

ENGINEERING  
TOMORROW

*Danfoss*

Case Story | Leanheat®

Roll-out in 50,000  
housing units: **enercity  
AG optimizes district  
heating supply** with  
**Leanheat® Building**

The AI-powered software Leanheat® Building helped Hanover's district heating utility systematically integrate the buildings side of the network and achieve a 5-10% reduction in energy consumption and a 20% reduction in peak loads.

Climate-neutral district heating in Hanover by 2030 and a district heating share of 56% –instead of the current 26% – by 2045: enercity AG, one of the largest municipal energy companies in Germany with around 3,000 employees and an annual turnover of more than nine billion euros in 2023, has set itself ambitious goals. The transformation activities in the grid and power plant landscape are correspondingly extensive: the gas-fired power plant in Hanover-Linden, a landmark of the city with its iconic three towers, will be converted to hydrogen by 2030. The coal-fired power plant in the Stöcken district will be shut down and replaced by 14 decentralized generation plants based on renewable energy sources such as waste heat, waste wood, geothermal energy or sewage sludge. In addition, enercity wants to comprehensively digitalize network operation and is breaking completely new ground in this context. It is the first district heating supplier to strive for the most complete integration possible of the building side of the network – that is, the secondary side – into the planning and control of network operation.



**Images 1-3:** The gas-fired power plant in Hanover-Linden (bottom) will be converted to hydrogen by 2030; the coal-fired power plant in the Stöcken district will be replaced by decentralized generation plants based on renewable energy sources such as waste heat, waste wood, geothermal energy or sewage sludge (top left). *Image sources: Danfoss (bottom and top right), enercity AG (top left).*

## The challenge: Integrating the secondary side into the planning and control of grid operation

For district heating suppliers, the secondary side used to be mostly a black box, as there was a lack of information about each building's characteristics and the users' heating requirements. The supplier's knowledge usually ended at the building's substation. In contrast, energicity uses Leanheat® Building from Danfoss, a cloud-based AI software that can be used to systematically record building and heat usage data and evaluate it for efficiency-optimized building and network control. Based on these data sets, utility managers can operate flow temperature control based on actual demand and reduce peak loads in the morning and evening hours. This makes it possible to cover the heat demand with lower energy intensity and ultimately supply a higher number of connected consumers with identical power plant capacities.



**Fig. 4-6:** For district heating suppliers (right picture: the control center of the Linden gas-fired power plant, left pictures: the corporate headquarters of energicity AG), the building side of the network – the so-called secondary side – has mostly been a black box until now, as they lacked information about building characteristics and occupants' heat demand.  
*Image source: Danfoss.*

## The solution: AI-based flow temperature control and peak load control

The use of Leanheat® Building was initially tested as part of a pilot project conducted over two heating seasons in a total of 24 properties. For this, enercity equipped the buildings' substations with network-enabled Danfoss ECL 296 district heating controllers and installed IoT wireless indoor sensors in 120 of the 900 included apartments to measure room temperature and humidity. The sensors are integrated into the Leanheat® Cloud via enercity's LoRaWAN network, where the data they transmit is continuously analyzed by the Leanheat® Building software.

During the first heating season, the focus was on optimizing the supply temperature control: based on the indoor sensor and controller data, and incorporating weather information, the Leanheat® Building AI software learns the building characteristics and user behavior and automatically adjusts the supply temperature flexibly and proactively to meet actual demand. In the second heating season, the focus shifted to reducing peak loads: Leanheat® Building automatically learns the individual load profile of the properties and, when peak loads are expected, uses the thermal storage capacities of the building envelope to moderately shift the heat demand without degrading indoor climate conditions.



**Fig. 7-9:** The use of Leanheat® Building was tested as part of a pilot project conducted in a total of 24 properties, including properties of the housing association Ostland (right). For this, enercity equipped the buildings' substations with, among other things, network-enabled Danfoss ECL 296 district heating controllers (bottom left).  
*Image source: Danfoss*

**The result:  
Significant reduction in  
energy consumption  
and peak load leads to a  
comprehensive rollout**

The results of the pilot project confirmed expectations: During the first heating season, energy consumption decreased by an average of 5 to 10 percent, weather-adjusted. In the second heating season, peak loads were reduced by nearly 20 percent through the use of the building envelope's thermal storage capacities. Due to these results, enercity decided to implement a comprehensive rollout of the solution, which has already begun. By 2027, around 5,000 additional multi-family houses with approximately 50,000 housing units will be equipped with network-enabled district heating controllers and wireless indoor sensors; the demand-led supply temperature control and peak load management will also be handled by the Leanheat® Building software. Initial results are confirming the outcomes of the pilot project. Looking ahead, a widespread implementation of the solution is planned, which, following the full digitalization of the district heating network, would enable comprehensive AI-based optimization of the entire network operation—from planning and energy generation to network control and end-user delivery. Danfoss' Leanheat® software suite also offers solutions for this purpose.

**20%**  
reduction in  
peak loads

**5-10%**  
reduction  
in energy  
consumption



We had a problem, we found a solution, we established the solution. It delivered exactly the desired result, thus we are now doing a full roll out.

Simon Zöller, Senior Vice President  
Marketing & Sales, enercity AG



The cooperation with Danfoss is – and I can speak for the whole of enercity AG here – very good. We have worked together as partners over the past few years.

Nico Treder, Head of Key and Business  
Account Sales, enercity AG



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