

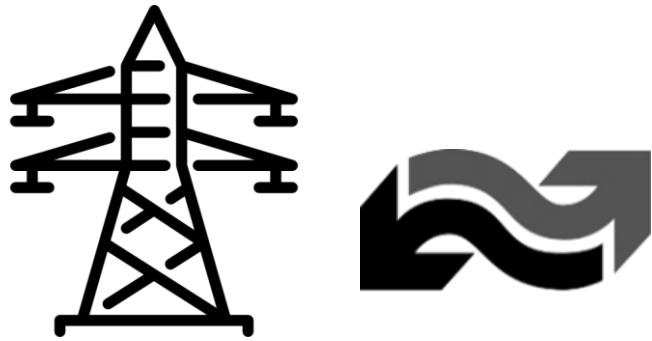


Field experience of data-driven control and monitoring to support energy efficient and flexible building operation

Pierre J.C. Vogler-Finck, Henrik Lund Stærmose, Per Dahlggaard Pedersen

Many challenges at different levels

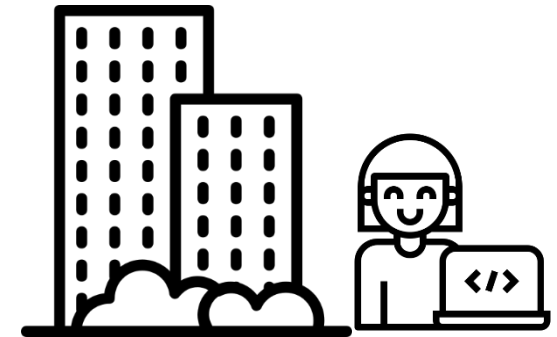
Reduce the global climate footprint



- Integrate renewable sources
- Improve planning and operation
- Reduce losses



Ensure cost-efficient operation



- Maintain heating system in a healthy state
- Secure comfort

There are 2 important dimensions on the demand side in a 'smart' energy system

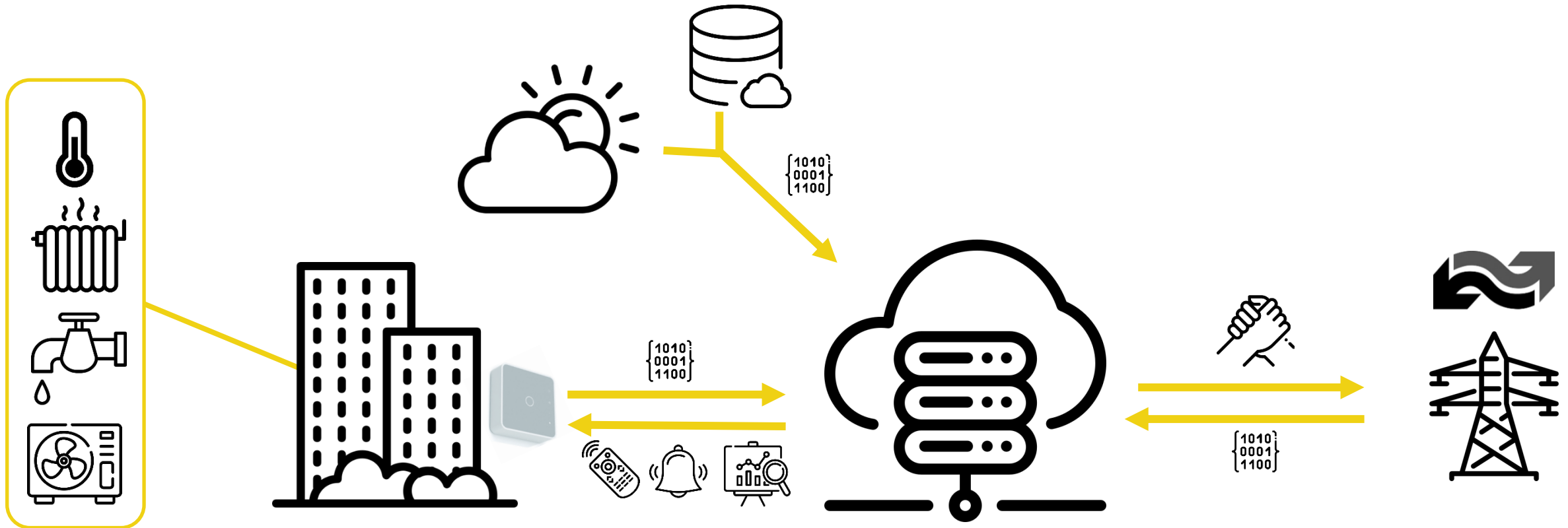
Efficiency: use only the amount of energy that is needed

&

Flexibility: use the right amount of energy at the right time

*Data-driven control and monitoring
for energy efficiency and flexibility*

Our cloud platform binds different actors and data sources



Data brings does so much more than the legacy controller



Advanced model-based alarms



Model-based adaptive control,
using weather forecasts



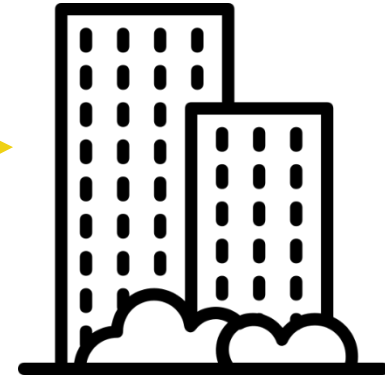
Integrated operation of building systems, also
with local energy production in building and/or
community



Remote diagnostic and management



Detailed analysis of performance



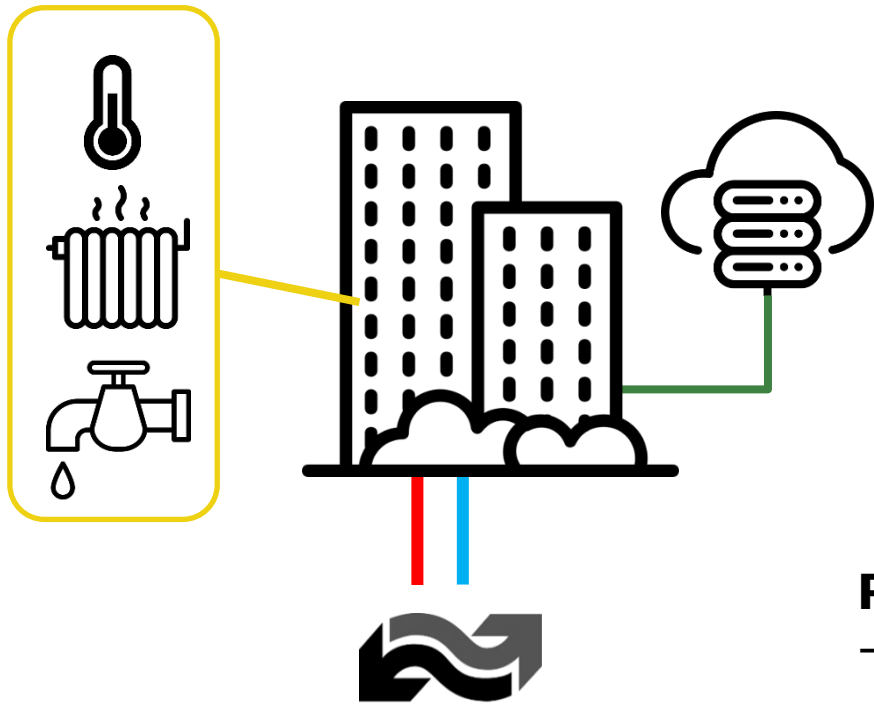
Maintenance and fault identification
based upon instantaneous values
of parameters



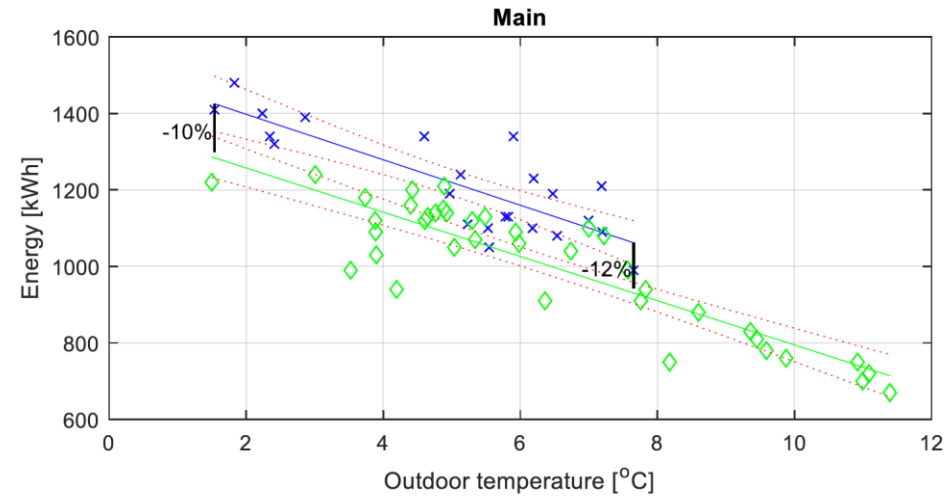
Basic static weather compensation



Energy efficiency was delivered in large residential buildings with district heating



Apartment blocks
(1970-1980s, 33.128 m²)



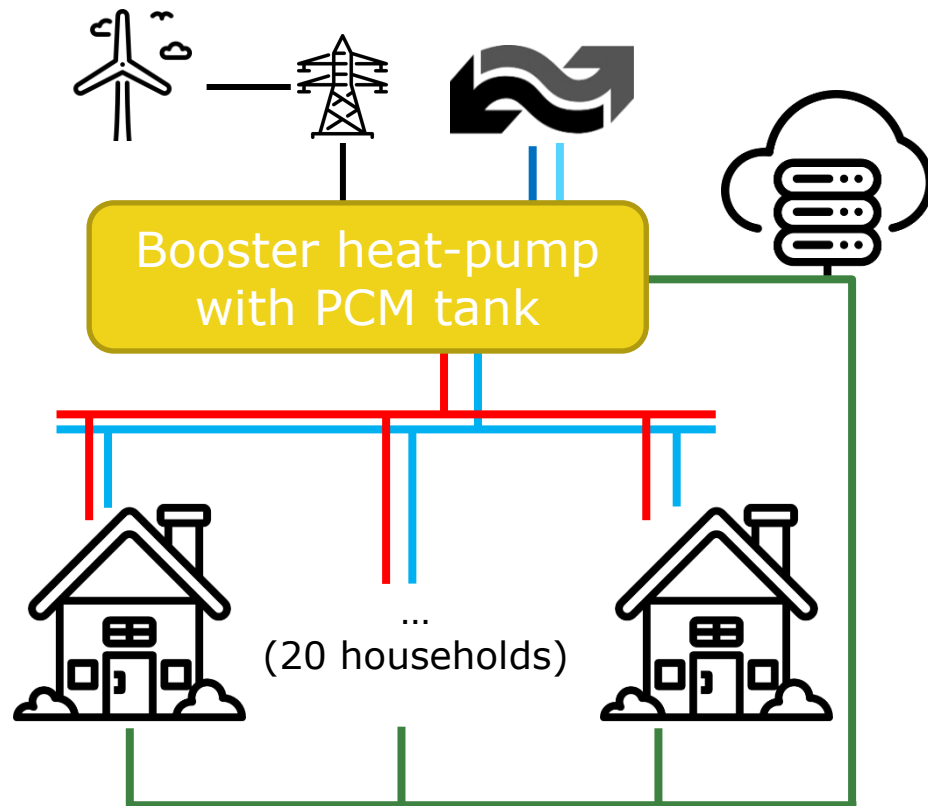
Results:

- Lowered return temperature to district heating (2-4°C)
- Total heating demand (space and water) reduced by ~10%
- Malfunctions identified

Pool control in a local district heating area

Objectives in first use-case:

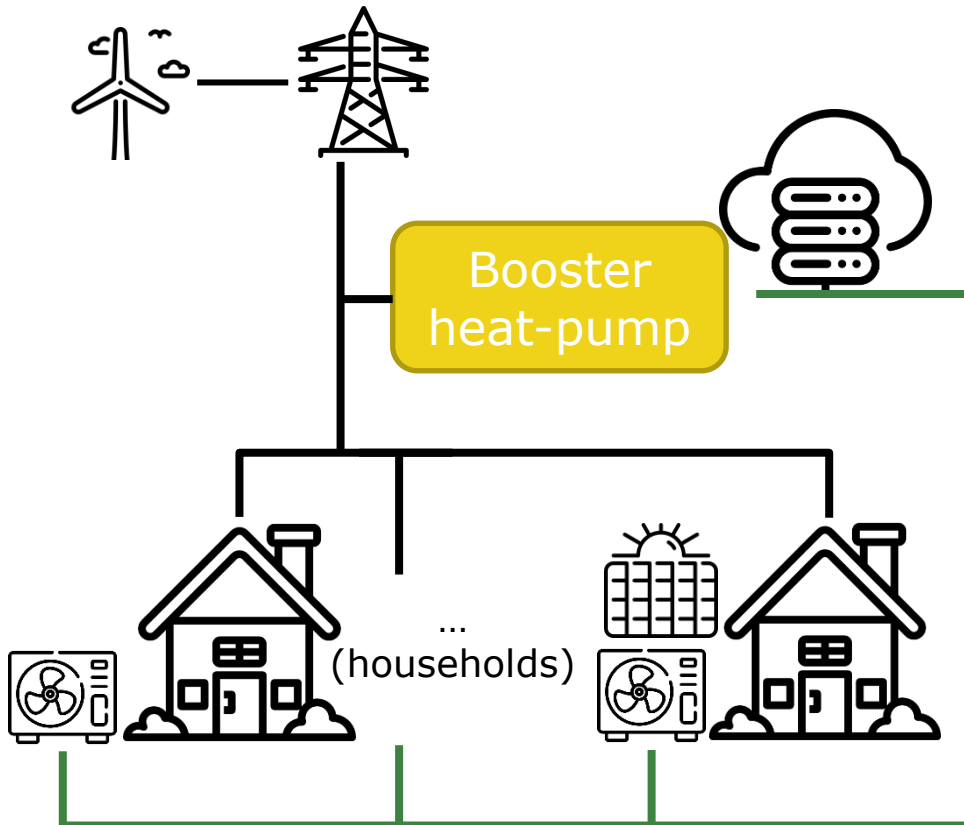
- Develop and demonstrate a novel boosting station setup in local area based upon a heat-pump with a PCM tank
- Coordinate optimised control of heating in houses with the booster heat-pump control
- Evaluate the potential for scaling up, based upon the case in the municipality of Skive (Denmark)



*Funded by EUDP
(the Danish strategic development and demonstration
program for energy technology)*

More details on <https://www.smartce2h.dk/>

Aggregated control of heat pumps



Objectives in second use-case:

- Evaluate the benefits of coordinated optimised control of heat-pumps within a community
- Evaluate the potential for scaling up, based upon the case in the municipality of Skive (Denmark)



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Conclusion

Digital technology for energy efficiency and flexibility in buildings is available

- Commercial technology is available for:
 - robust online cloud-based building data collection (from BMS + IoT),
 - online optimised control at building level,
 - ...and soon for optimised control at the community level.
- Supply temperature = can often be optimised further at building and grid level.
- Energy efficiency is a way to get into the buildings, and cloud-based controller infrastructure can support demand response at low extra cost.
- Flexible control technology faces major commercial barriers :
 - system operators are unable to provide a quantification of the value of flexibility for them
 - currently, there is no functional appropriate flexibility market (at least in Denmark).



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