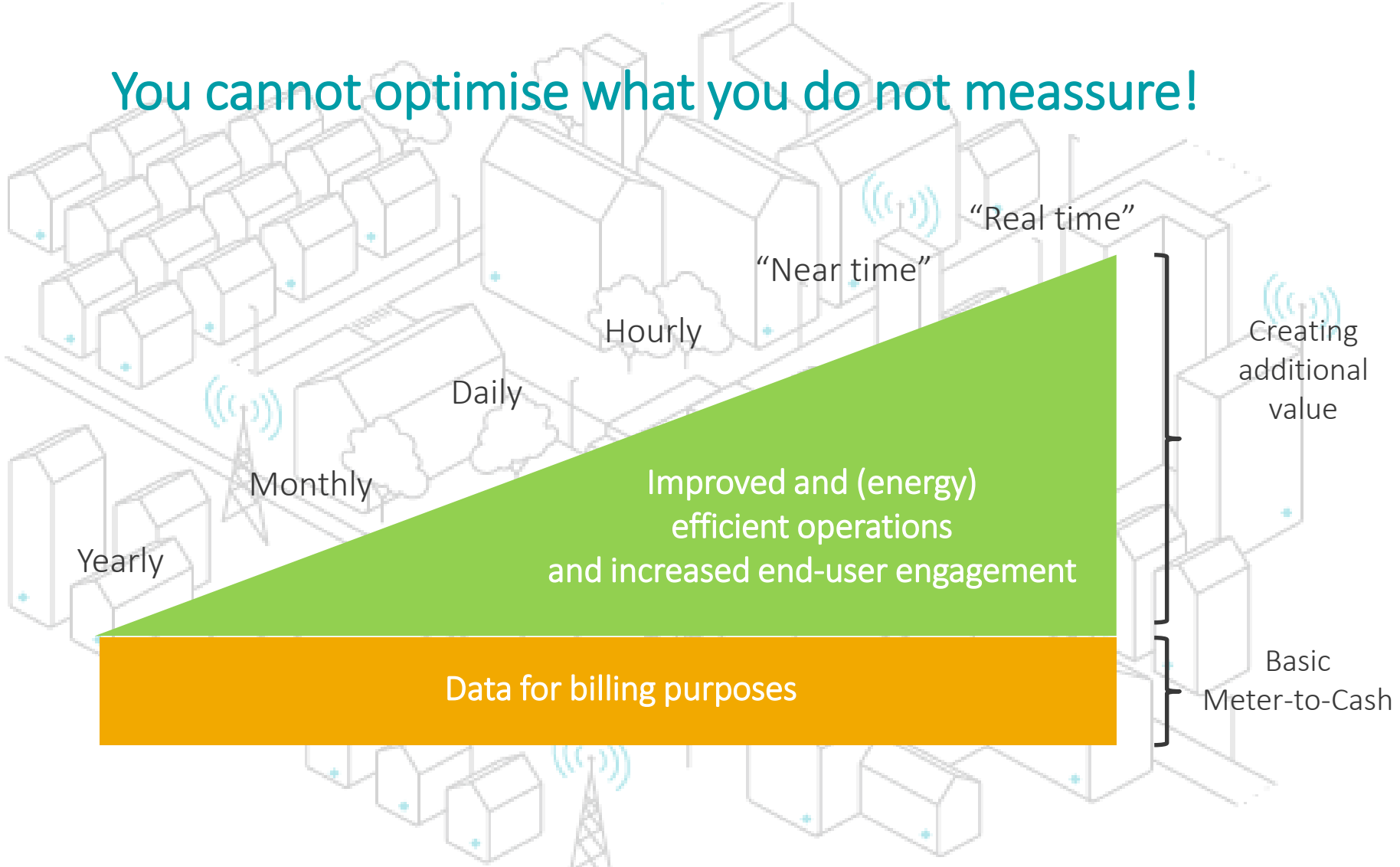
You cannot optimise what you do not meassure!



The digital value chain

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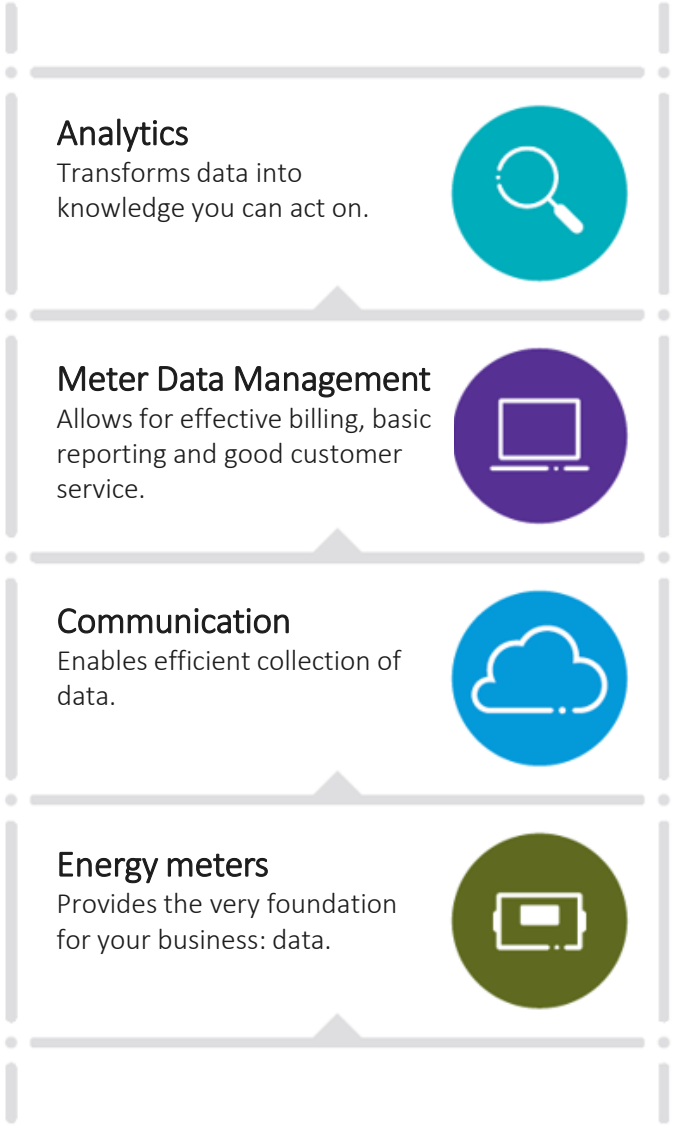
You cannot optimise what you do not measure, but…

Unlocking the true potential in smart meter data requires the right tools to turn it into knowledge you can act on

The digital value chain includes everything from the meter to the communication, software and analytics.



New metering requirements in the revised Energy Efficiency Directive

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Heat meters installed after 25 October 2020 must be remotely readable

All existing meters must be remotely readable 1 January 2027.

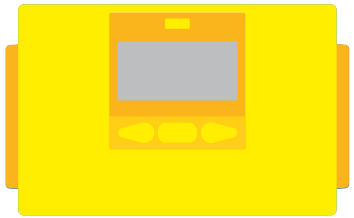
Remotely readable is defined as reading the meter without physical access to the buildings.

Data must be provided to the final customer at least 12 times per year.

Same requirements goes for **final customers** and **final users**, though submetering is subject to technical feasibility and cost effectiveness

The general criteria to determine technical non-feasibility and non-cost effectiveness shall be clearly set out. No general exceptions will be accepted.

Domestic hot water submetering in new multi-apartment are also required after 25 October 2020.



Digitalisation is good business

Assens District Heating, Denmark (100.000 MWh)

"Based on the continuous digitalization of our operations, we have actually been able to **lower the forward temperature by 6-8 degrees**"

"We have been able to **remove more than 100 bypasses** around the network"

"By optimizing our network operations we have, over the last few years, saved 2,500-3,000 MWh – that's approx. 2.5% – and **reduced pipeline losses by 12%**"

6-8°C

The utility has managed to lower the temperature in the network by 6-8 degrees

3.300

The network consists of approximately 3300 metering points

2,5%

The utility has reduced its annual heat production by 2.5%

€ 33

As a result of the optimizations the utility has realized savings in equivalence of € 33 per household

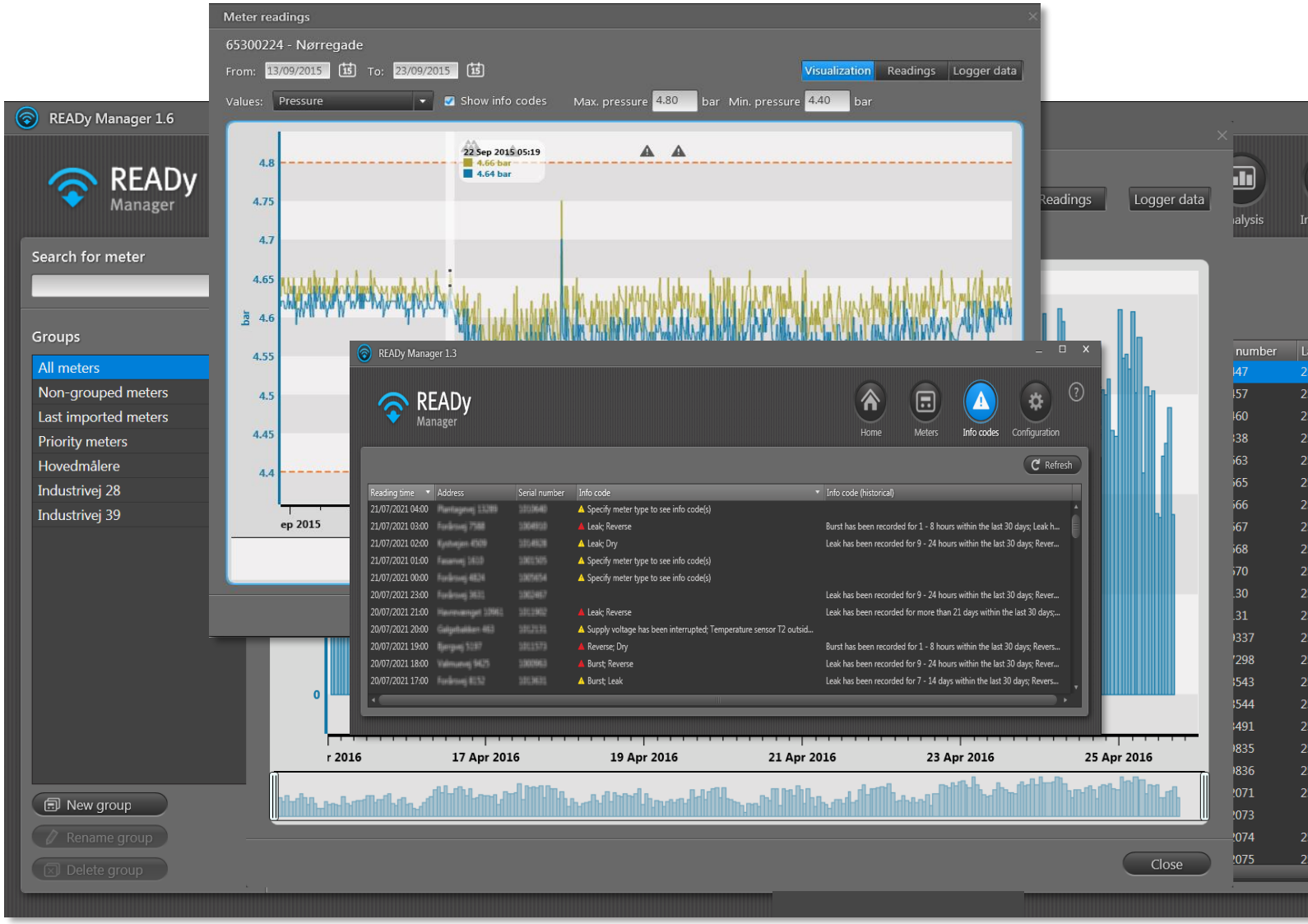
Sensors and data are already there … but how can we put data into play?

Smart meters fuels the digitalisation

Temperature and flow sensors in every connected building

Provide valuable data that can tell something about:

- end-user behaviour
- heat installations
- buildings
- distribution network
- …



Digitalised District Heating

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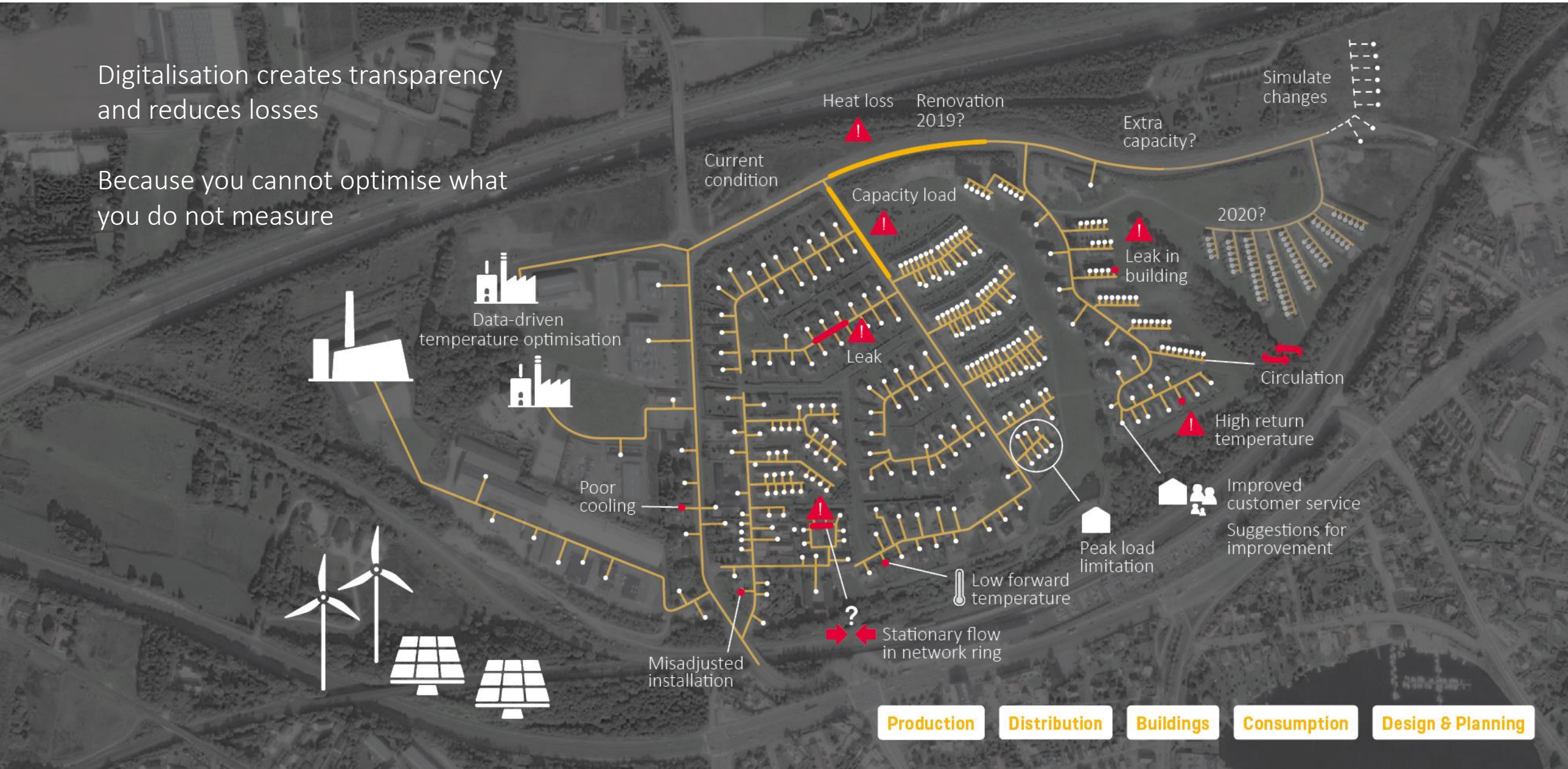
Digitalisation creates transparency and reduces losses

Because you cannot optimise what you do not measure



Kamstrup Heat Intelligence – creating SCADA for district heating distribution

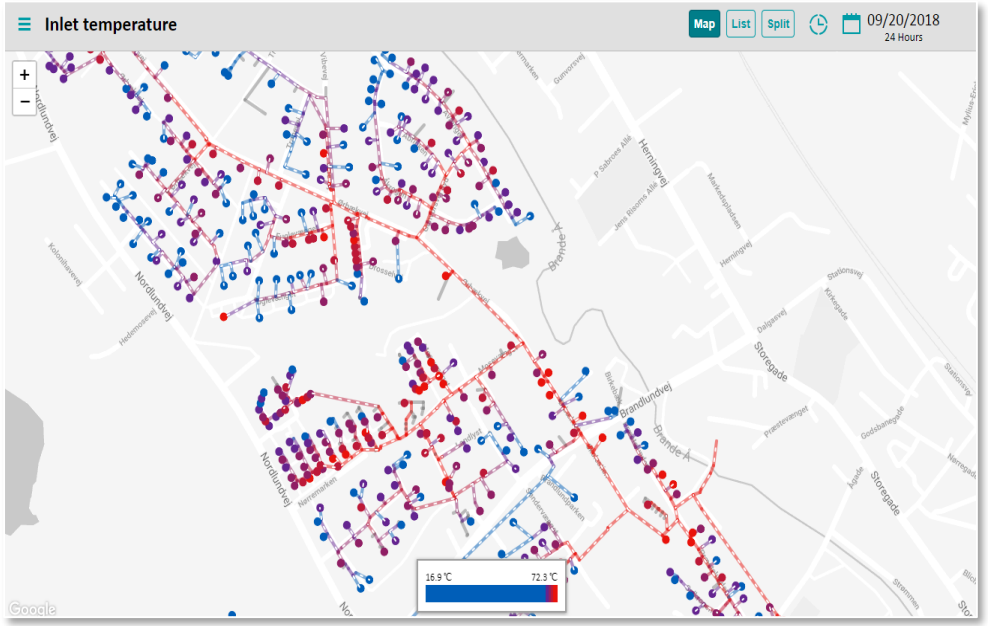
- **Heat Intelligence** - one of the first commercial products with the field of advanced analytics for district heating systems
- Cloud based platform
- Full Data-driven model of what goes on in the distribution network – without the need for additional sensors
- Combines meter data with a digital GIS model of the pipe network
- Creates a digital twin showing temperatures and flows throughout the system (and soon also pressure)
- Can handle complex network structures with multiple heat sources, ring connections, zones, mixing loops …

How Kamstrup can fulfil our dreams!

Prof. Sven Werner, Sweden

"Supervisory control and data acquisition (SCADA) systems have so far been absent for heat distribution networks.

When Kamstrup is now offering to provide future SCADA systems for heat distribution based on all heat measurements in substations, many old dreams can come true in district heating systems"



Heat Intelligence Example – building level

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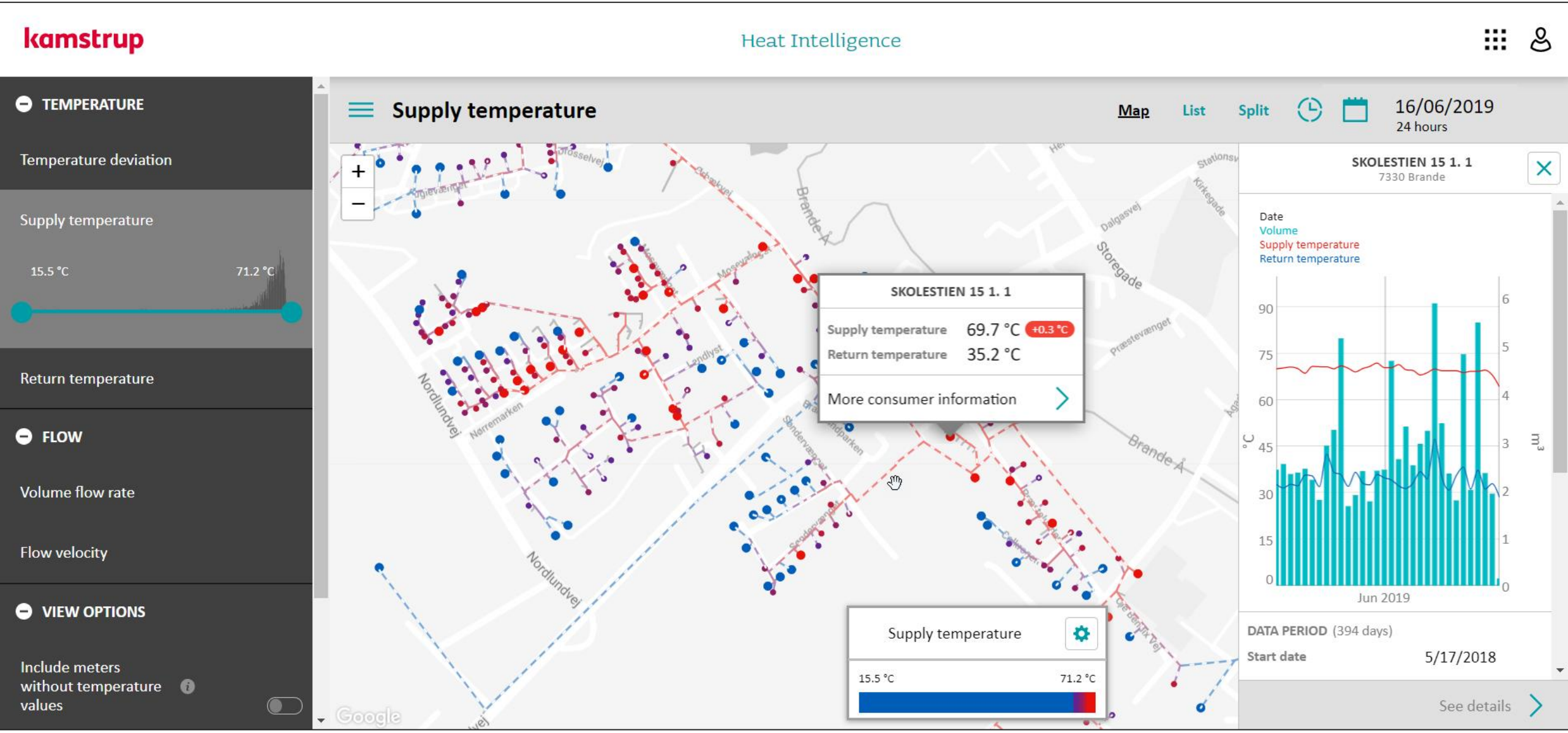

Heat Intelligence Example – pipe level

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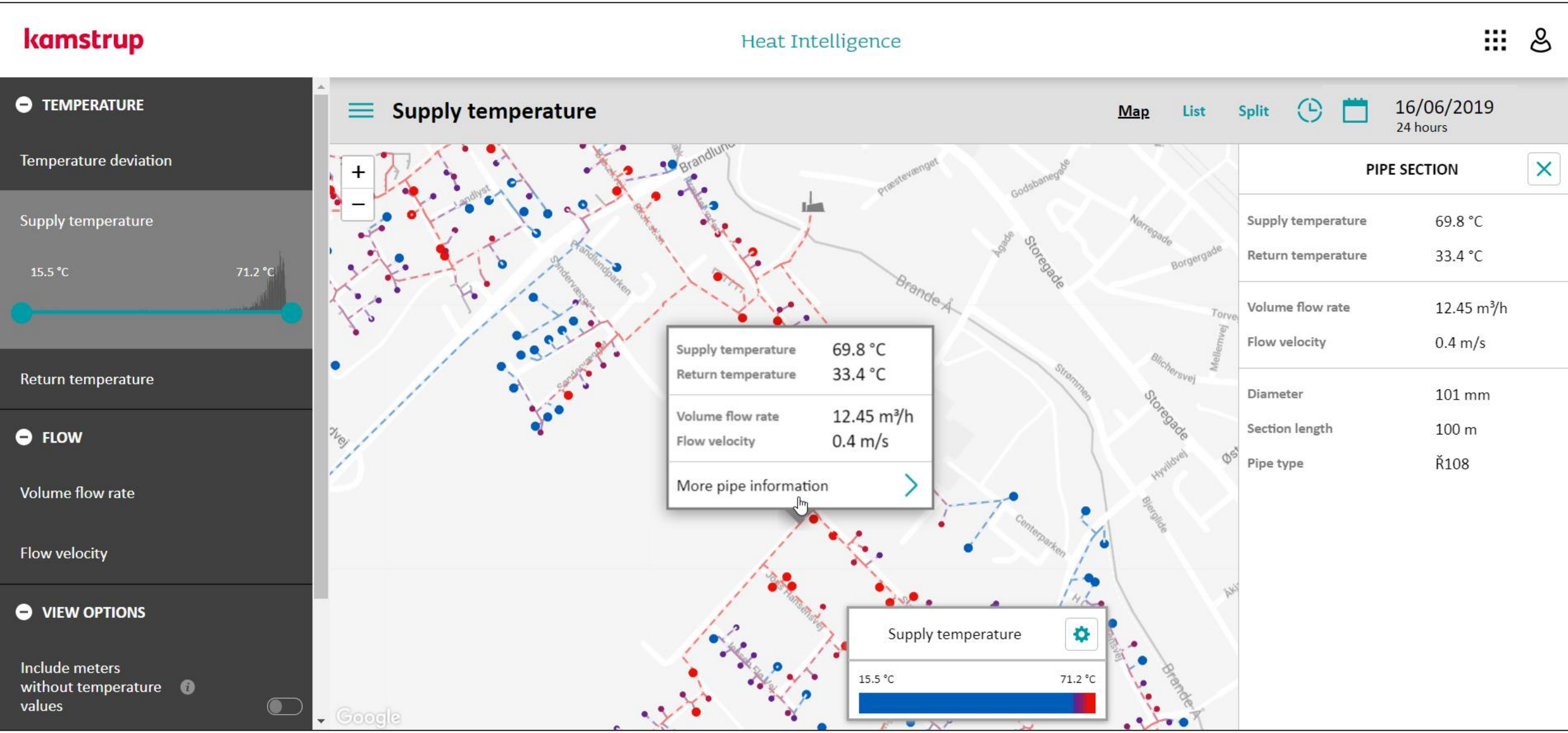

Heat Intelligence Example – high return temperatures

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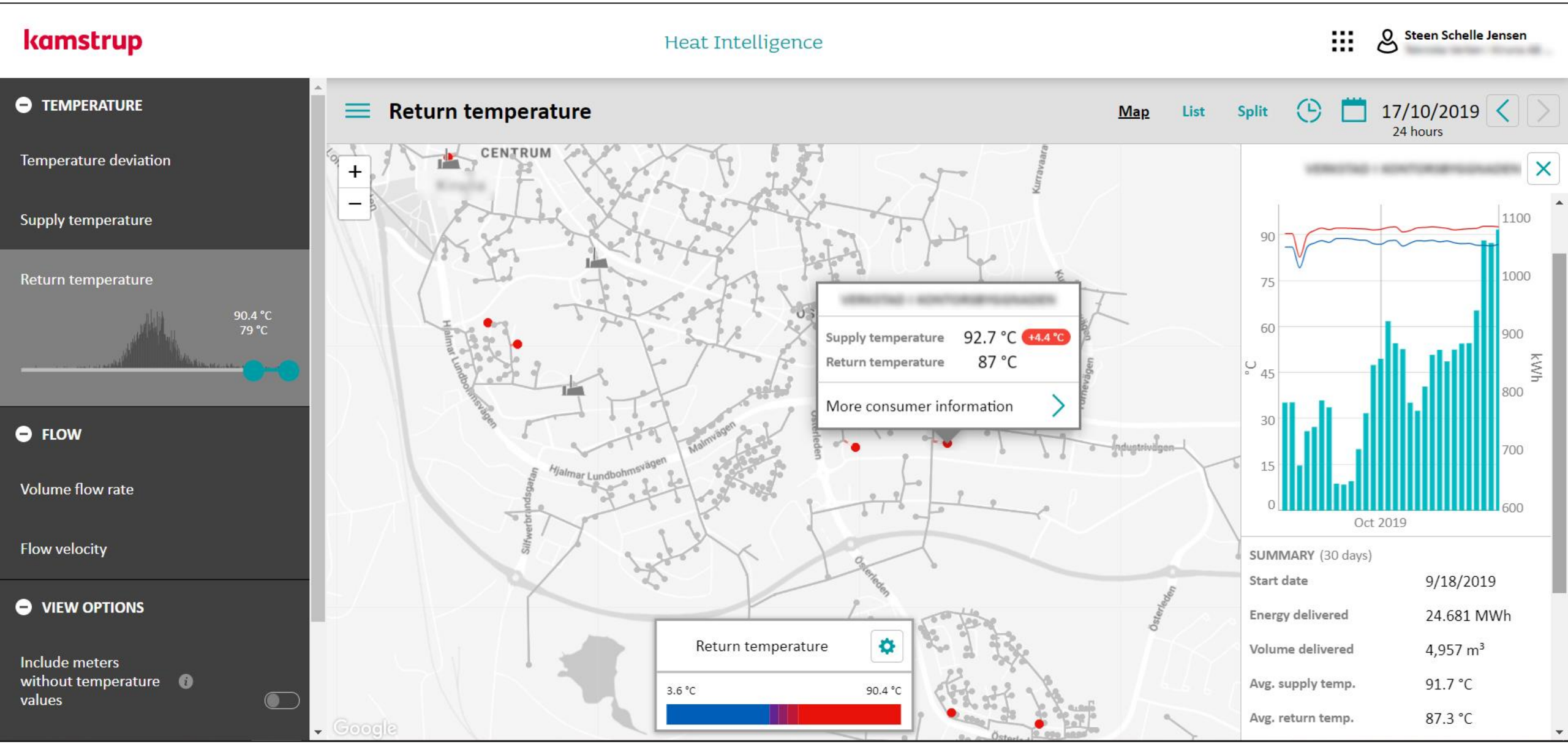

Heat Intelligence Example

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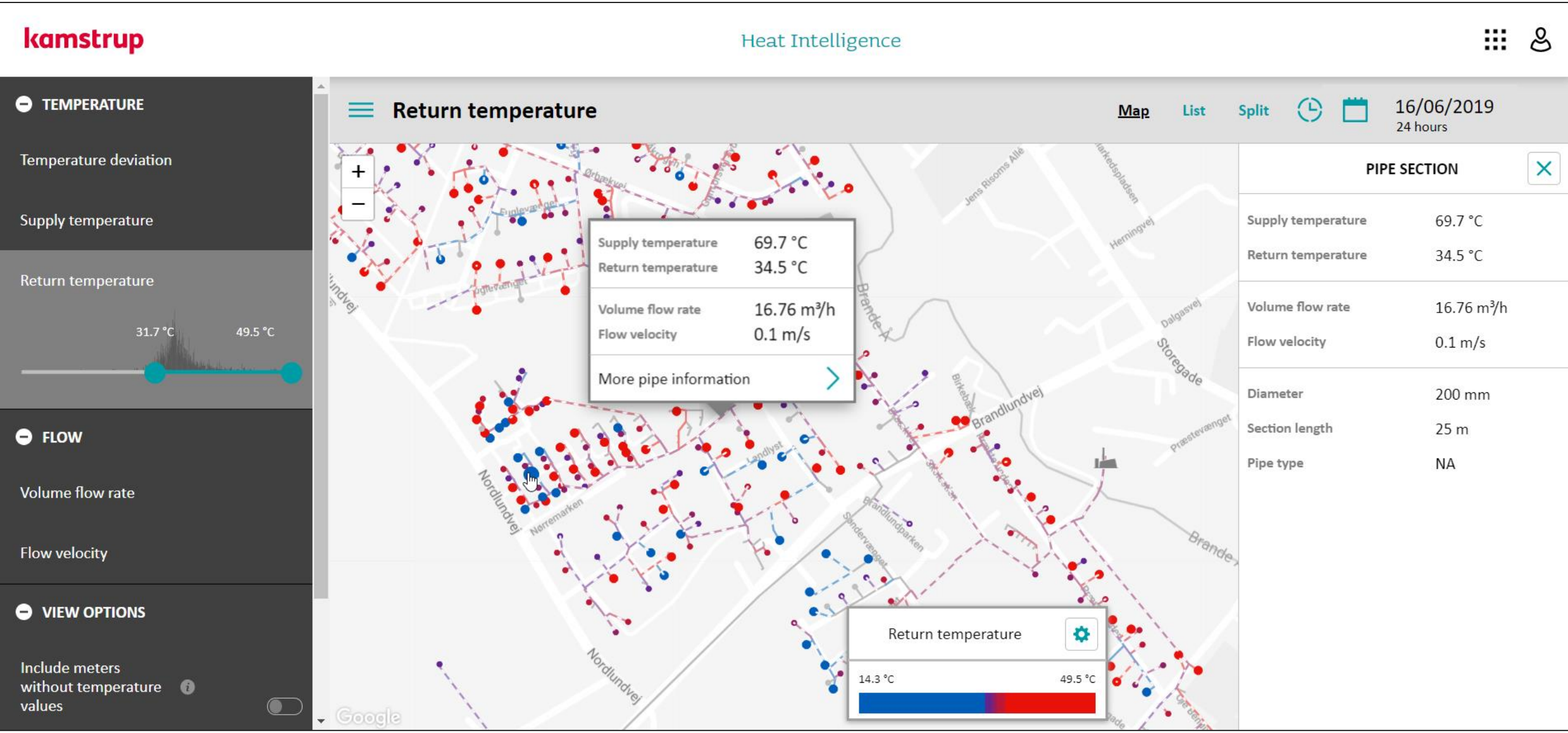
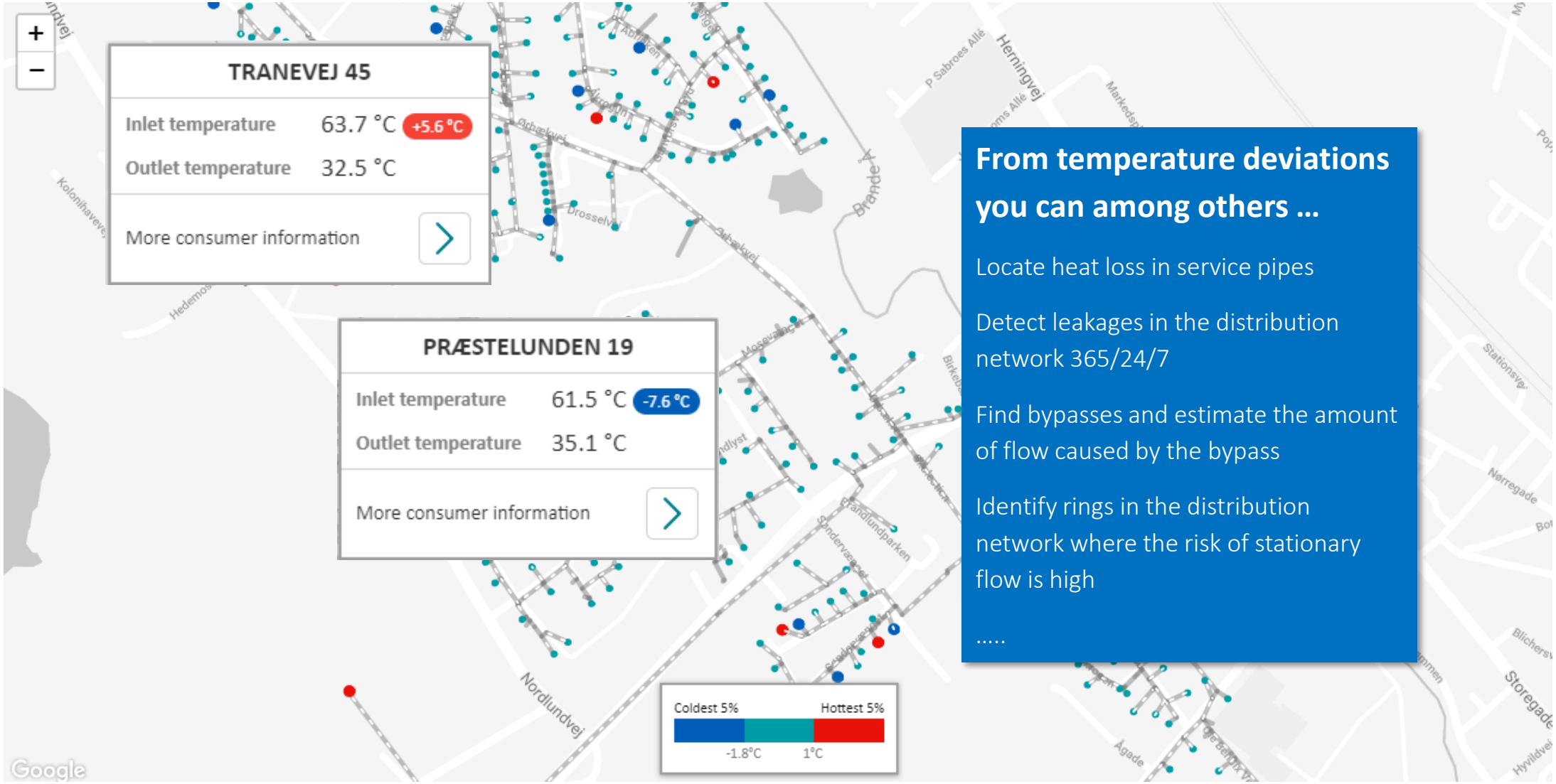


Temperature deviations reveals many secrets



From temperature deviations you can among others …

Locate heat loss in service pipes

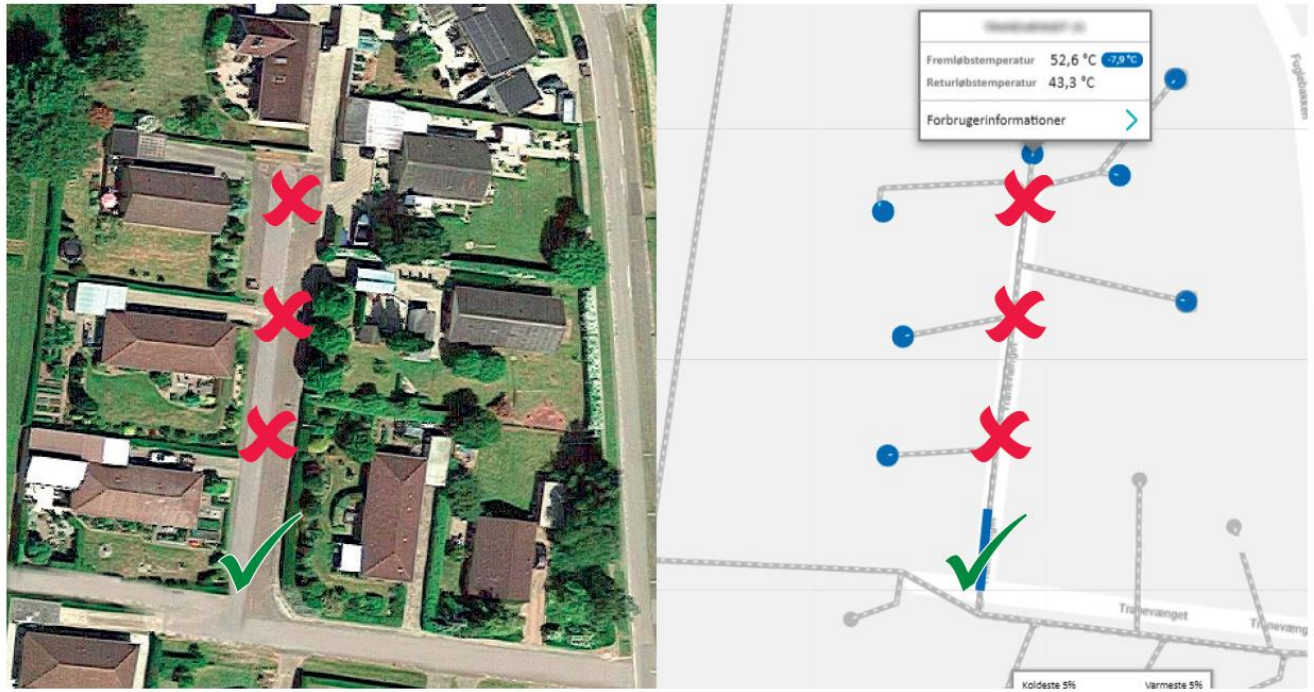
Detect leakages in the distribution network 365/24/7

Find bypasses and estimate the amount of flow caused by the bypass

Identify rings in the distribution network where the risk of stationary flow is high

…..

Data could have located the leak



Search for leakages with Heat Intelligence

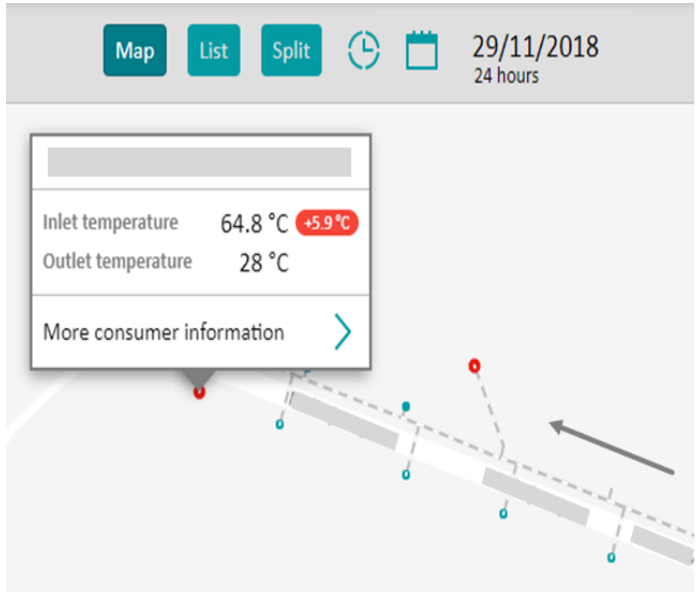
In the area around the leakage, the temperature pattern changes significantly

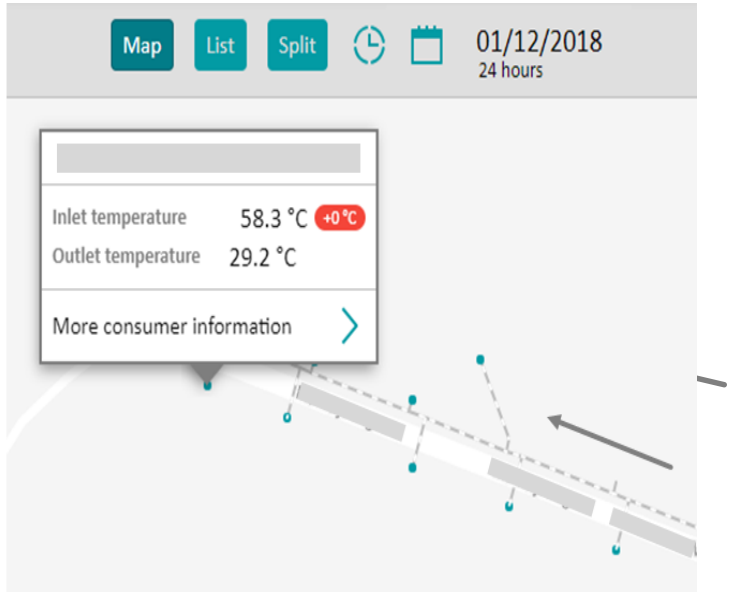
In this case, the consumers downstream from the leakage are marked blue due to temperatures lower than expected

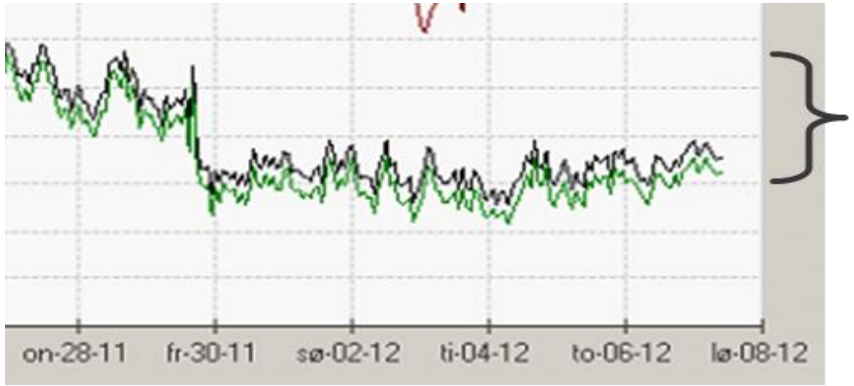
Based on data from Heat Intelligence, the first dig would have been done between the blue consumers (with deviations) and the consumers without deviations

The concrete repair of the broken pipe demonstrated that instead of digging 4 places before finding the leakage, 1 dig would have been enough as the leakage was found exactly where Heat Intelligence indicated it should be!

High return temperatures caused by unnecessary bypasses







≈ 1.5 °C decrease in return temperature

Identify unnecessary bypasses

District heating network in small village with 300 connections, primarily 1- family houses

In this case, the bypass is resulting in a flow temperature deviation of 5.9 °C

After closing the bypass, the temperature dropped to the expected temperature

The average return temperature from the area dropped with 1,5 to 2 °C

”Intelligent district heating”
… a joint development initiative that challenges technology providers

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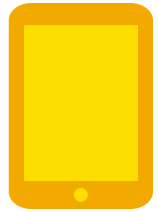
It is estimated that 50% of all heat installations in buildings perform inefficiently – both in old and new buildings

Heat installations are increasingly complex, and the process of troubleshooting is difficult

Building owners and facility managers often focus on fixing the problem at hand – not on long-term performance optimization

There is a competence gap among professionals working with heat installations

15 mill.
EUR per year savings



Think digital to be able to scale!

5%
reduction in total heat demand

HOFOR

GRUNDFOS

Danfoss

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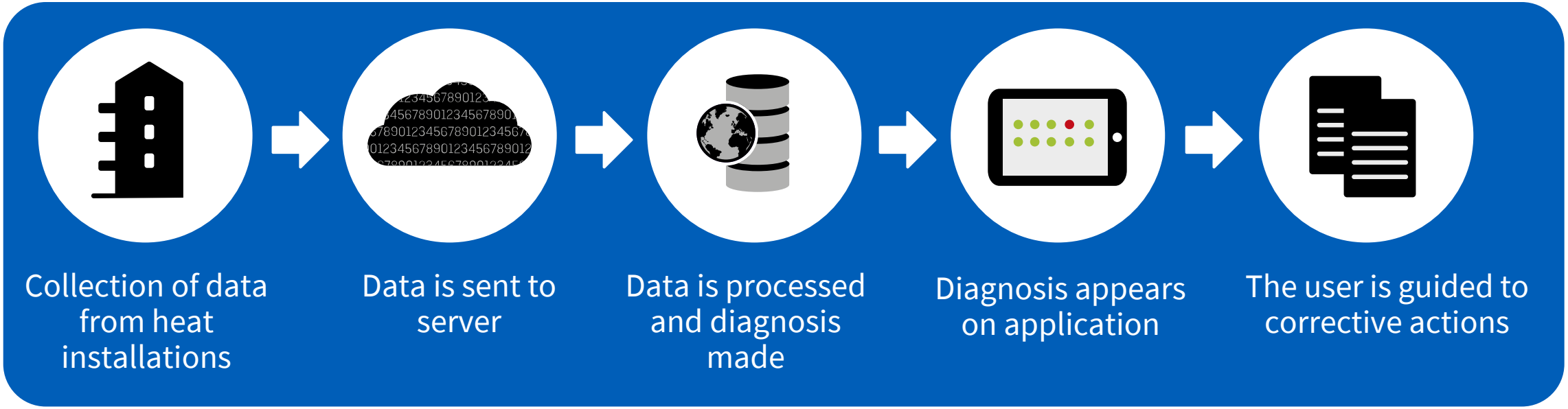
”Heat Assistant”

The “Heat Assistant” prototype – a fully data-driven decision support tool removes the barriers and makes troubleshooting easy and understandable

Yes! – data-driven troubleshooting can be done. 77% of the analyzed heat installations can be optimized

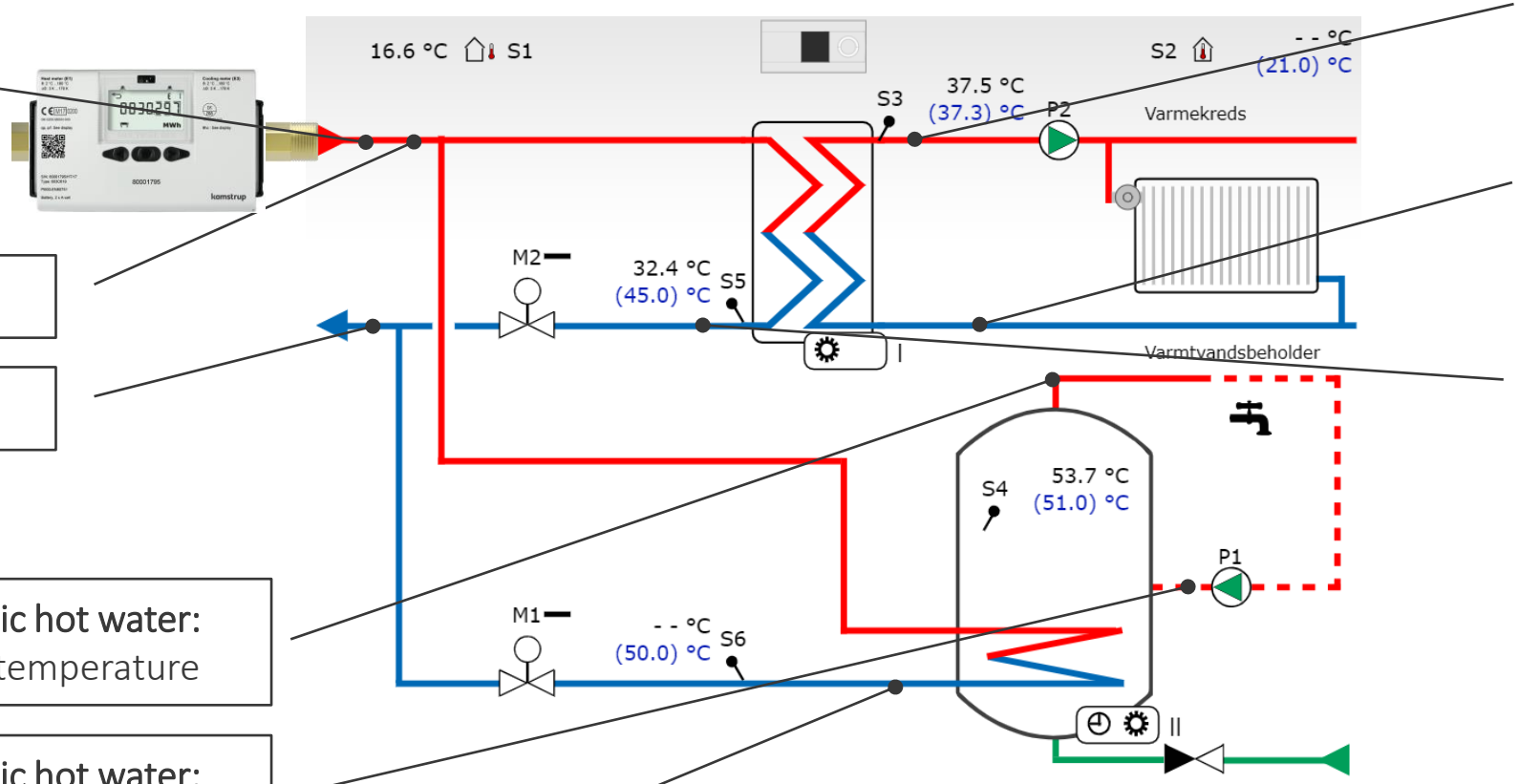


”Heat Assistant” data input

Primary side:
Flow (energy)

Supply temp.

Return temp.



Space heating:
Supply temperature

Space heating:
Return temperature

Space heating:
Return temperature to primary side

Domestic hot water:
Supply temperature

Domestic hot water:
Circulation temperature

Domestic hot water:
Return to primary side

9 signals in total (8 temperature + 1 flow) … and in addition:

Building data (age, size, type of installation, components)

Weather data (degree days, outdoor temperature)

GDPR and the rights to use data for optimisation

GDPR and the legal foundation for frequent data

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Do we need end-user consent to collect data?

Because smart meter data is personal data, processing it raises the question of the need for individual customer consent …

… especially when meters are read more frequently than required for billing purposes and consumer information, e.g. on hourly basis

Knowing that end-user consent is an administrative burden

Knowing that lack of consent will have a negative effect on the data-based optimisation – not just for a specific building but also for the planning and distribution

The Danish interpretation of Article 6 of the GDPR

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The Danish Energy Agency and Department of Justice has looked into whether legal basis for processing smart meter data can be found in Article 6 of the GDPR: **Lawfulness of processing**

They state that **processing of personal data is lawful to the extent** that:

(e) processing is necessary for the performance of a task carried out in the **public interest** or in the exercise of official authority vested in the controller;

(f) processing is necessary for the purposes of the **legitimate interests** pursued by the controller or by a third party (…)

The Danish interpretation of Article 6 of the GDPR

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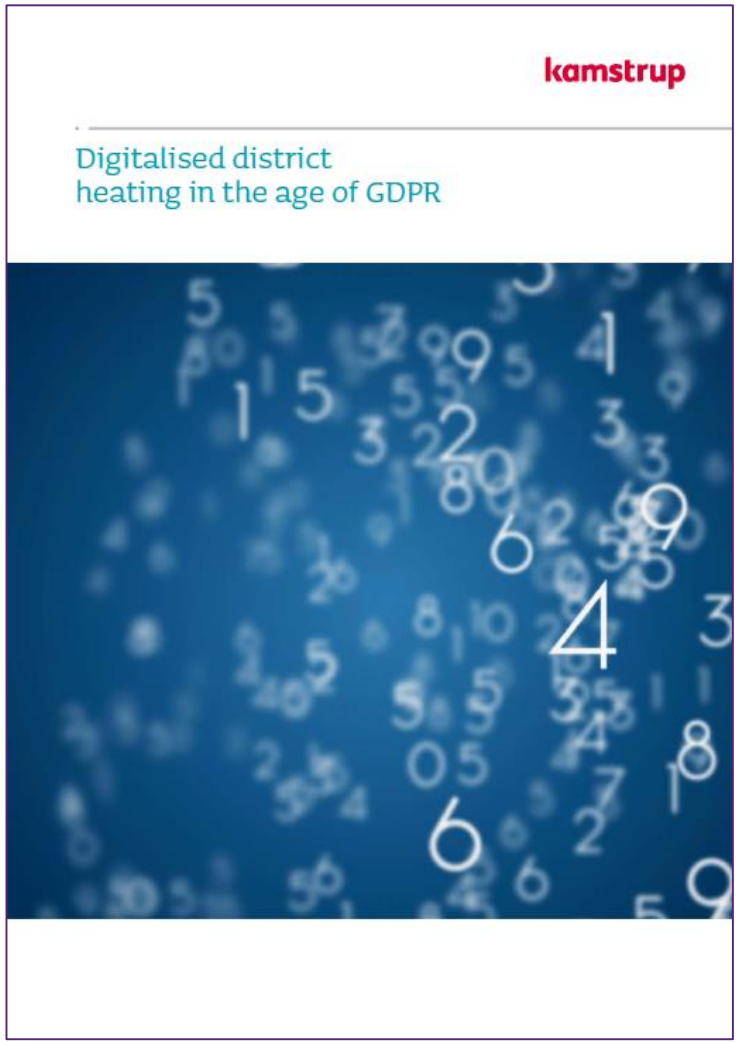
In conclusion, the official Danish position states that frequent data collection from heat meters **can be done without customer consent** ..

… as long as the energy supplier uses that data either in the interest of the public to save energy and **minimise energy losses**, or for the legitimate purpose of **improving the energy efficiency** of its operations

… may only take place if providers of smart metering solutions also **comply with the fundamental principles set out in Article 5** on processing of personal data.



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Think forward!

Steen Schelle Jensen
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DHC+ Digital Roadmap – insights on how digitalisation impacts the industry

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The Digital Roadmap provides a comprehensive overview and nuanced insight into digitalisation

Describing digitalisation on six different levels:

- Production
- Distribution
- Building
- Consumption / end-users
- Design and planning
- Sector coupling

Describing state-of-art, objectives, recommendations and barriers with digitalisation

Downloadable at the DHC+ Knowledge Hub:
https://www.euroheat.org/knowledge-hub/

Now available in 2nd version