STORM - Smart Thermal Operational Resource Management

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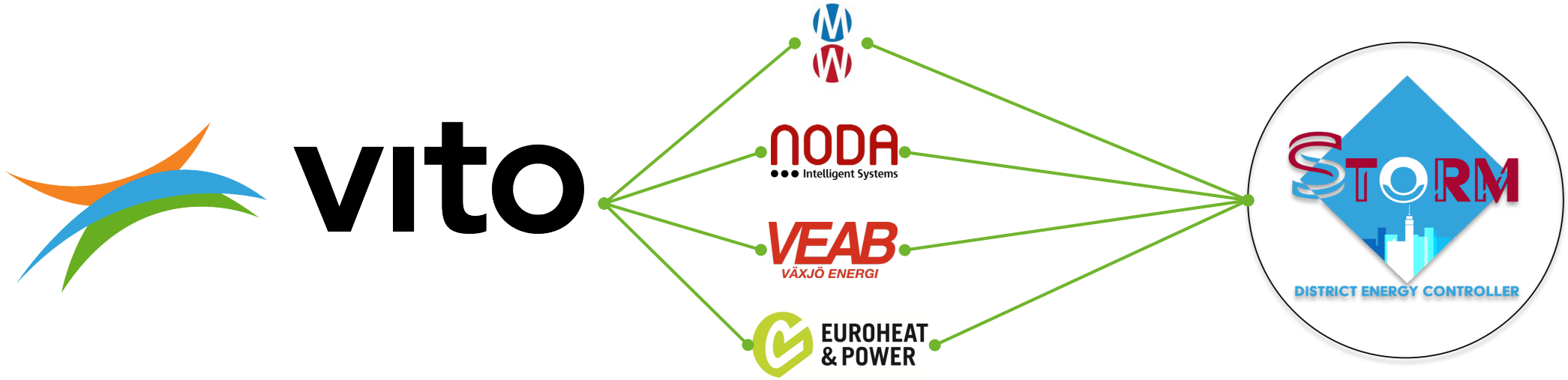
Background information

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

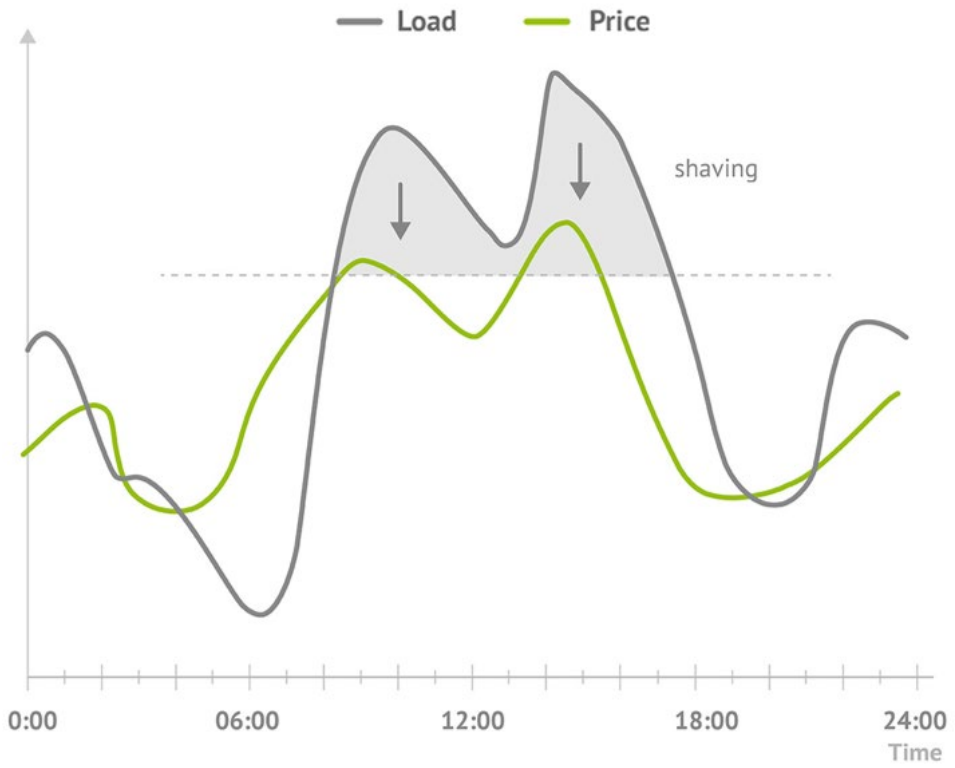


What is STORM?

- 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



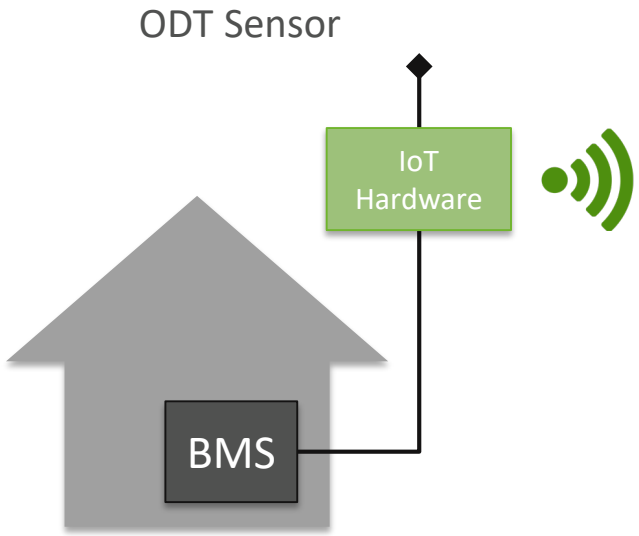
Key idea

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

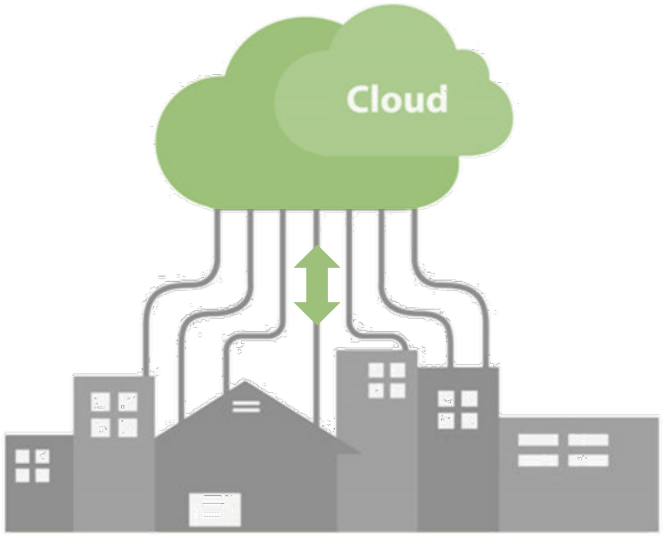
Duration	Potential reduction in peak load (%)
Short-term [1-3h]	40-50%
Medium-term [3-5h]	20-30%
Long-term [>5h]	10-12%

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

On site implementation 1

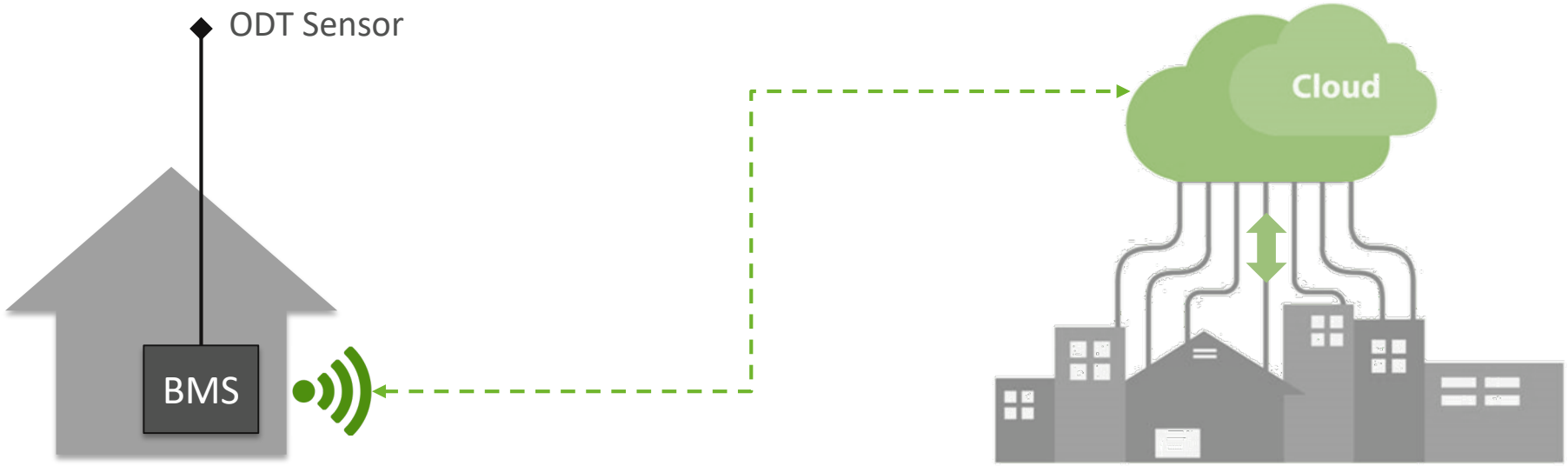


COMPATIBILITY WITH EXISTING BMS'S



CLOUD BASED DATA PROCESSING AND VISUALIZATION PLATFORM

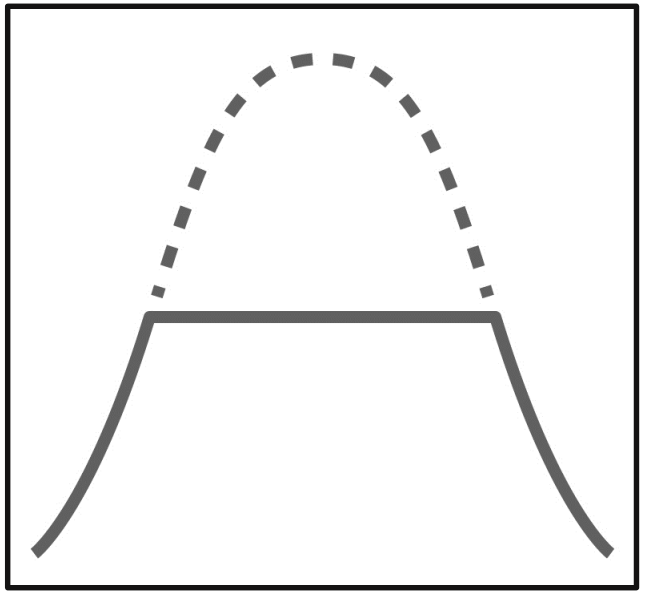
On site implementation 2



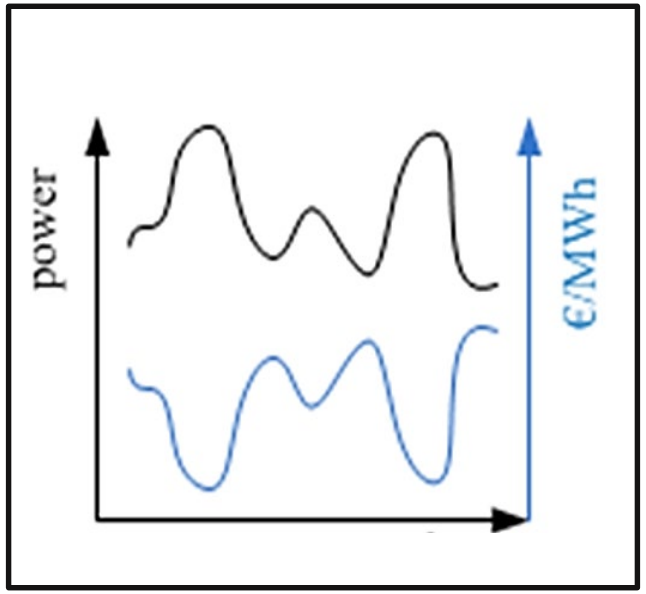
DIRECT BMS CONNECTION WITH THE CLOUD

CLOUD BASED DATA PROCESSING AND VISUALIZATION PLATFORM

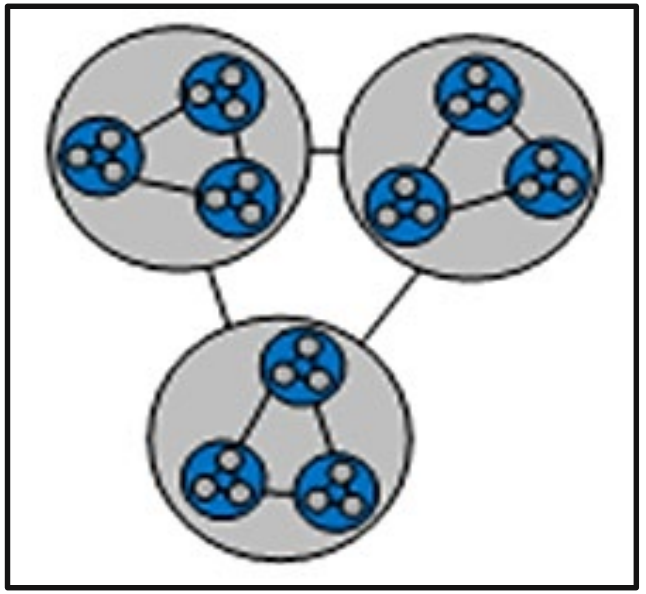
Control strategies



Peak shaving

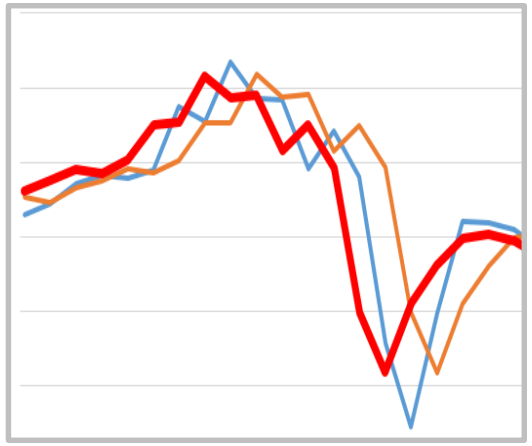


Electricity Market Interaction

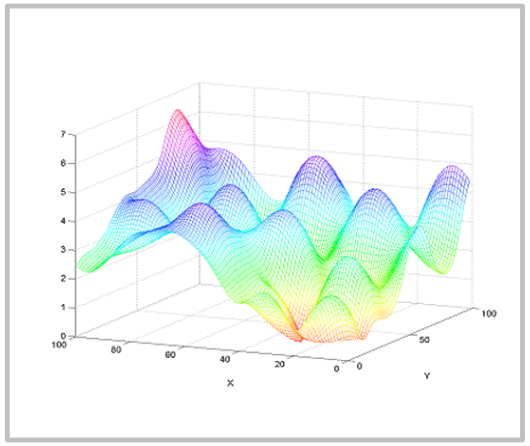


Cell Balancing

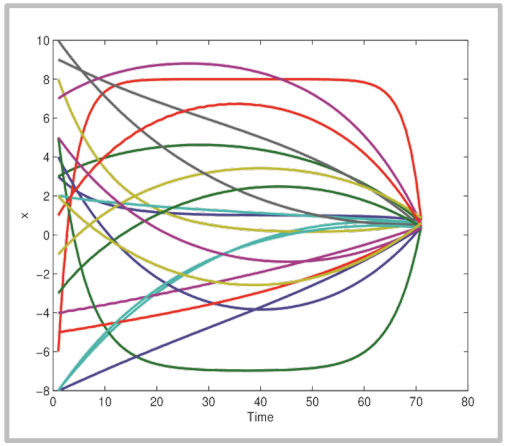
Technical details



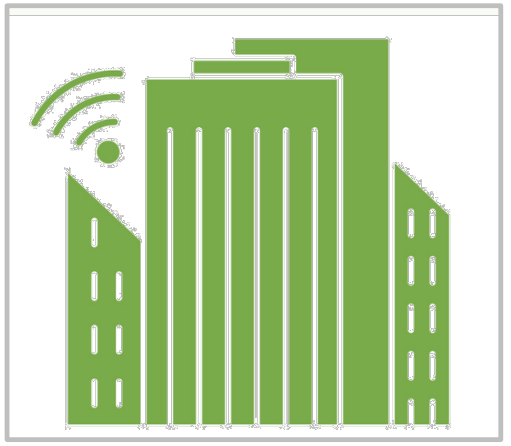
FORECASTING (AI)



DAY-AHEAD SCHEDULING & OPTIMIZATION



REAL TIME TRACKING & OPTIMIZATION



WIRELESS COMMUNICTION 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 CO_2 emissions
11.2 KTonnes/year

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

Reduction in peak heat demand
12.7%

Reduction in CO_2 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 CO_2 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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