

Optimization system for local energy management

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Introduction

Various commercial and prototype “energy box” implementations for consumers’ short-term local energy optimization have appeared in the recent years. Normally they lack the possibility to forecast local PV generation or switch between district heating, solar thermal heating or electric heating. These features were or are being implemented in the system shown here, focused to residential customers.

Communication architecture

Local energy management system makes queries to FMI’s and Fortums servers using the HTTP protocol. Electricity prices for the current day and weather forecasts 36 hours ahead are obtained. Irradiation forecasts must be further processed to obtain production forecasts for PV and solar thermal systems.

Electricity price forecasting was not applied in this case; instead the realized spot-prices were used. The system is run once a day or more often.

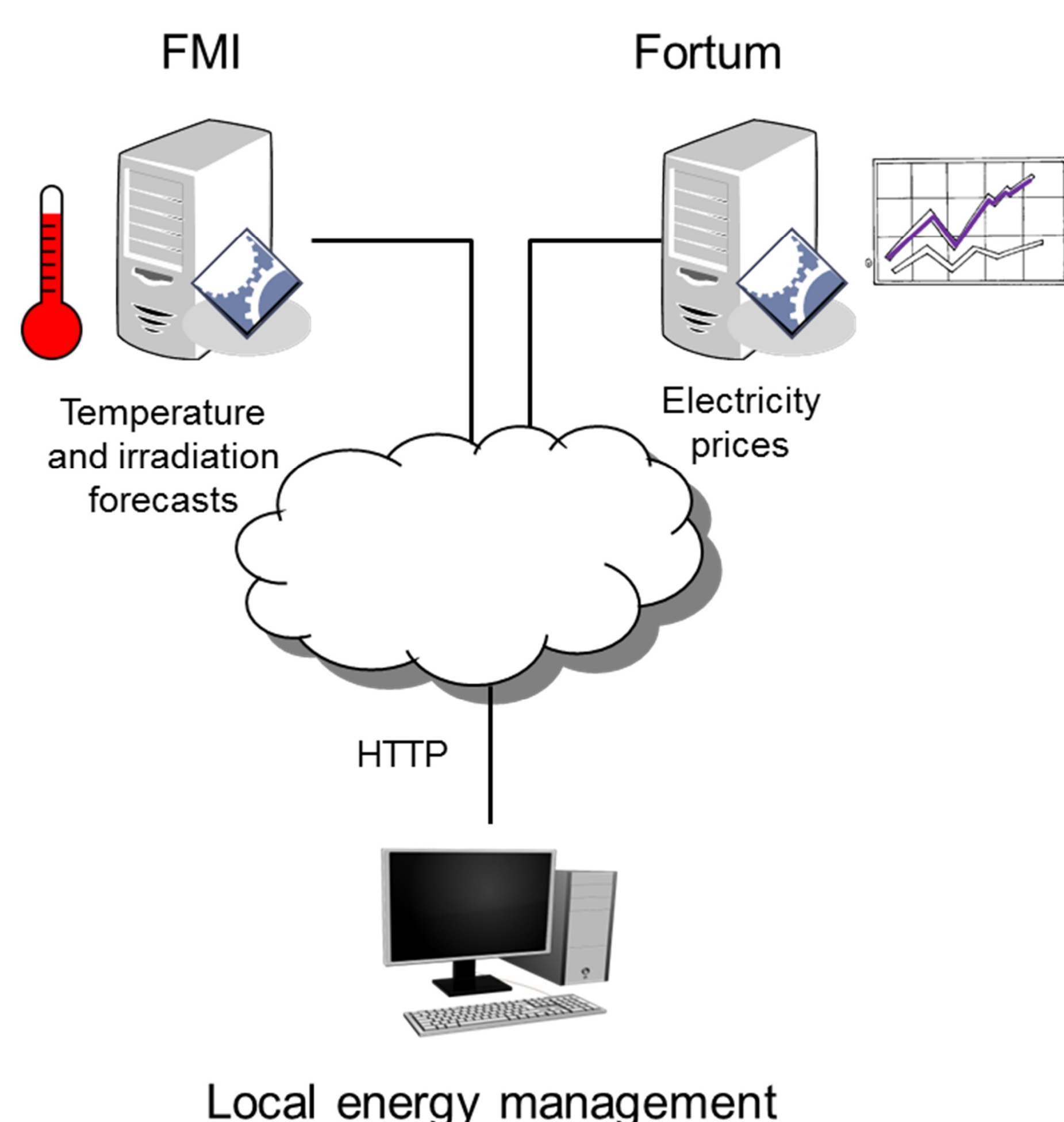


Figure 1: The application queries two types of data via the Internet.

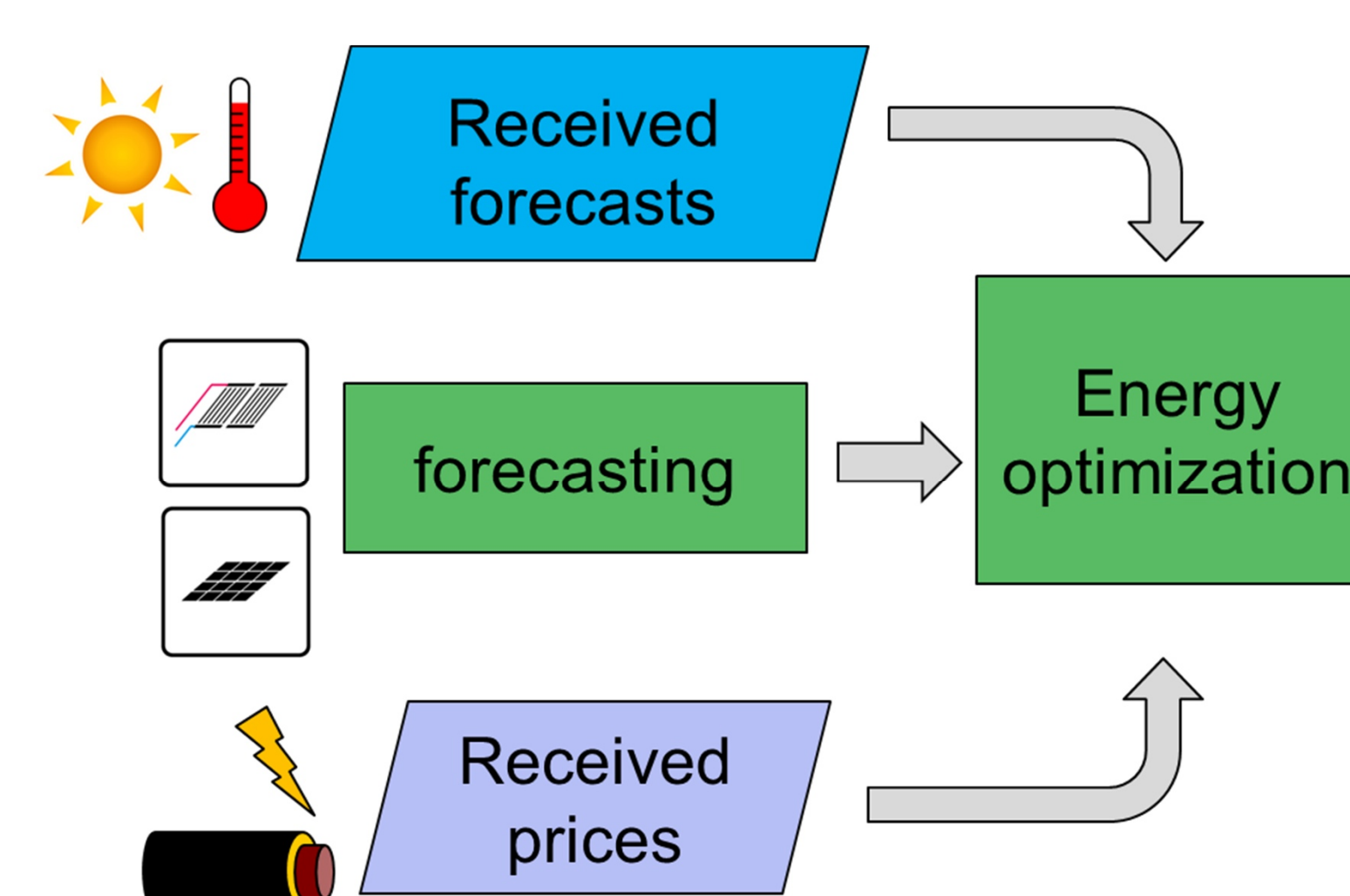


Figure 2: Inputs to the optimization process.

Optimization model

The optimization model makes the decisions how to produce and store heat during the next 24 hours. Different production opportunities such as heat pumps may be defined in the model. Residents’ thermal discomfort is accounted for. The model is at the time not yet fully finished.

Currently the optimization problem has been implemented as an LP problem. The commercial Cplex solver was used to solve it.

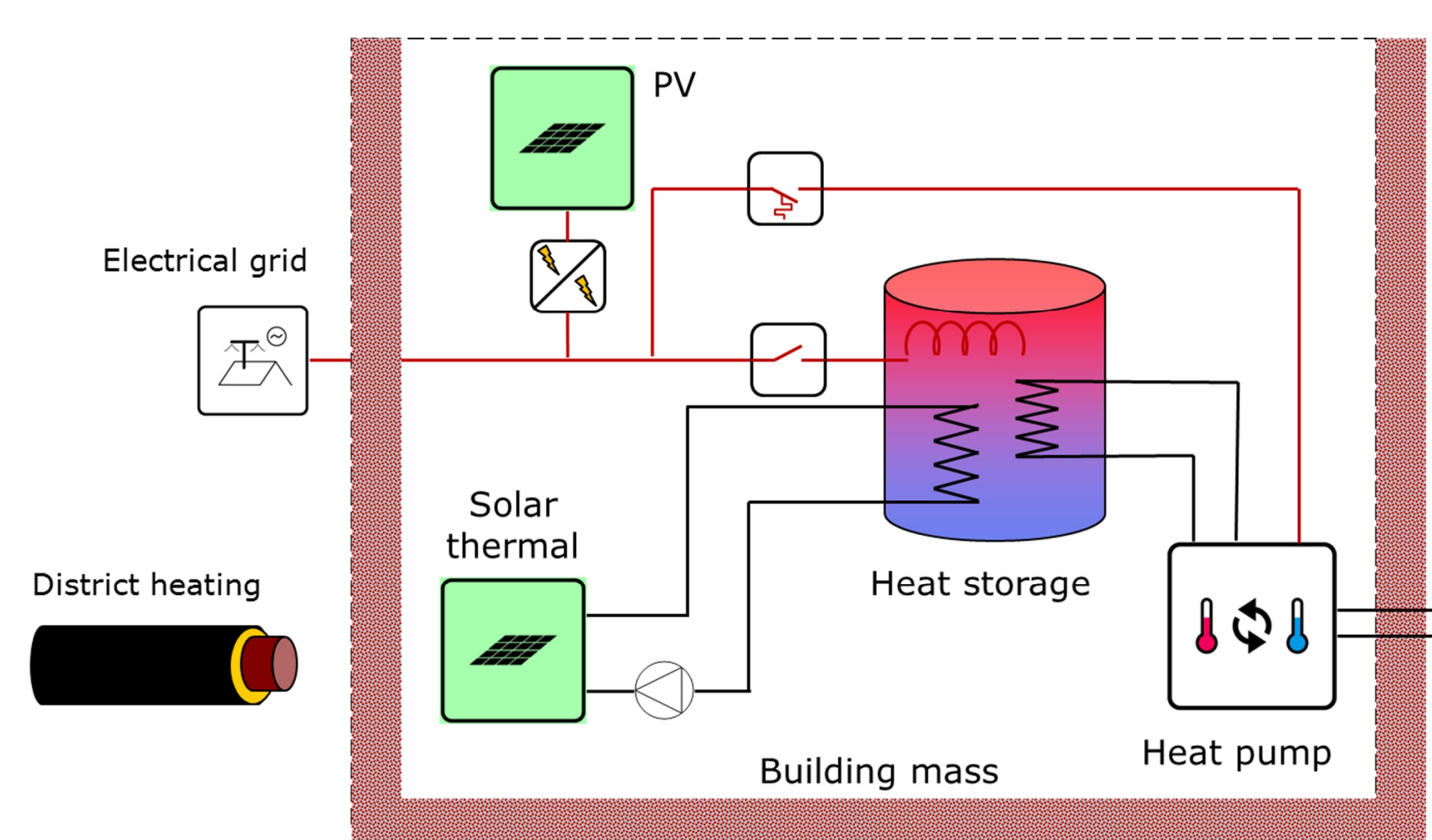


Figure 3: Different heating possibilities to be included in the model.

Conclusion

The system is initially working but many features still need finishing.