KONSTANT Living Lab at Port of Aarhus: Energy flexibility

ABOUT THE LIVING LAB:

The cooling capacity at the Port of Aarhus in Eastern Jutland has been expanded over the past few years, and this increases the pressure on the electricity grid.

The vision for the KONSTANT living lab at the Port of Aarhus is to create a large-scale demonstration of energy flexibility in business and industrial areas through energy synergies between the companies, from silo thinking to joint thinking of the companies' energy supply and consumption.

Besides consumption data from the area, the KONSTANT living lab incorporates load and temperature values from transformer stations.

Facts about the living lab:

- ✔ Type of Living Lab: DSO
- ✔ Power grid supplying an area of the port of Aarhus. 3 10/0,4 kV substations containing Linc devices.
- ✔ Cold store (Lineage): 4000 m²

RESULTS:

- ✔ Danish Technological Institute has established automatic retrieval of energy and cooling data from the Lineage cold store.
- ✔ KONSTANT has installed Linc devices in 3 substations, measurement of current, voltage and temperature.
- ✔ Temperature + Energy measurements established.
- ✔ High quality realtime measurements established.
- ✔ Connection to a common data platform established.
- ✔ Temperature optimization model developed, yet to be tested in (new) LL.

PERSPECTIVES FOR THE FUTURE:

- ✔ IoT sensor network creating a finer temperature mapping inside the cold store. New sensor will be established in April 2023.
- ✔ A unified data model for handling transformer data, cooling data and goods data will be useful for data handling/ processing/usability in coming projects.

KONSTANT AARHUS HAVN PORT OF AARHUS DTU TEKNOLOGISK INSTITUT centerdenmark intelligent energy

Publications related to the living lab can be found at www.flexibleenergydenmark.com/further-information/knowledge-bank/publications/

TECHNICAL SETUP:

Danish Technological Institute: A 4G energy meter retrieves energy data from Lineage compressor room and the cooling data from the AC systems is automatically retrieved through an API. Both sources are aggregated at DTI and forwarded to Center Denmark through MQTT.

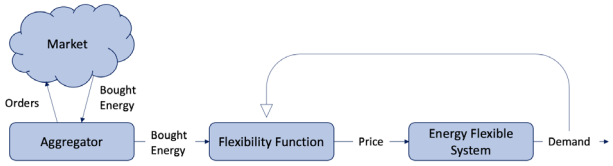
Center Denmark has a data ingestion pipeline set up to subscribe to these MQTT topics and save them in the filebased FED Datalake.

In collaboration with external project partner (Linc), KONSTANT has established online/real-time measurements for the transformers connecting to Lineage cooling facility by using a MQTT broker.

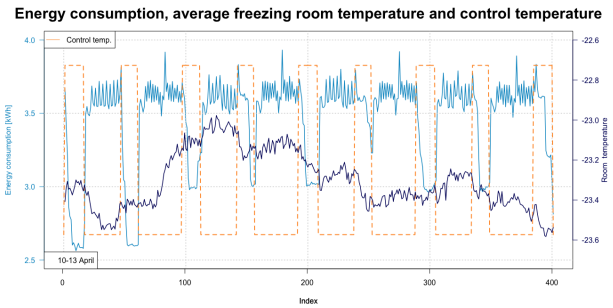
Center Denmark has set up a persistent deduplication data pipeline to save to the filebased FED Datalake.

MODELS:

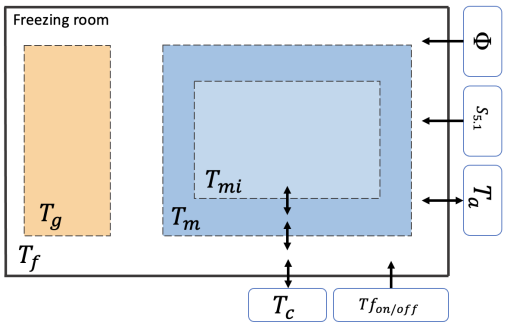
Methods for bidding the flexibility into the market using the Flexibility Function:



Activated flexibility for some days in April 2022:



The final data-driven digital twin model for optimization and control:



FED is a Danish digitization project, funded by Innovation Fund Denmark, aimed at turning Danish power consumption flexible to enable utilization of excess power from wind turbines and solar cells.

The project brings together Denmark's foremost researchers, organizations, supply companies, software companies and a number of living labs that provide data for the project.

FED FLEXIBLE ENERGY DENMARK

Innovation Fund Denmark