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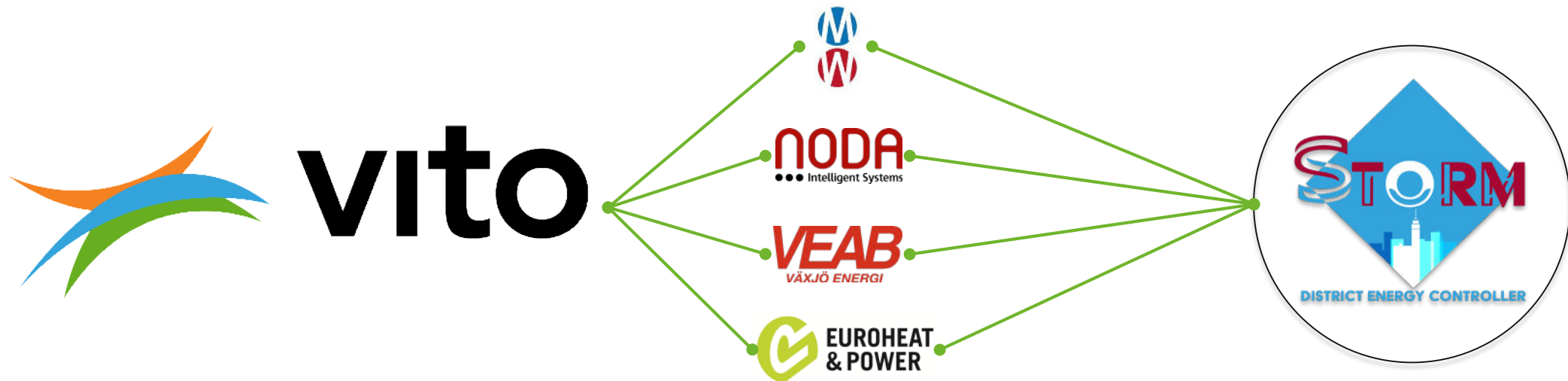
STORM - Smart Thermal Operational Resource Management

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Background information

- The STORM Controller was developed by VITO, Belgium as part of a H2020 project.

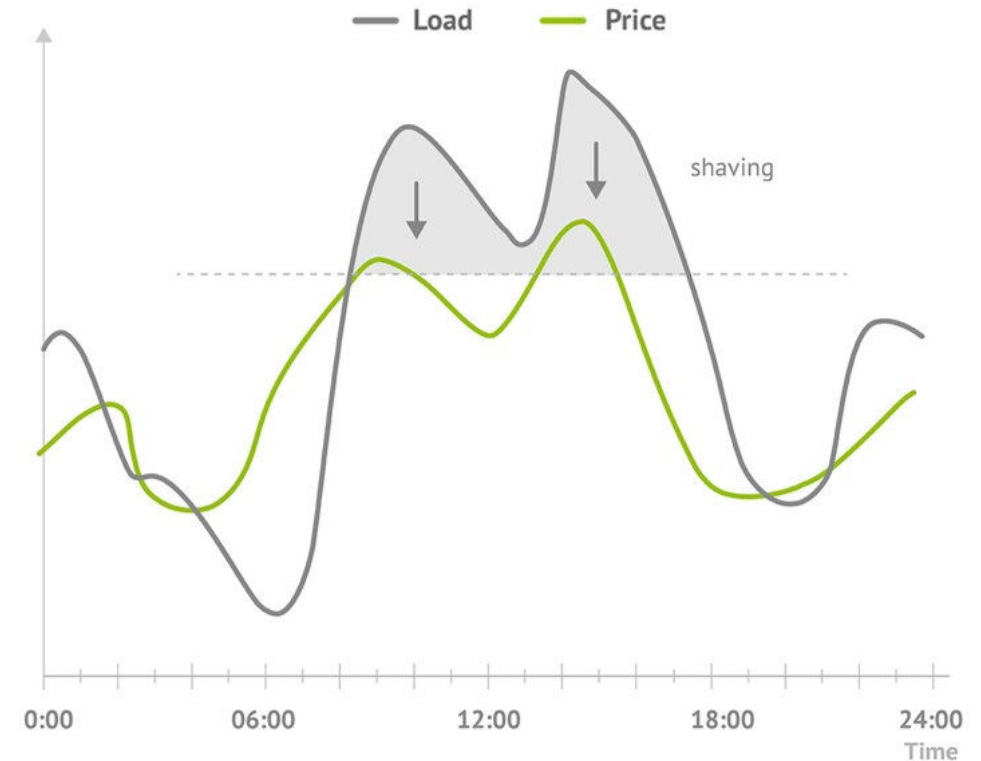


What is STORM?

- An artificial intelligence (**AI**) based controller for district heating networks which achieves operational optimization (**OO**) through active demand side management (**DSM**).

OO Potential

- **Base load (Cheap):** Waste, Biomass, Renewables, CHP
- **Peak load (Expensive):** Oil, Gas



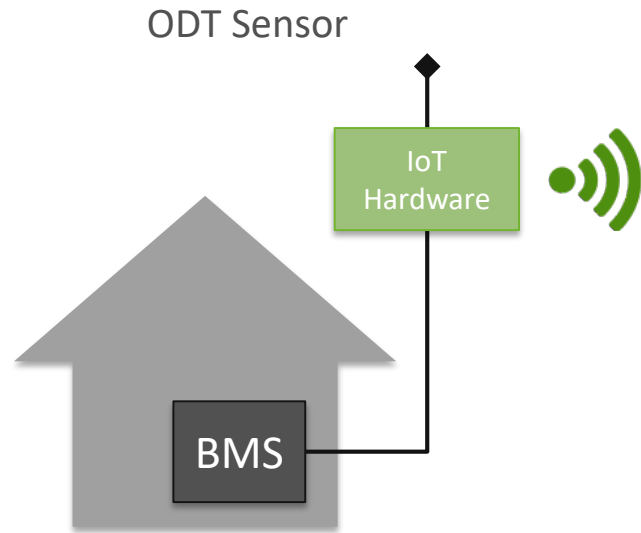
Key idea

- Active demand side management utilizing flexibility offered by the buildings' thermal mass without loss in quality of service.

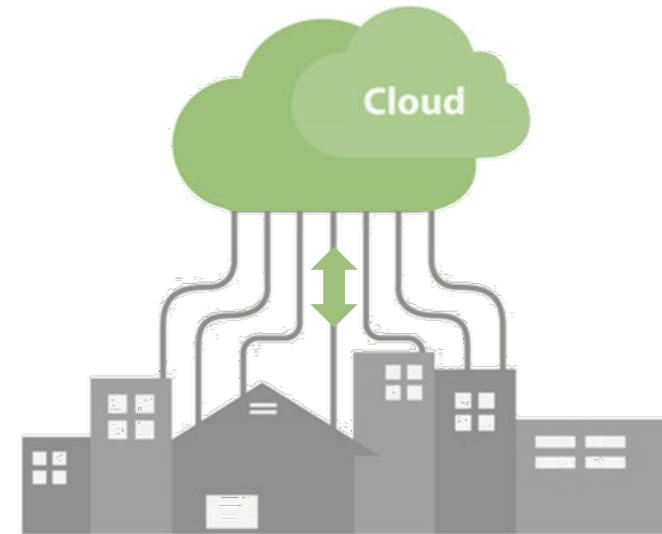
Duration	Potential reduction in peak load (%)
Short-term [1-3h]	40-50%
Medium-term [3-5h]	20-30%
Long-term [>5h]	10-12%

1. Without loss in thermal comfort ($\Delta T_{indoor} \approx 0.1^{\circ}C$ Order of magnitude)
2. Regardless of outdoor temperature (ODT)

On site implementation 1

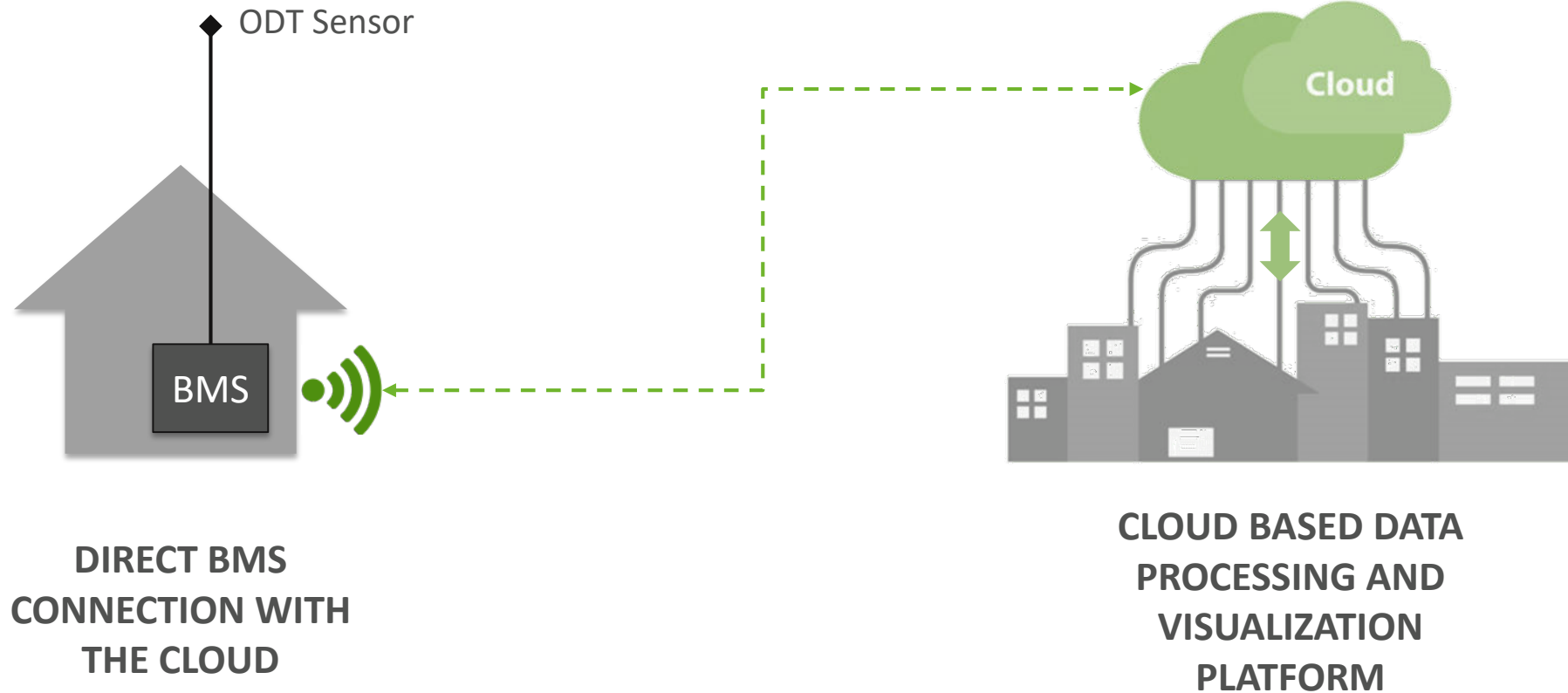


**COMPATIBILITY WITH
EXISTING BMS'S**

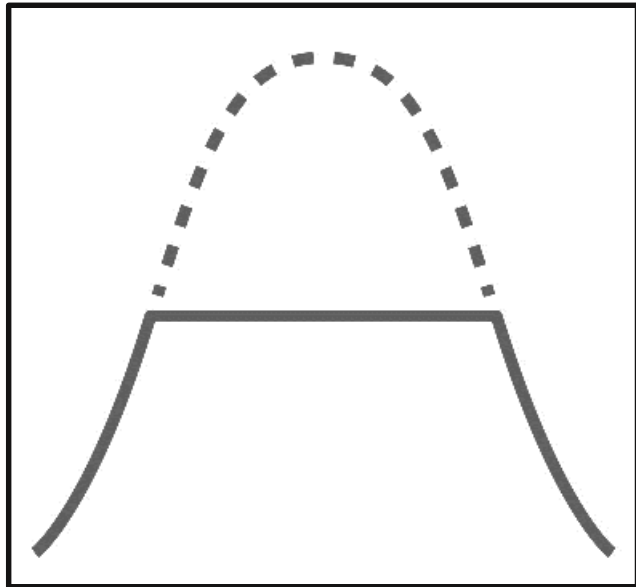


**CLOUD BASED DATA
PROCESSING AND
VISUALIZATION
PLATFORM**

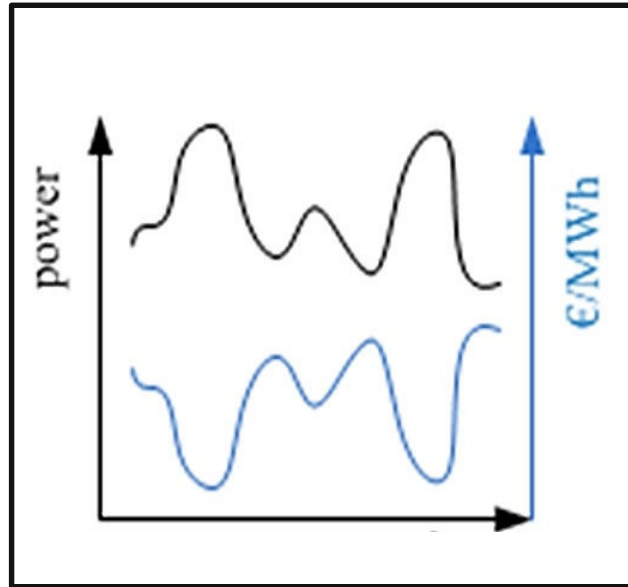
On site implementation 2



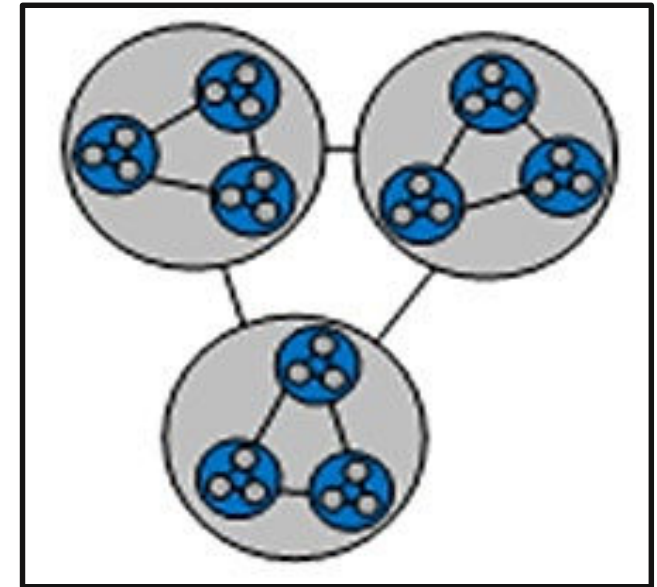
Control strategies



Peak shaving

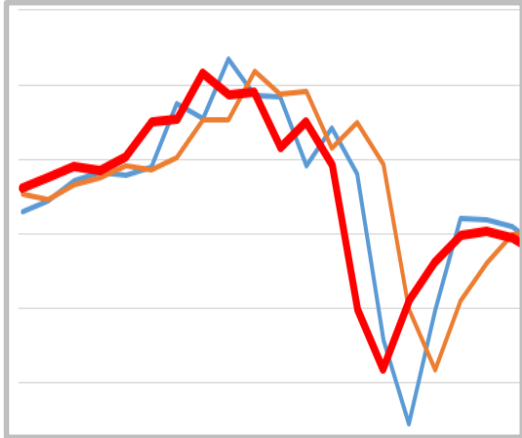


Electricity Market Interaction

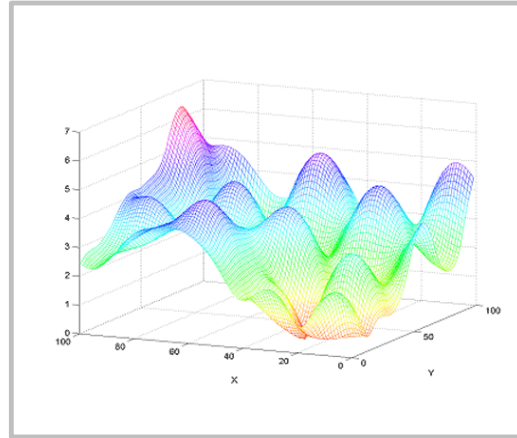


Cell Balancing

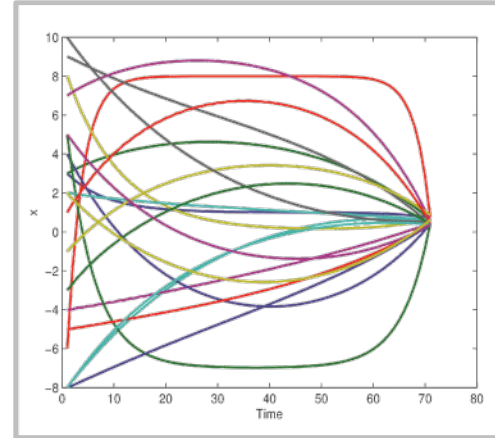
Technical details



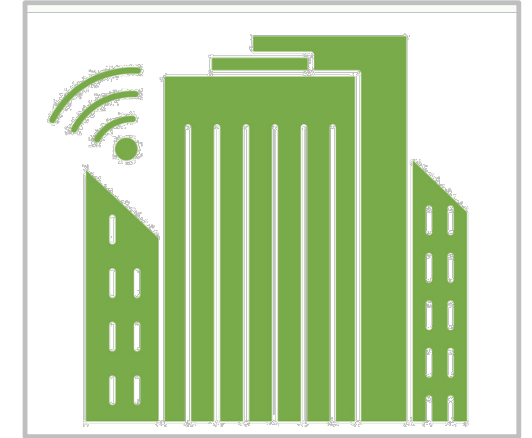
FORECASTING (AI)



**DAY-AHEAD
SCHEDULING &
OPTIMIZATION**



**REAL TIME TRACKING
& OPTIMIZATION**



**WIRELESS
COMMUNICATION OF
CONTROL SIGNALS**

Demonstrated technology



3GDH in Rottne, SE



4GDH in Heerlen, NL



3GDH in Eindhoven, NL

Proven benefits in numbers



Reduction in peak heat demand
17.3%



Reduction in CO₂ emissions
11.2 KTonnes/year



Increase in capacity
42.1% enabling **48k** additional homes



Reduction in peak heat demand
12.7%



Reduction in CO₂ emissions
10.8 KTonnes/year



Reduction in power procurement costs
6%

STORM implementation steps

- Step 0: Feasibility assessment
- Step 1: Potential savings calculation (contract research)
- Based on commonly available input data
 - Hourly grid consumption
 - Hourly outdoor temperature
 - Monthly building energy consumption
- **We calculate potential annual cost and CO₂ emissions savings**

STORM implementation steps

- Step 2: Reference data measurement/ Benchmarking (contract research)
 - Installation of IoT hardware in buildings
 - Measurement of data to characterize building flexibility
 - Training of AI for forecasting algorithms using production data
 - Evaluation of the controller
- Step 3: Operation (licence+support scheme)
 - STORM controller fully active
 - Evaluation, reporting and support
 - License scheme (optional: support)



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