

# Fortum

## Project 1: Building heating model

### Project description for ESGI144

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## Background

Building connected to a district heating network has Heat Substation as a heat source. Typical Heat Substation is using so called heating curve to define what should be water temperature in the internal heating installation, depending on the current outside temperature. This system is not efficient, because heating curve knows only the actual temperature and doesn't consider changing weather conditions such as changes of outside temperature, wind or precipitation. Very important elements that are not used in the traditional steering are other energy sources in the building such as home appliances or people and their behaviour.

This complexity results in inefficient energy usage and problems with individual settlement of the heat usage. Default settlement model where the cost of heat energy delivered to a building is divided between apartments using their size in m<sup>2</sup>, doesn't reflect real energy usage and doesn't encourage owners to energy efficient behaviours.

## The problem

The goal of this project is to create a thermal model of the building that uses real-time sensor information and user interaction to:

- deliver input information for intelligent steering of the Heat Substation,
- provide near-real-time information about thermal comfort to apartment owners,
- create heat settlement model for apartment owners that adapts to real temperature distribution in the building.

Heat usage in the apartment should be calculated not only based on individual apartment consumption but also its share in the heat distribution in the building (depending on energy that apartment gives or takes from other spaces or from outside)

Default model should not consider the ability to steer thermostats in individual apartments, however, it should be evaluated as priority option. Primary sensor data is temperature but other data type can be considered, e.g. humidity. The model should allow immediate detection and response to deviations from the calculated norm to ensure robustness needed in the settlement process.