THERMAL INERTIA OF BUILDINGS TO PROVIDE FLEXIBILITY FOR GRID MANAGEMENT PURPOSES IN MALMÖ

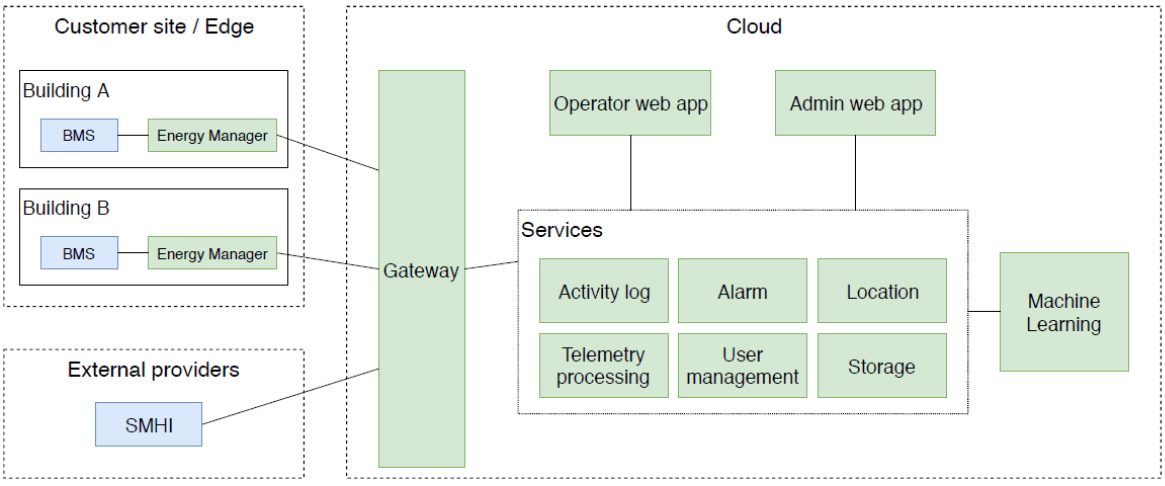
In the mornings and evenings, the heat demand is higher than at other times of the day, resulting in peak loads in the district heating network. At the same time, the room or building temperature often increases due to social behaviour. A peak in the district heating networks means higher costs and a larger impact on the environment. Avoiding to starting extra production due to consumption peaks is always sought from an environmental and cost perspective.

One of the Swedish demonstrators, located in Malmö, evaluates and tests operation of distributed Demand Side Response (DSR) using the building´s envelope thermal inertia (the inbound heat in the house) and the district heating/cooling network´s thermal inertia (the possibility to control the amount of energy in the network). These sources of flexibility aim at optimizing production and distribution. The idea is to shift loads in time, without impacting the comfort and without impacting the overall energy consumption.

The solution is comprised of three layers of functionality, which continuously communicates and operates together:

- Enrolled buildings are connected to a **central cloud platform - ectocloud™**- from which the system is controlled through generating steering signals.
- These signals are communicated to a **local computer - Energy manager -** installed in the recruited buildings.
- The energy manager serves as a local gateway, translating the signals generated in the cloud in order to communicate with the **monitoring system of the building - BMS -** via Modbus. The BMS carries out the steering of the heating system and coordinates and monitors other functionalities such as sensors, actuators ventilation, fire alarm and security system.

The overall solution is referred to as CESO (Customer Energy and System Optimization).



Overview of the CESO solution enabling power control functionality

Thanks to the power control functionality offered by CESO, the district heating DSOs can manually reduce or increase the thermal power demand of connected heating systems. The DSO accesses the system through the operator interface of ectocloud™, where the available aggregated flexibility and the outcome of previous actions are displayed, as shown in the figure below. The system allows the operator to set multiple schedules for desired power control based on available flexibility. The DSO analyses the data and sets the decrease of the thermal power demand before a forecasted consumption peak, for example at 7 AM when everyone takes a shower before work. When the DSO creates a new power control schedule, the power control signals are sent to each Energy Manager, which in turn send offset signals to the connected BMS, reducing (or increasing) the heat demand temporarily. Customer comfort is assured through only allowing temperature changes of +/-0.5 degrees Celsius. Depending on the preference of the DSO, this could allow for e.g. 75 % power reduction for 2 h or 25 % power reduction for 6 h so that the forecasted consumption peak is reduced.

DSO operator interface of the cloud based platform (ectocloudTM)

The green graph is the current heat power demand, and the orange is the outdoor temperature. The DSO can set a schedule using power control to decrease the power in the building (the blue graph) for a number of hours when the demand is high and the temperature is low. In this way the peak is reduced, without any impact in customer comfort.