



LEANHEAT

by Danfoss

City Wide Deployment For Coming Winter –
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Energy solutions for the block level – Opportunities in Smart City
business environment -seminar 12.9.2019

Leanheat Is The Choice Of Professionals



Number of Leanheat installation 2014-2019



A warm, slightly blurred photograph of a family in a living room. In the foreground, a young boy in a grey sweater is sitting on the floor, playing with a green toy car. To his right, a woman with dark hair, wearing a green and white striped shirt, is lying on her stomach on the floor, focused on drawing on a piece of paper. In the background, a man and a woman are sitting on a green sofa, looking at a large white object, possibly a piece of paper or a small screen. The room has a wooden floor, a shelf with books and plants in the background, and a cup of colored pencils on the floor near the woman drawing.

10 % of Finnish flats
are Leanheat controlled

Customer Decides Temperature Target – Leanheat Delivers It With Minimum Costs

Energy savings 0-5 %
Power savings 0 %



Energy savings 5-10 %
Power savings 20 %



TRADITIONAL MODEL

1. Heating is controlled with setpoints related to outside temperature
2. Customer complains → setpoints are adjusted
 - Over the years setpoints are "calibrated" to meet the needs of the hardest situations and most difficult apartments
 - Indoor temperature vary and energy is wasted

MIDDLE MODEL

1. Some apartments are equipped with temperature sensors
2. Heating is compensates reactively of rule based utilizing the measurements
 - Not applicable to all buildings
 - Cause power variations
 - Over and underheating

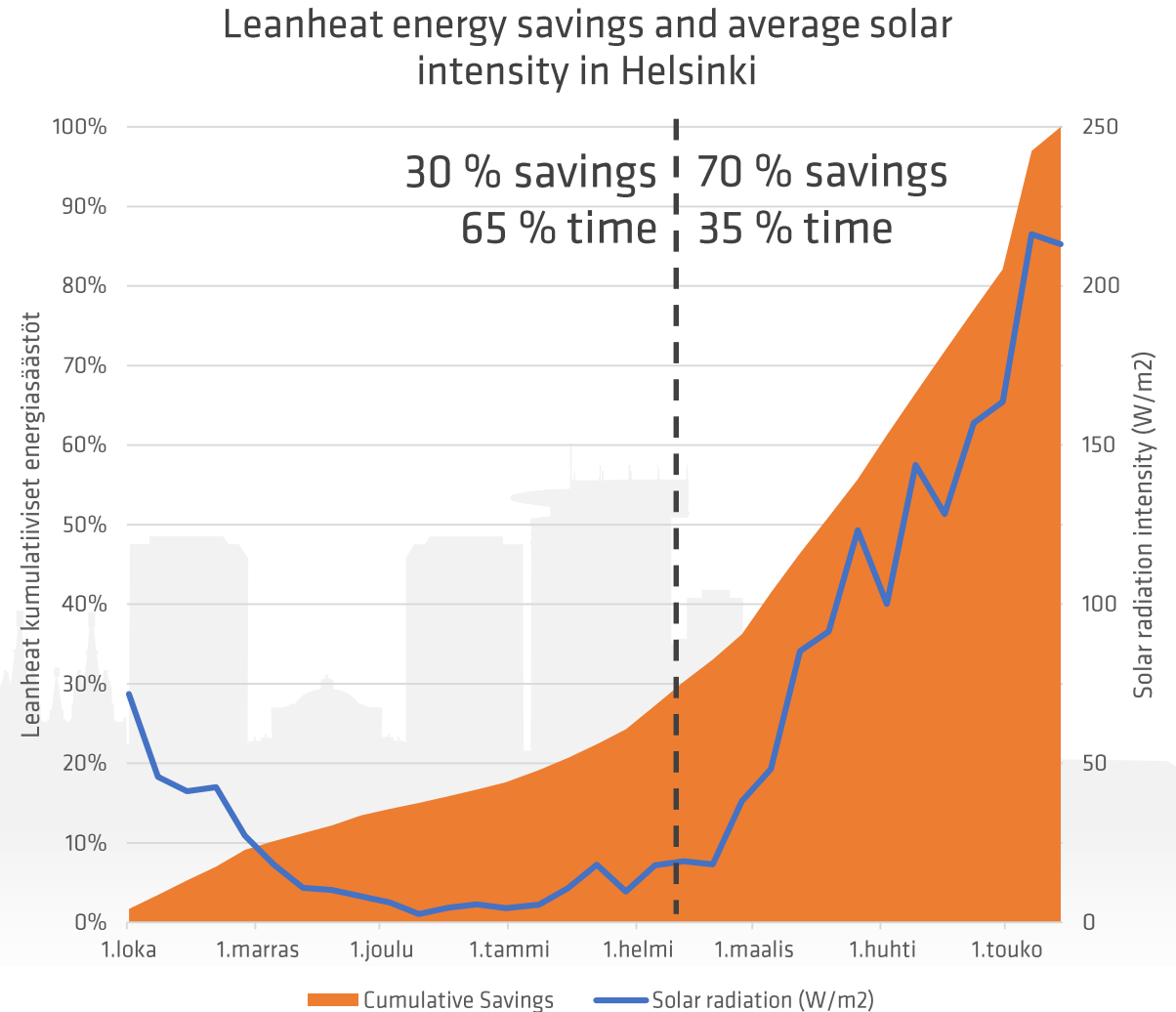
LEANHEAT

1. Some part or all apartments are installed with temperature sensors
2. AI builds thermodynamical model of the building
3. Customer decides temperature target
4. All possible control combinations are tested with the model to minimize the cost and keep the comfort at the same time
 - Adapts to any building
 - Energy consumption and power requirements are minimized

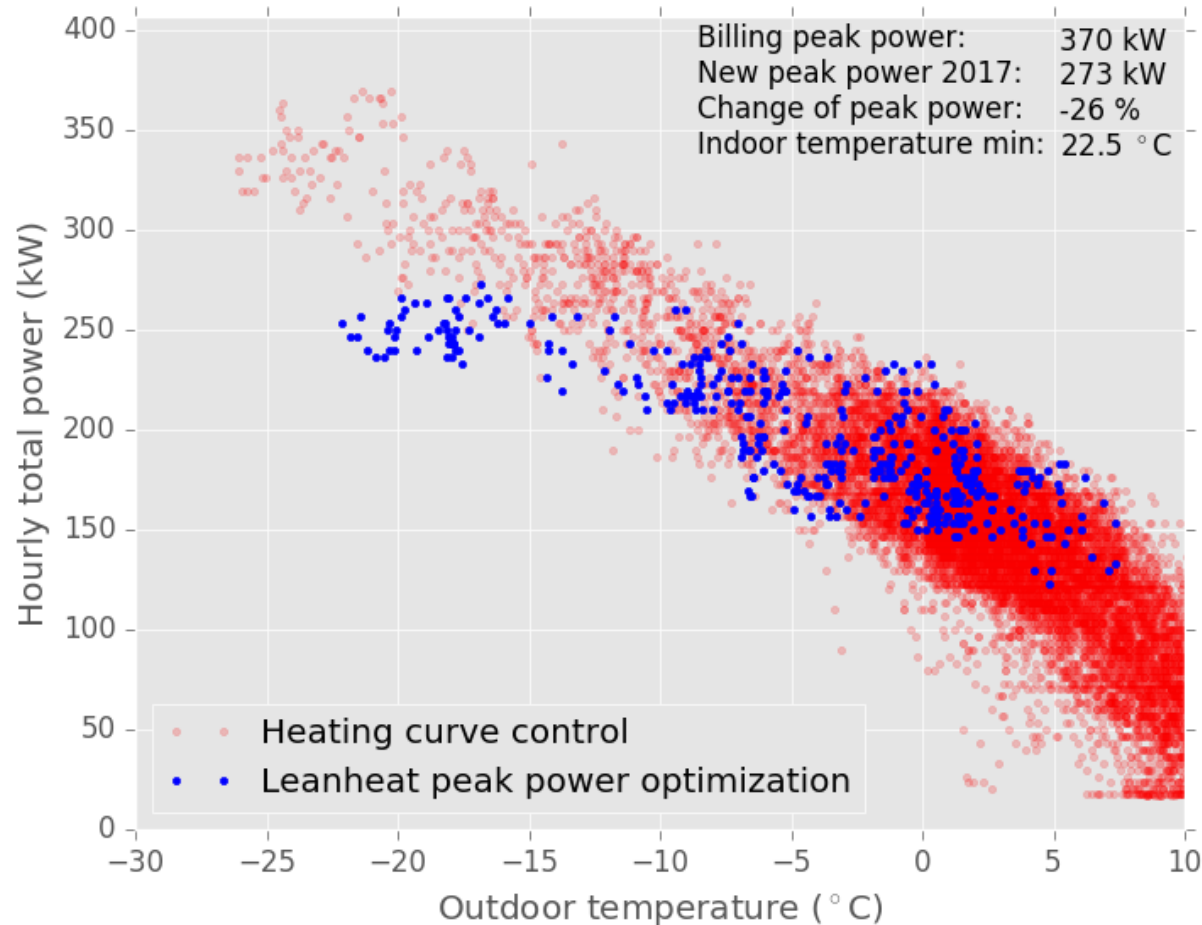
70 % of Leanheat Savings Are Not Possible With Traditional Heat Control

- 70 % of savings are created between 15.2.-15.5.
- Savings occur despite the temperatures are raising towards the spring → total energy need is low
- Savings are explained by increased effect of sun, which Leanheat can utilize by learning the effect for each building
- Traditional heat control based on setpoints related to outside temperature can't cope with sunshine
- Typical Leanheat savings are 7 %, which 70 % are related to effect of the Sun

→ **Leanheat saves atleast 5 % when compared to setpoints based on outside temperature if the indoor temperature is the same**

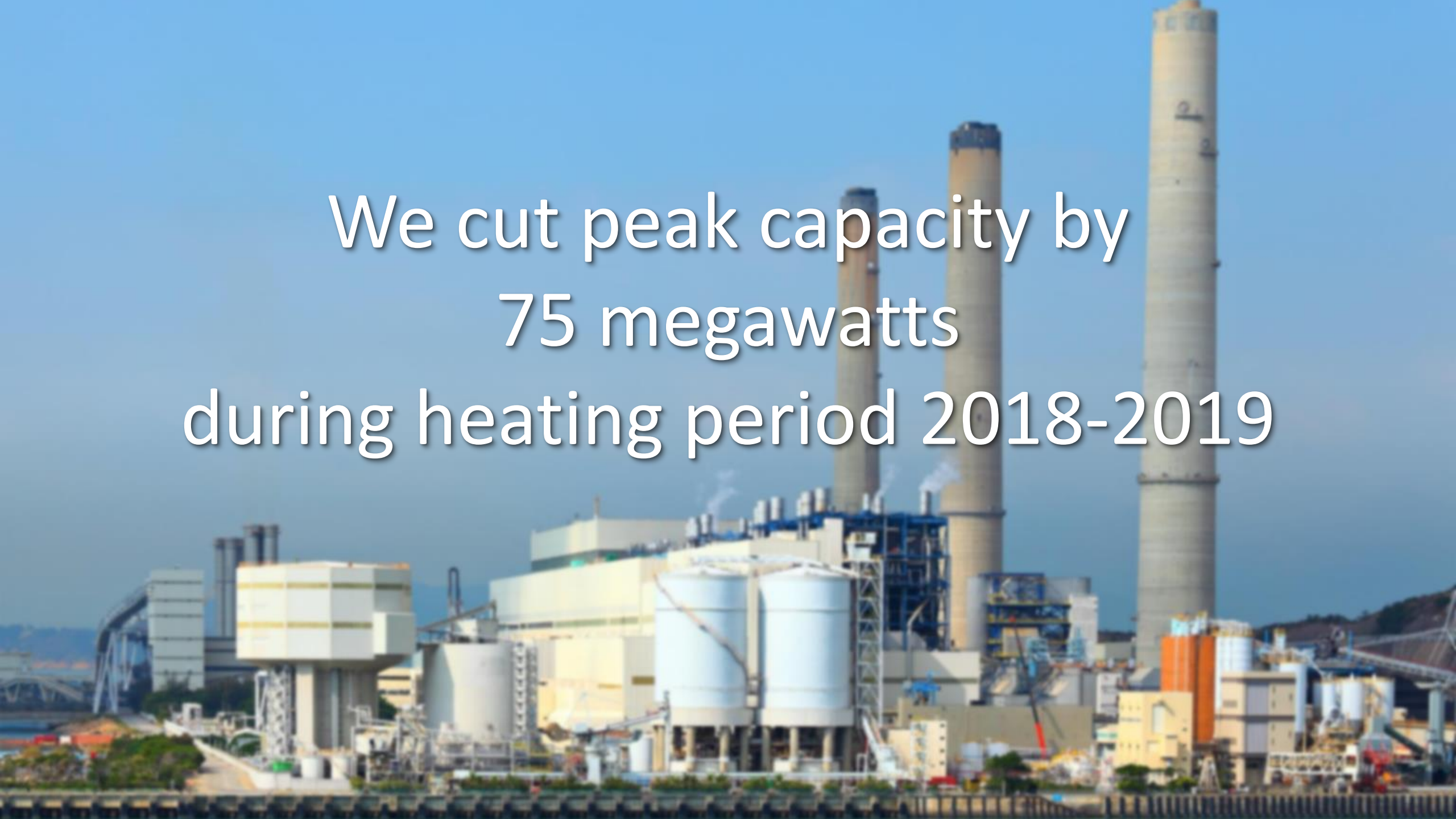


Demand Response Saves 20 % of Power Requirements



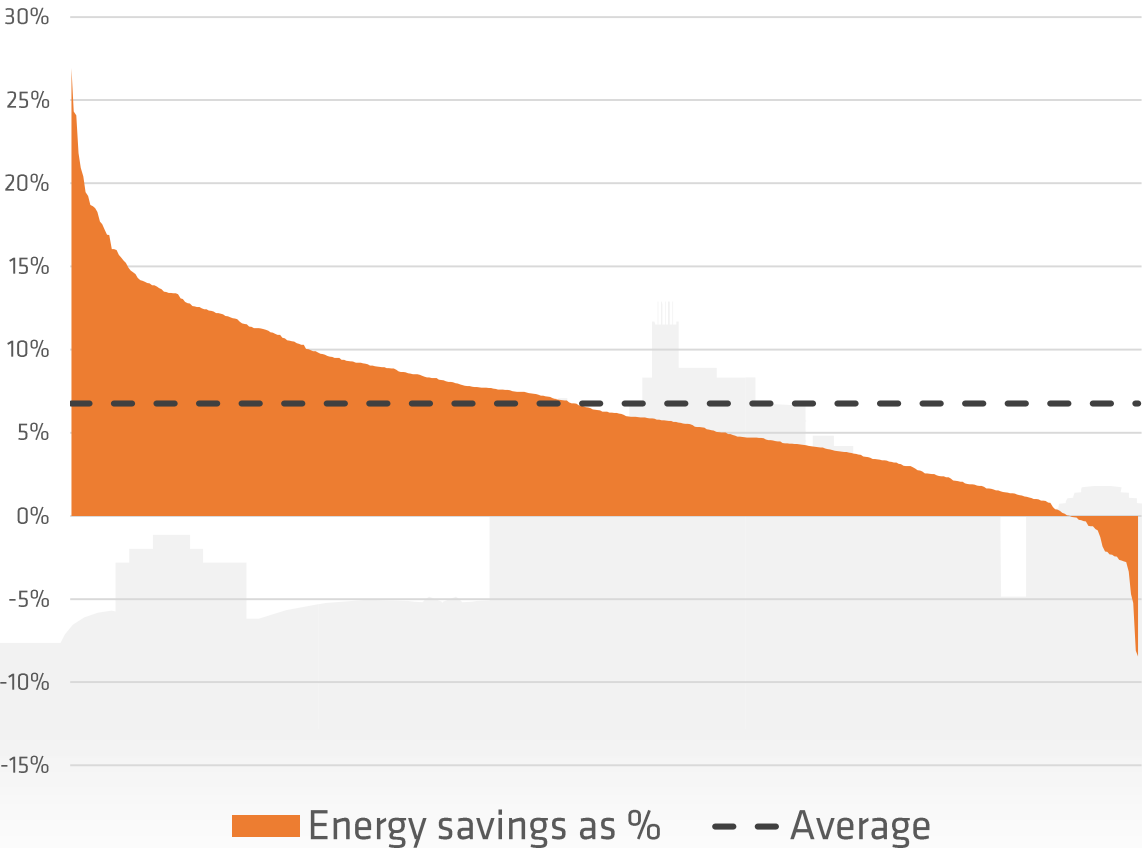
- Leanheat cuts as average 20 % of building power need by optimizing space heating around hot water consumption
- Indoor temperature is at least 21.5 °C
- Demand response lower the connection fee for district heating and enables more environmental heat production

We cut peak capacity by
75 megawatts
during heating period 2018-2019

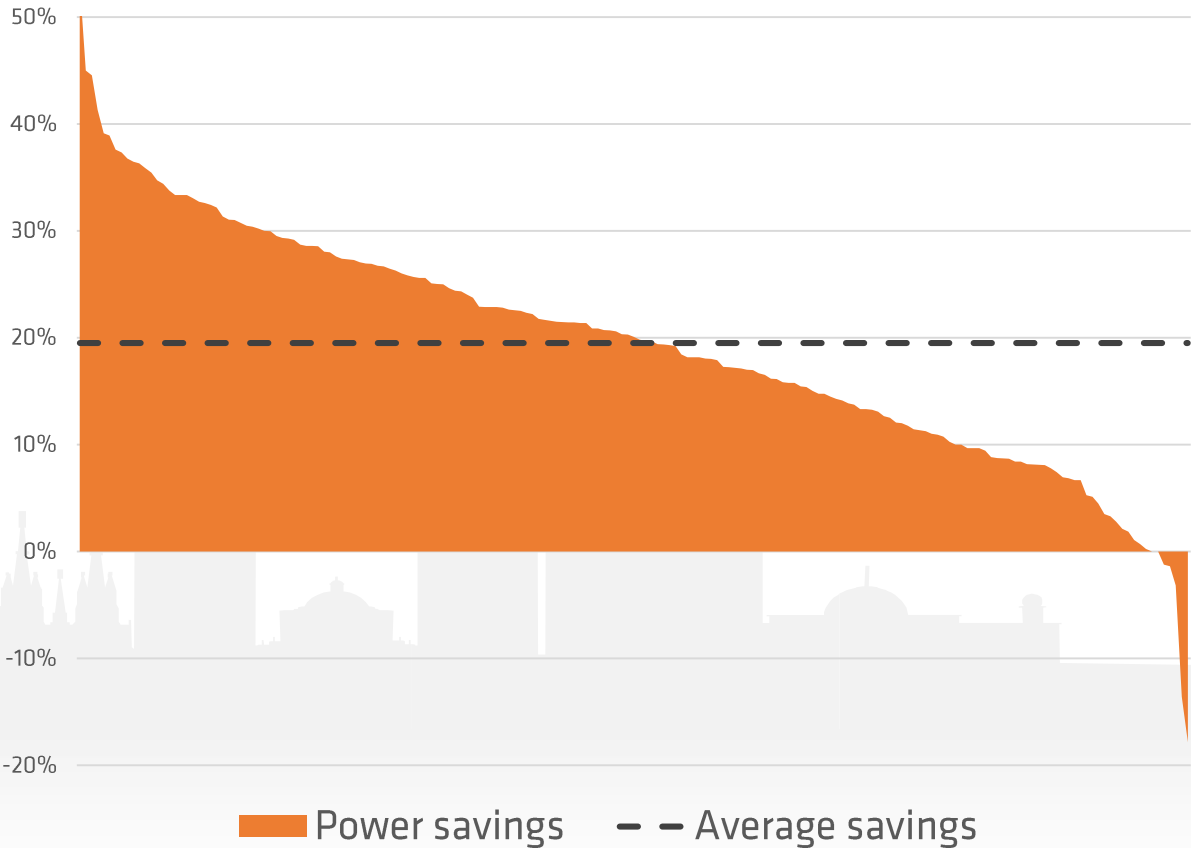


Leanheat Saves As Average 7 % Of Energy And 20 % Of Power

Energy savings of all Leanheat controlled buildings
(2300 sites, 100 000 apartments)

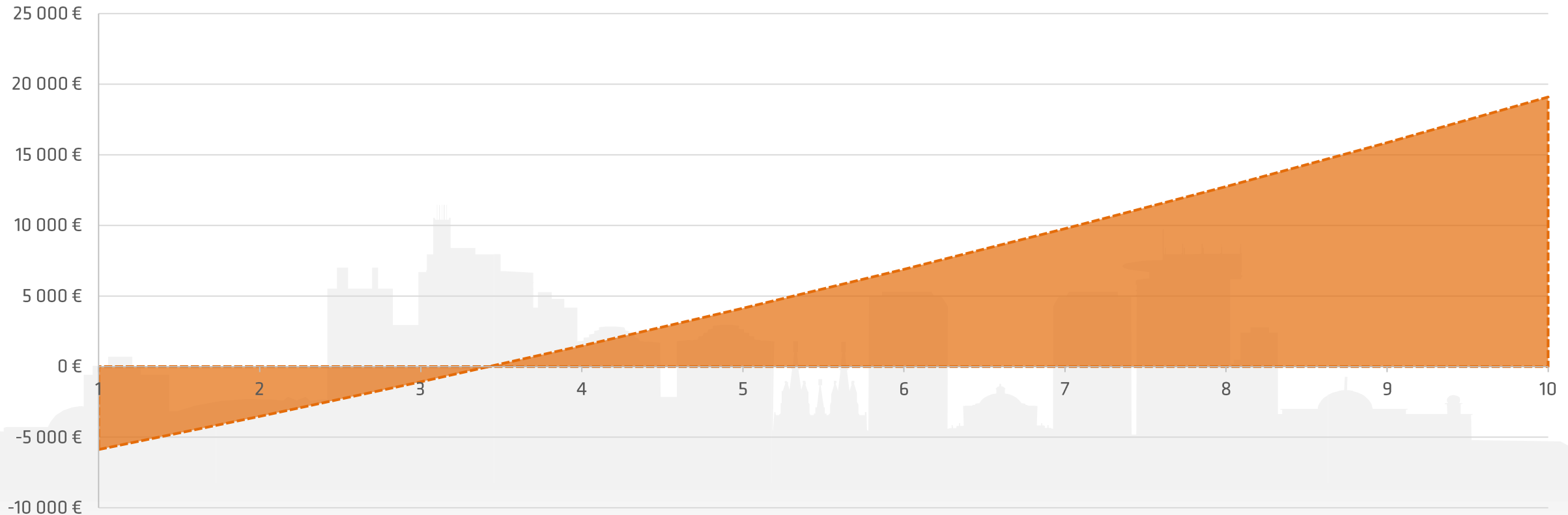


Decrease of power requirement of all Leanheat controlled buildings
(2300 sites, 100 000 apartments)



Average Payback Time Of Leanheat Investment Is 3,5 Without Savings In Energy Production And Distribution

Cumulative cashflow of Leanheat in one building



- Calculations are done with heat price in Helsinki and building with 40 flats
- Leanheat investment is 175 €/apartment (alv0), service fee approx. 30 % of energy savings

Too high additional moisture may look like this



Typical Problems In Leanheat-apartments

1. Temperature imbalance between the apartments

- Temperature imbalance between the coldest and the hottest apartment can be over 5-6 degrees.
- Heating the whole property according to the coldest apartment reduces living comfort of (others) and increases energy consumption → apartment-specific fixes needed to reduce the temperature imbalance.

2. Structural problems of the apartments are exposed

- Defects in window or door insulation, ventilation or radiators have been previously compensated by overheating
- Temperature of normal apartments raises too much because of overheating, which reduces living comfort and increases energy consumption.

→ The cheapest solution is apartment-specific repairs

→ Increasing the site supply temperature should be the last option

Steps for Citywide Deployment And For Efficient Energy Production And Consumption

STEP 1-Apartments

Buildings with central heating and the role of ventilation is low

Public buildings, which are technically similar (for example Child Care and Schools)

Energy Saving Potential ~ 7-10%

Power Flex Potential ~ 20%

STEP 2-Easy public buildings

Items with greater ventilation role and supply air heating with District heat

Premises and public buildings wider, especially those with water radiators, the proportion of heating large and building automation fairly simple and/or integration easily feasible

Energy Saving Potential ~ 3-5%

Power Flex Potential ~ 10%

STEP 3-Premises

All items that are economically viable to execute

Premises and public buildings wider

Energy Saving Potential ~ 10-15%

Power Flex Potential ~ 30%