District energy
Danfoss

Main Challenges in District Energy

ΔT Optimization

Economical balance between temperature and flow

Optimal Network Design

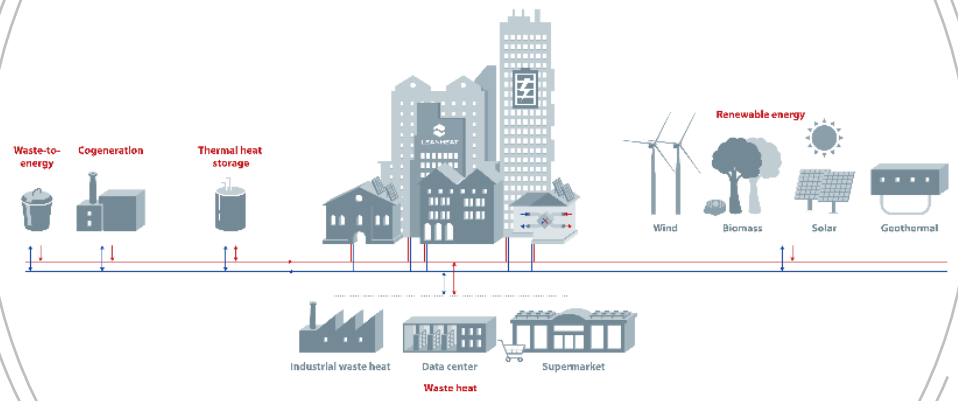
With new connections and new buildings

Decentralization - Increased source complexity

In production: more heat sources including renewables

Decarbonization

Legislation and environmental care / energy efficiency



Peak energy demand

Drives up overall cost (OPEX as well CAPEX)

Legacy SCADA

Make data integration less difficult and time consuming

Increase focus on business models

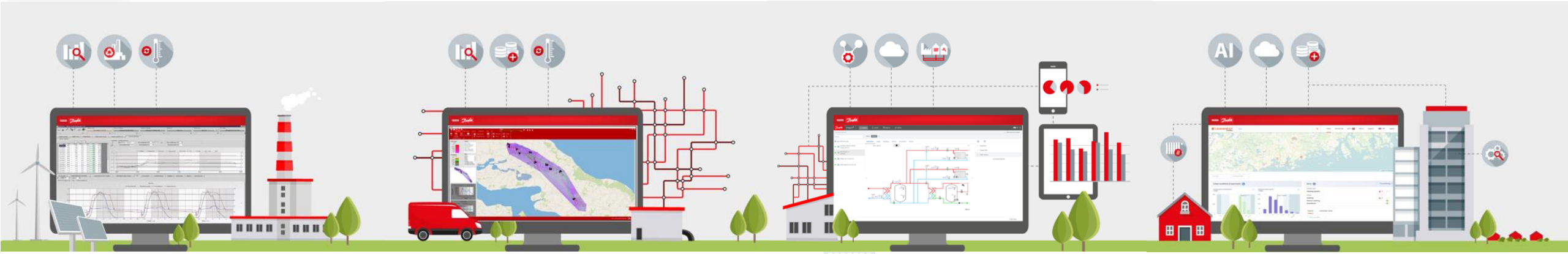
Create attractive business environment for future

Resilience

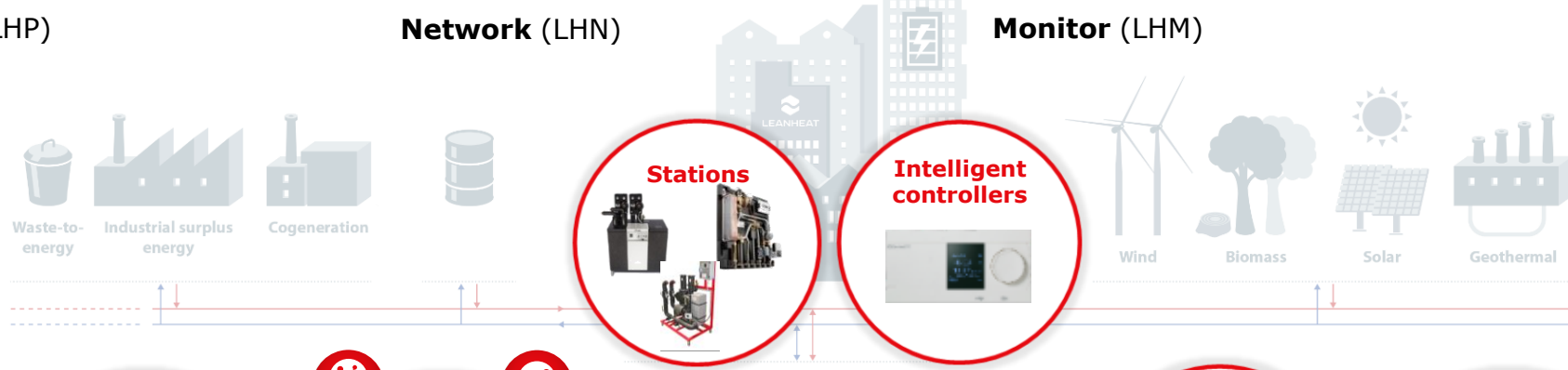
Secure high efficiency of operation in unexpected conditions

Danfoss District Energy product portfolio

From components to optimization tools & services



Production (LHP) **Network** (LHN) **Monitor** (LHM) **Building** (LHB)



Heat exchangers, line components

Motorized valves

iNET iSET

Self acting diff. pressure controls

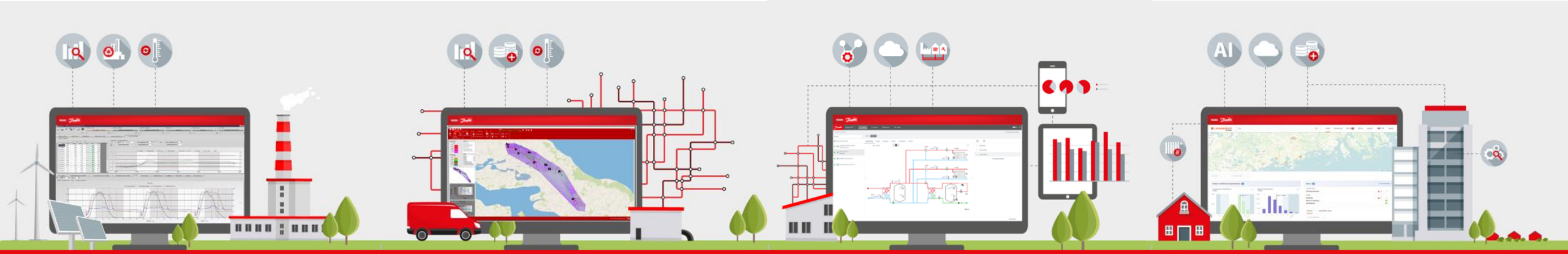
Heat pumps & heat recovery

Heat meters

eTRV

ASV

Danfoss Leanheat® software suite & services
End-to-end energy optimization solutions



Leanheat® Production (LHP)	**Leanheat® Network** (LHN)	**Leanheat® Monitor** (LHM)	**Leanheat® Building** (LHB)	
Load forecasting	Network design	Monitoring and control	Peak load optimization	Customer engagement
Data Driven temperature optimization	Online visualization of network operation	Easy data integration, extraction and interpretation	Energy optimization	Return temperature optimization
Production optimization	Hydraulic supply temperature optimization	Integrate devices with different protocols		
Production planning	Pressure optimization			

Data API HUB

AI Engine

Primary Side
(Planning, Network operation, Production)

Secondary Side
(Buildings)

Leanheat® Production

Minimize energy loss in the distribution network and achieve substantial energy savings

Leanheat® Production is an advanced **software tool for forecasting, planning and optimizing district energy production** and **distribution**

Predicting the **exact heat consumption** in the network

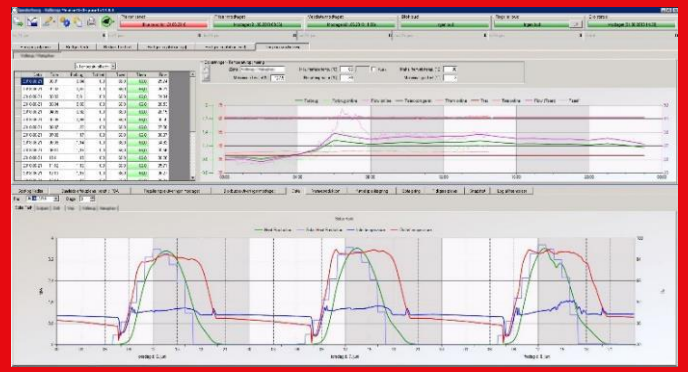
Reduction of heat loss by **5-10%** leads to **big annual cost savings**

Save between **1-3% on fuel costs** by choosing the right mix of sources

Demand response control & distributed optimization

Results

- Annual CO_2 footprint reduction of 1150 t
- By working with the supply temperature sets for the district heating network the utility can make 5.500 MWh in energy savings
- The return of investment is under 12 months
- The energy loss in the network can be reduced from 19% to 17% per year



More than

95%

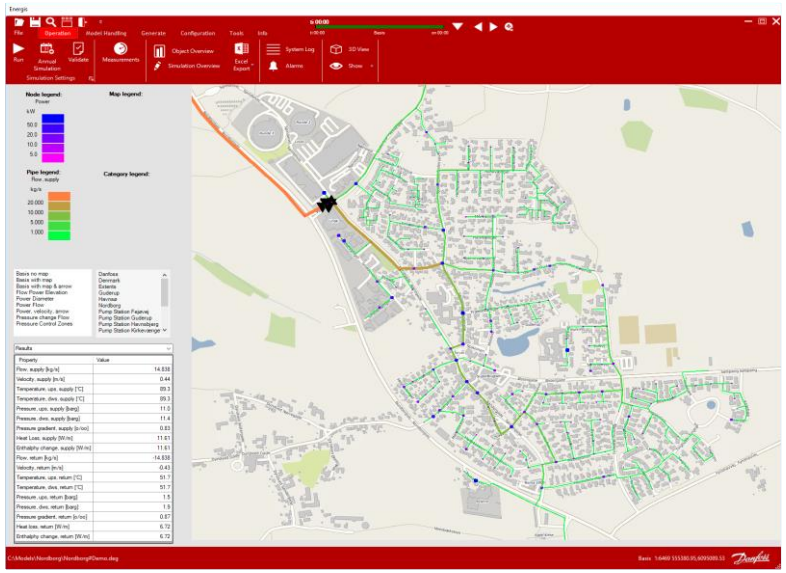
load forecast accuracy helps reduce carbon emissions

Leanheat® Network
Achieve improved and sustainable network operation

Leanheat® Network as a **development** support tool

Optimization of **expansions**, **refurbishments** and **new connections**

Analysis of impact of expansion, refurbishments and new connections on the rest of the network



17%

investment reduction

Leanheat® Network as an **online** support tool

Calculate **optimal hydraulic parameters** and apply them

Overview of the **temperature, flow** and **pressure** at any point in the network

Simulation of future conditions based on weather prognosis

What-if analysis for daily operating challenges and critical events

10%

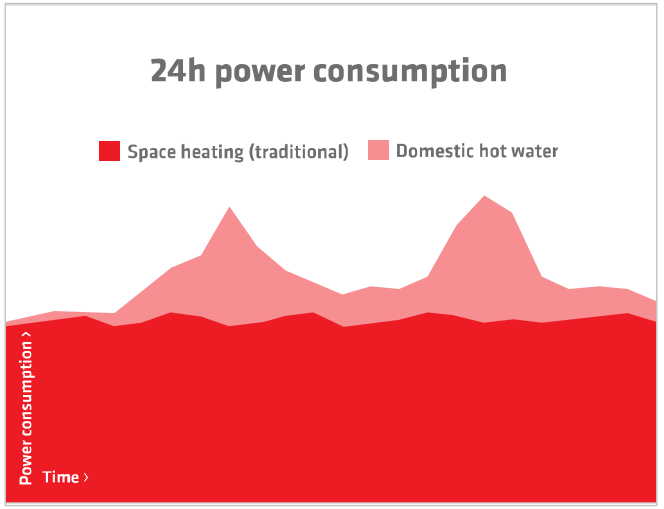
heat loss reduction due to a lower supply temperature

Leanheat® Building
Better indoor climate with less energy and maintenance costs

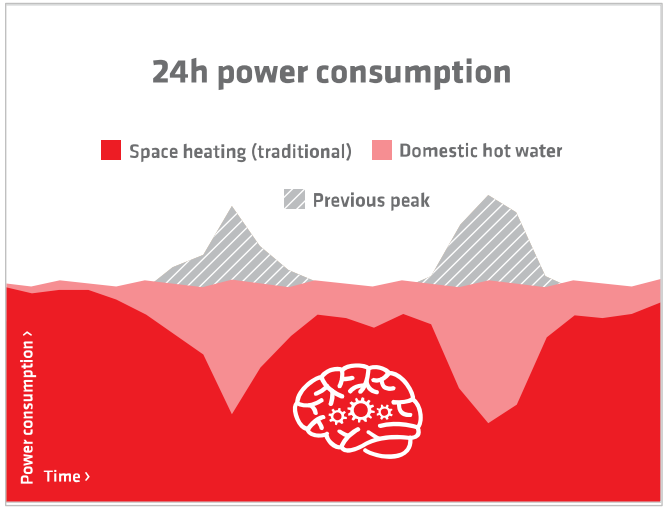
Leanheat® Building is an **AI solution**, using IoT technology to enables **smart heating control** & **maintenance for buildings**

Cut peak power
by **20%**

Traditional building automation



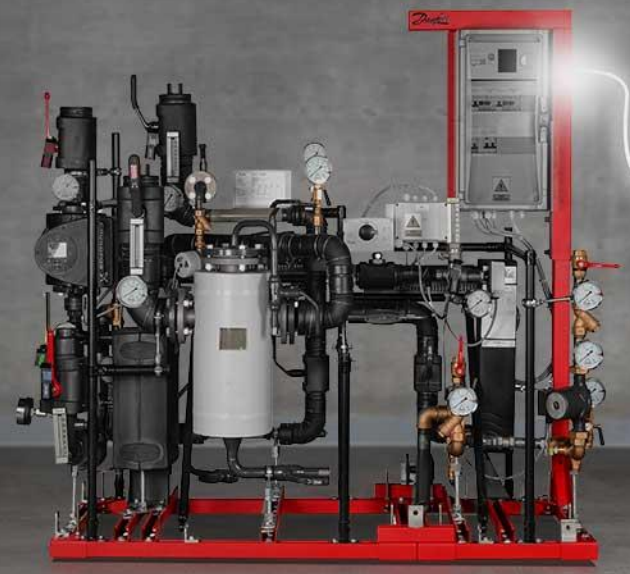
Optimized by **Leanheat® Building**



Enter a new dimension of district energy with **Titan™** by Danfoss

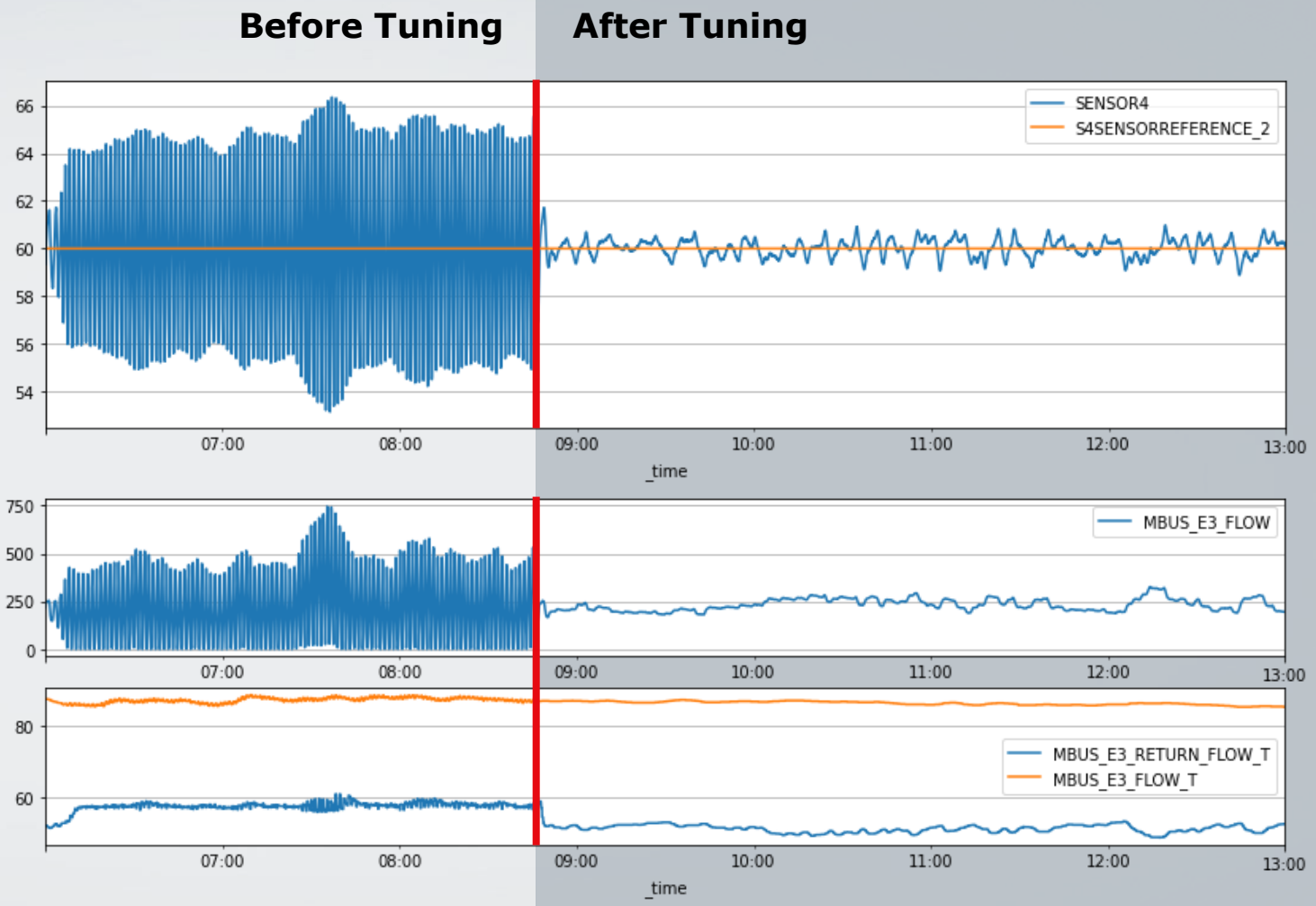
70% of stations are never commissioned

- Intuitive, reliable, and continuous cloud commissioning
- Best-in-class settings—ensuring longer station lifetime
- Optimum ΔT unlocking data-driven energy efficiency
- 100% Danfoss component-based station ensuring the highest quality and reliability



Data – PI tuning

- Operating point calculated from design data
- PI parameters calculated using substation model



Giessen, Germany

New digital solutions optimize Giessen network in minutes

Results

- Stable temperature at all times
- 1-2°C lower temperatures on return water means lower pumping costs
- Eliminated need for peak boilers
- Estimated payback time of Virtus + iSET less than 10 weeks
- Reduced operational costs due to energy savings and less wear on parts

Overview

DHU Giessen supplies approx. 500,000 MWh district heating annually

Challenge

Constant flow and temperature oscillations in the network

Solution

Virtus + iSET

ENGINEERING
TOMORROW