A European urban transition project towards more sustainable cities through innovative solutions, in the fields of mobility, energy and digitality.

Smart City

Global Project

Coordination: CARTIF
European grant: 18M €
30 partners, 6 countries

Period: Dec. 2016 - Nov. 2021
Demonstrators:
Hamburg, Helsinki, Nantes

@mysmartlife_EU
https://mysmartlife.eu/

Helsinki Demonstrator Site

Coordination:
The City of Helsinki
European grant: 5,6M €
7 partners

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ACTION OVERVIEW

Helsinki

Data and Demand Response

This action was implemented by VTT Oy. A full report (D 4.22) is available on https://mysmartlife.eu/publications-media/public-deliverables/

► OBJECTIVES

› To provide insights on the electricity consumption habits of Kalasatama residents
› To analyse the residential demand response potential on city block level
› To scale-up the potential on the wider Kalasatama area

► IMPLEMENTATION

CHALLENGE / CONTEXT

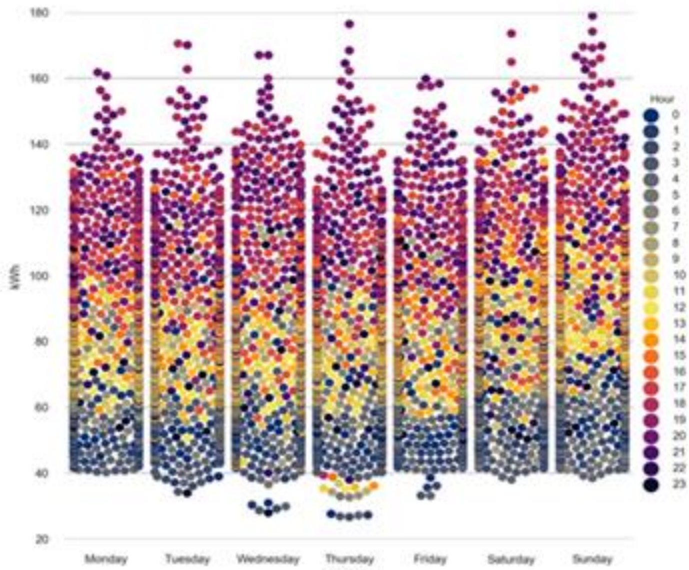
In the new Kalasatama district, Smart Meters have been deployed in all the residential buildings. The dwellings also contain the latest distribution automation technologies, including a view on real-time consumption patterns. With the help of the data provided by them, the both demand and data response strategy will be developed to improve the monitoring of system's performance and support decision-making.

The practical results include improved customer profiling, fault detection, and service reliability, among others. In addition, big data approaches will be developed. It includes combining smart grid data with other data from the project. Buildings and the traffic-related data will be integrated with the aggregated demand response data. This produces different sources of flexibility, ranging from individual customers to larger units. Finally, the viability of an aggregator business case will be analyzed in the studied area.

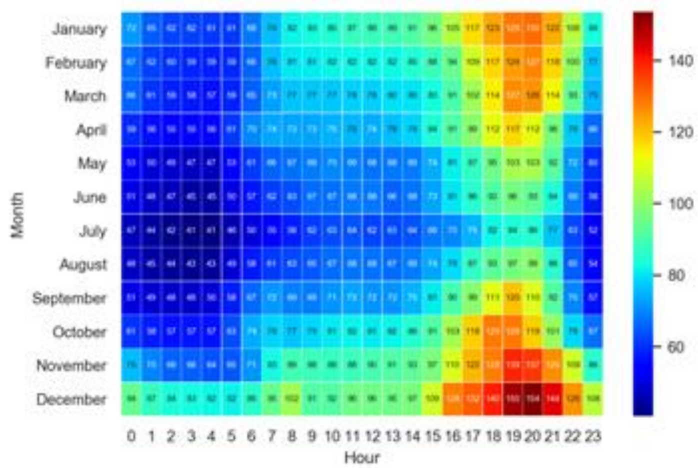
PROGRESS

In order to study the demand response potential, typical residential electrical loads, commonly found in modern apartments, were analyzed. The loads were then categorized into different types based on their flexibility and feasibility for being utilized as a source of demand response. Technical capabilities and characteristics of typical apartments and apartment buildings in Kalasatama were examined to form a basis for the analysis.

A full year's hourly residential electricity consumption sum data of a city block in Kalasatama was analyzed. The analysis provided insights about the electricity consumption habits of Kalasatama residents on a city block level. This analysis was used to illustrate demand peaks and variations in hourly electricity consumption through weekdays, months and seasons.



Visualization of all the year's hours divided into their respective weekdays - the color illustrates the time of the day. The vertical axis shows the hours' respective electricity consumption, and the range of values on the vertical axis indicates how widely the hourly consumption values are distributed on a given weekday over the year.



Monthly variations of the average hourly electricity consumption over the year

LESSONS LEARNT

Residential electricity consumption is not considered the most practical source for demand response because individual electrical loads are low and consumption is relatively inflexible. However, it could be beneficial to decrease some of the demand peaks that typically occur during the fairly fixed and predictable high-demand evening hours in order to flatten out the fluctuating consumption.

Engaging residential loads in demand response could also add stability to the power system that needs solutions in order to adapt to the growing share of renewables. Some loads, such as refrigerator-freezers or floor heating, could potentially be aggregated, and when necessary, be remotely controlled by the aggregator without needing the manual action from the residents.

Research has shown that the monetary savings for individual residents participating in demand response are typically low, thus alternative incentives could be considered as well, to engage a meaningful number of residents.

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