FLEXCoop
Project Overview

Sustainable Digital Tools for All Energy Actors Workshop
29.10.2020

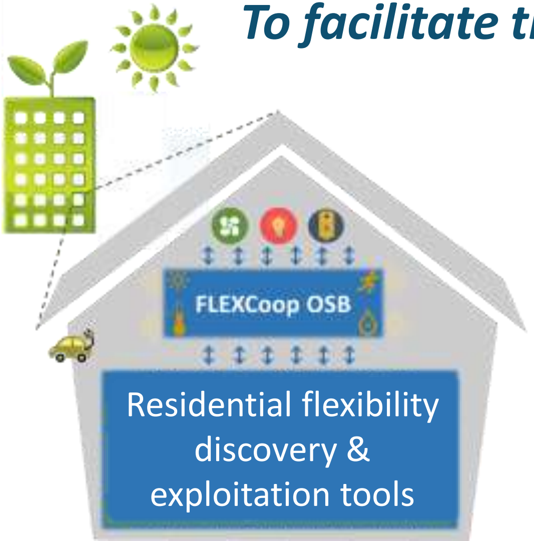
Antonis Papanikolaou, Hypertech

The FLEXCoop project

FLEXCoop

Democratizing energy market access through innovative flexibility-based Demand Response tools and novel business and market models for energy cooperatives

To facilitate the participation of citizens in energy markets



PARTNERS

The FLEXCoop project

THE PROBLEM

Small consumers still excluded from energy markets

- Lack of smart / **real-time metering**
- **Limiting regulations & market codes** in most EU MSs
- **Non-proven** biz models for small consumers

THE NEED

- Make prosumers **aware of their flexibility and its benefits** for the energy system
- **Leverage residential flexibility through aggregation** to facilitate market participation
- **Fair contract**ual relationships with aggregators
- Acceptable & reliable **automated DR** tools

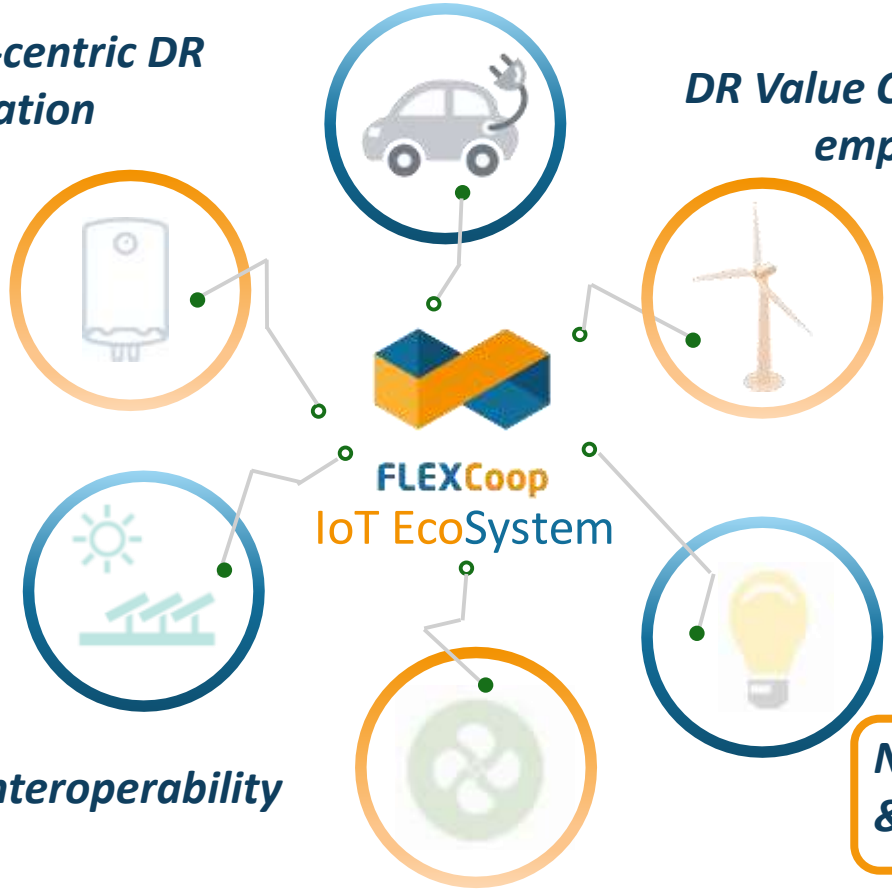
THE **FLEXCoop** SOLUTION

- **Cooperatives** as aggregators / new business model
- **End-to-end automated DR** optimization framework
- Flexibility based on low-level metering / ambience sensing/ **human-centric approach**
- **Dynamic** Virtual Power Plant creation

The FLEXCoop Objectives

Human-centric DR optimisation

DR Value Chain Stakeholder empowerment



Democratizing energy markets

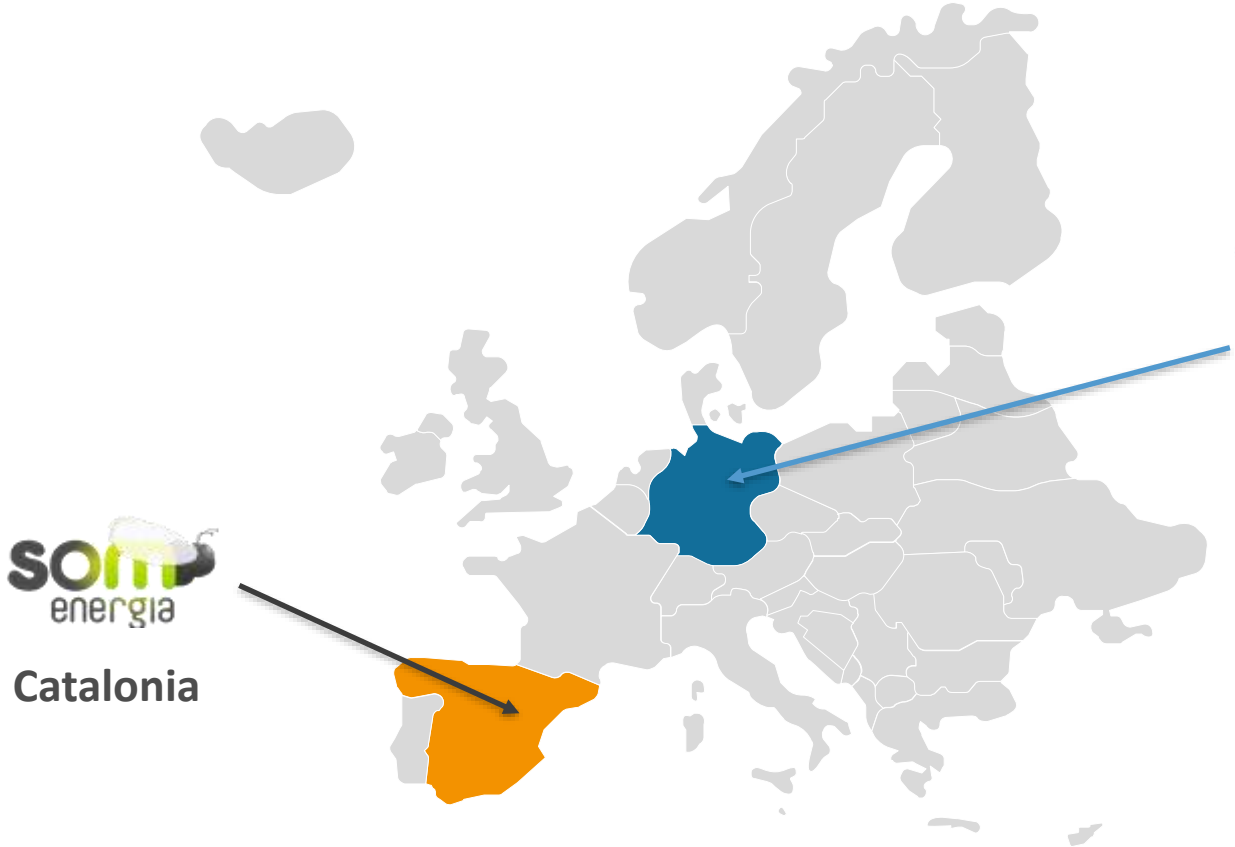
Automated DR framework

End-to-end Interoperability

New business models & fair remuneration

The FLEXCoop Pilot Sites: Active Energy Cooperatives

FLEXCoop



ODE decentraal

ENDONA energie

ESCOZON

Netherlands

SOM energia

Catalonia

The FLEXCoop Business Models

FLEXCoop

Catalonia, ES

Role: Cooperative as a retailer

Target biz model: ESCO and trader

- ✓ Maximise self-consumption
- ✓ Shift demand to minimize wholesale electricity cost

omie

Netherlands

ODE decentraal

ENDONA energie

ESCOZON

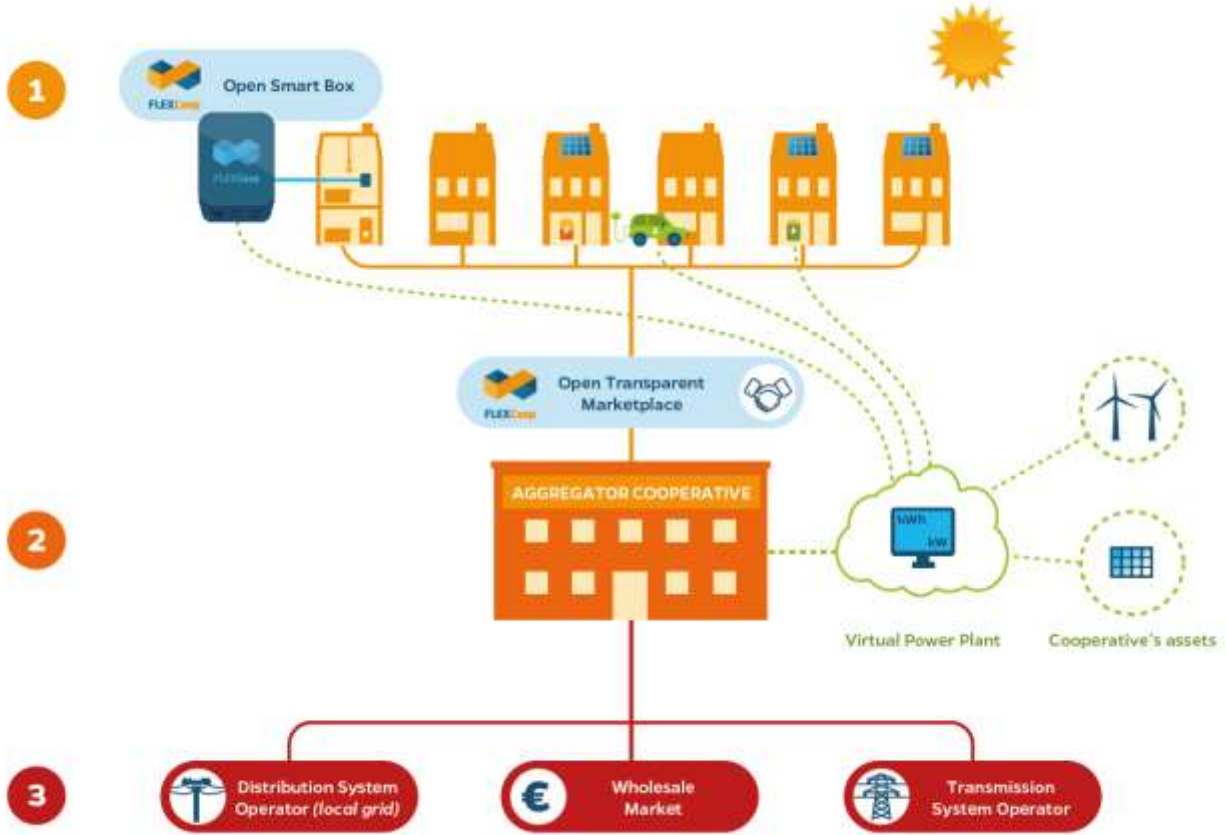
Role: Cooperative as an (independent) aggregator.

Target biz model: Balancing Service Provider to TSO

- ✓ Participate in TenneT's sandbox balancing market (aFRR).

TenneT Taking power further

The FLEXCoop Solution as a whole



The FLEXCoop Human-Centric Demand Response Solution

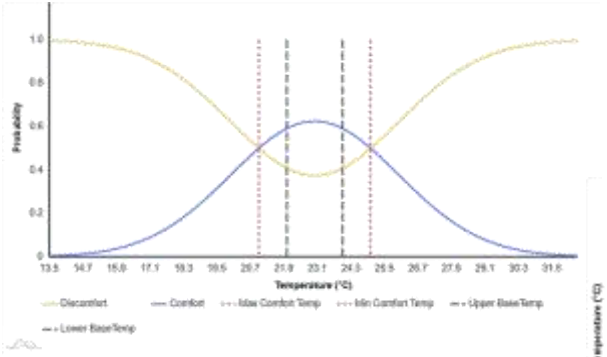
Smart buildings are fundamental for the discovery and exploitation of residential demand flexibility : data-driven asset models and demand forecasting are key for flexibility optimisation

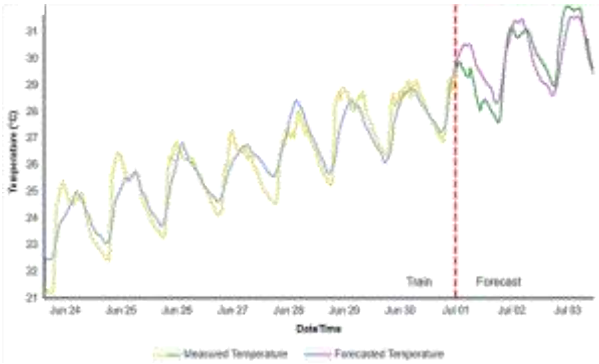
- Time of day
- Operational monitoring of building energy systems (e.g. HVAC, lights, etc.)
- Building Thermal Dynamics
- Ambient Conditions (e.g. temperature, illuminance, etc.)
- User occupancy detection & forecasting

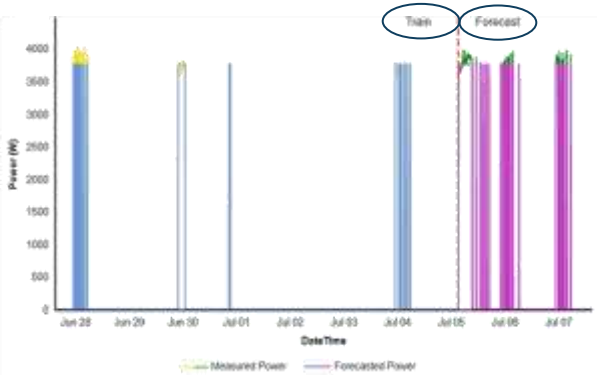
The FLEXCoop
Context-Aware Flexibility Profiling

delivers real-time, data-driven citizen digital twins

Human-centric demand forecasting is prerequisite for flexibility discovery and delivery





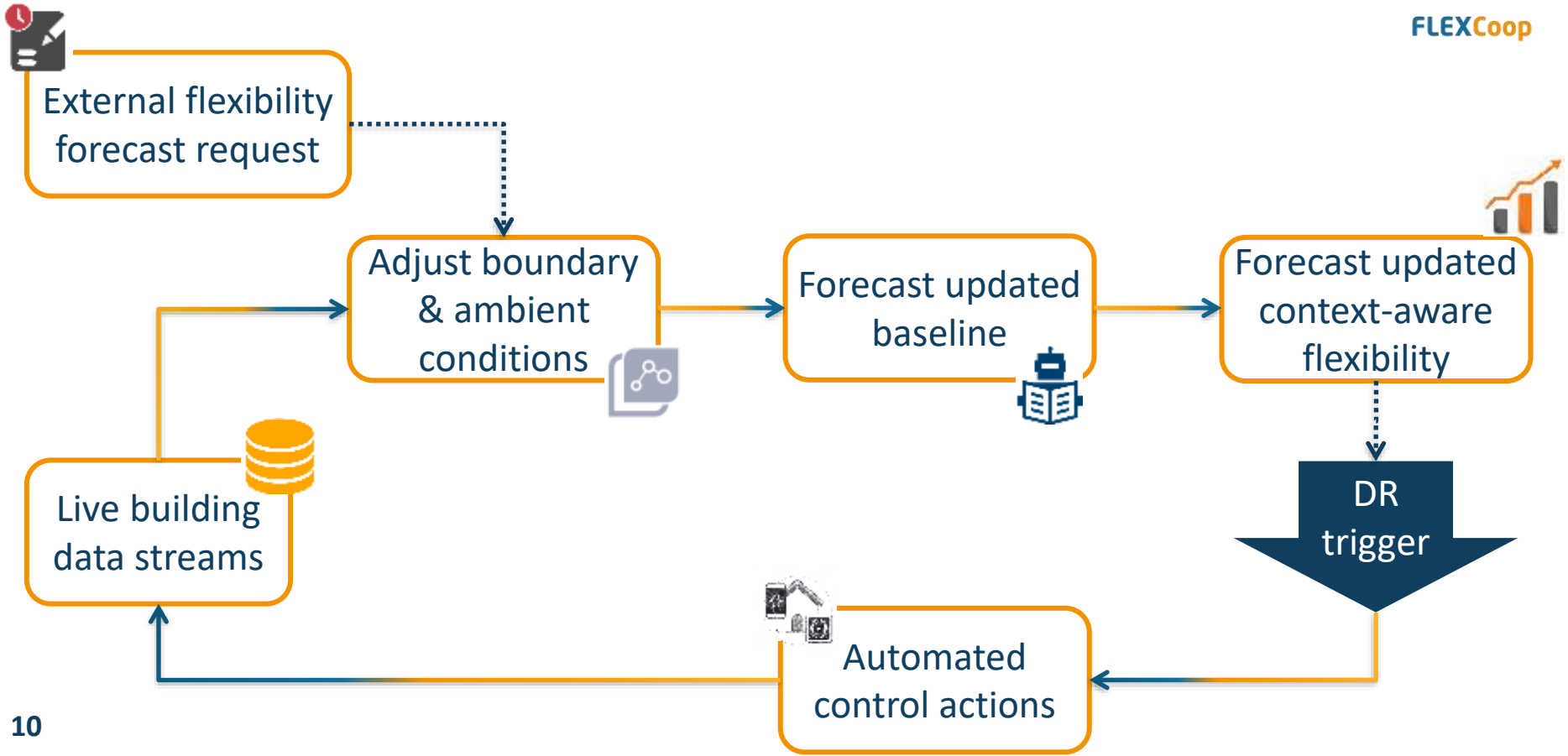


Thermal Comfort

Building thermal dynamics

HVAC demand profile

Continuous flexibility quantification & delivery



The FLEXCoop Solution Demonstration

Requested: 1kWh
Delivered: 0.95kWh

Requested: 1kWh
Delivered: 0.92kWh

Requested: 1kWh
Delivered: 0.98kWh

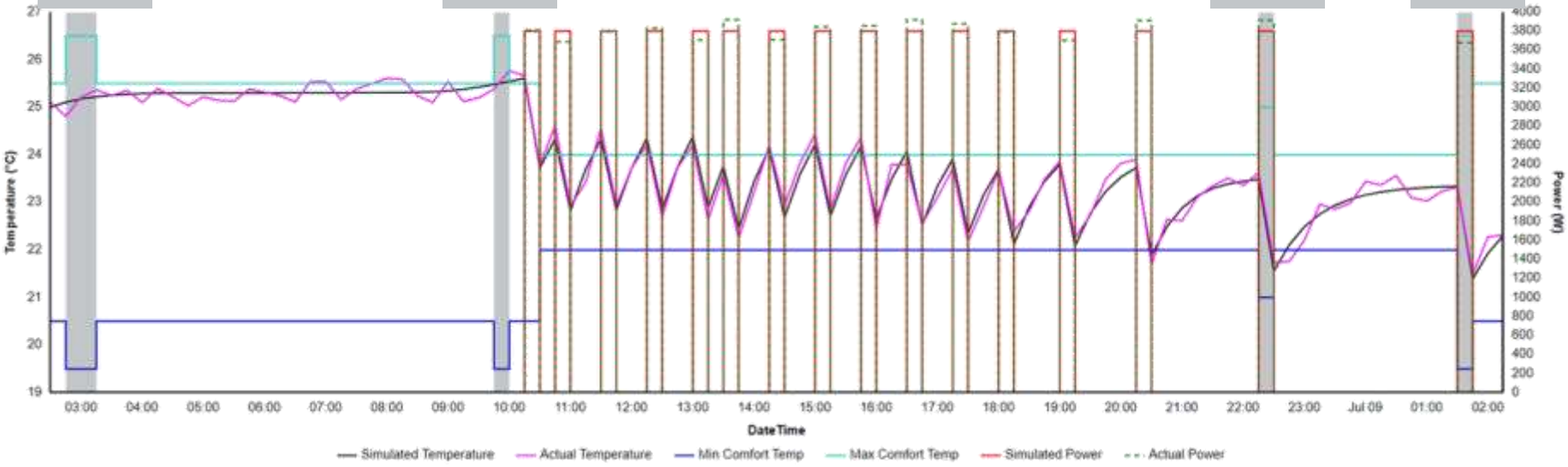
Requested: 1kWh
Delivered: 0.92kWh

DR event

DR event

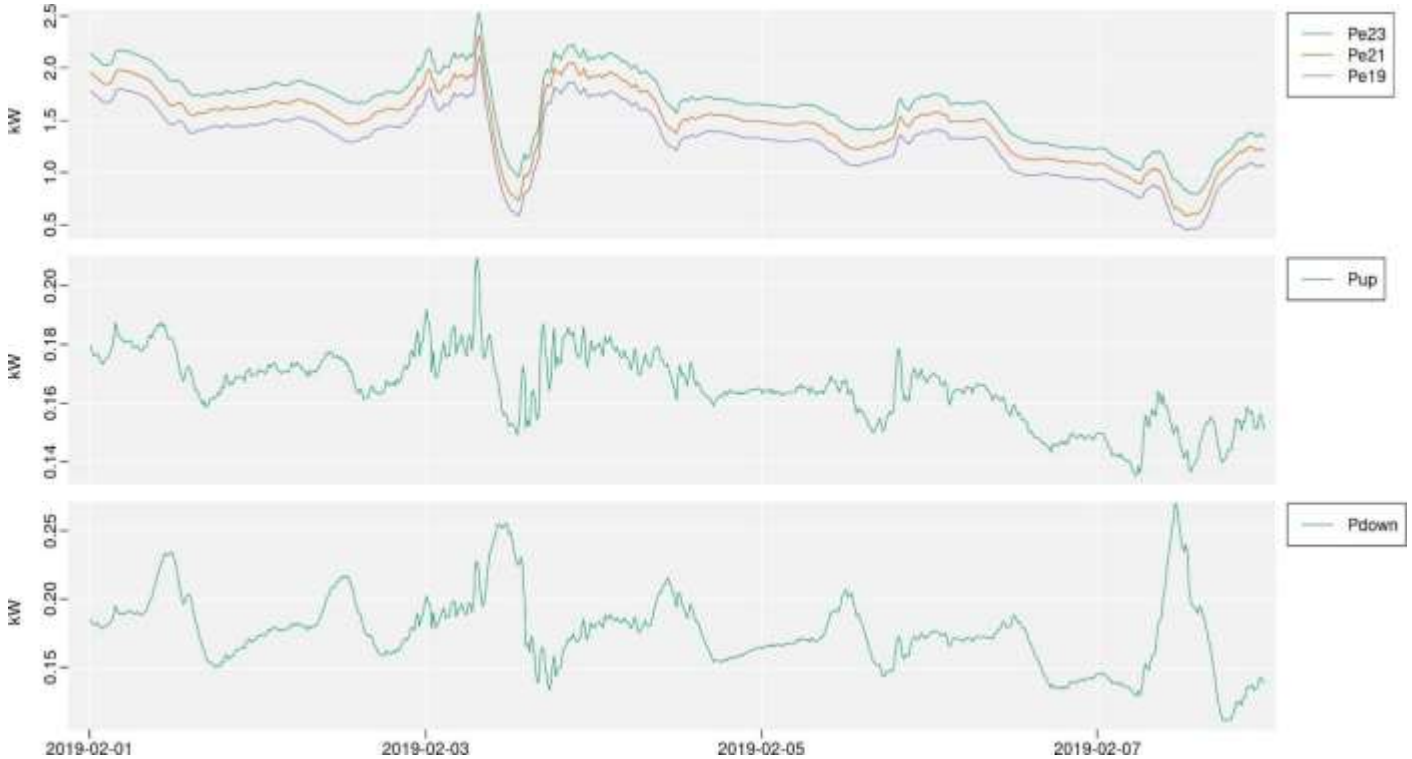
DR event

DR event



During DR delivery, comfort boundaries are relaxed to facilitate regulation up/down.

Weekly regulation up/down potential from a given heat pump in the FLEXCoop pilot sites



The FLEXCoop Solution Impact Potential in aFRR Market

FLEXCoop

ASSUMPTIONS

- 1000 HVACs (heat pumps) in aggregator portfolio (2-4 kW)
- Mean flexibility per HVAC available based on demonstration (~ 8 kWh ⬆, ~ 5kWh ⬇)
- Daily flexibility to bid in aFRR market (~ 6.4 MWh ⬆, ~ 4 MWh ⬇)

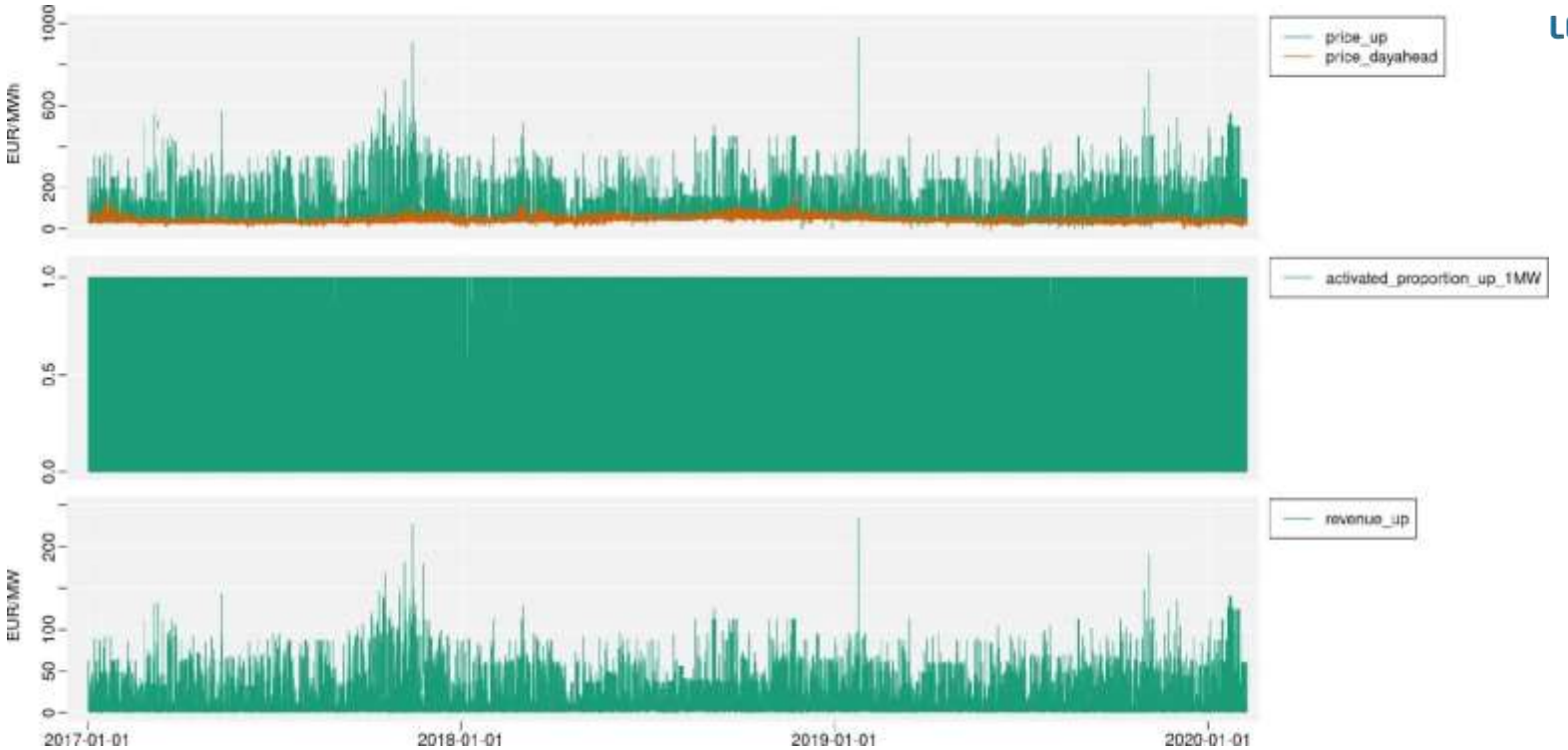
  Leveraging bundle of 800 HVACs, 200 reserved for delivery risk hedging
- 2 DR events ⬆ assumed per day
- 2 DR events ⬇ assumed per day

RESULTS

- Total flexibility requested: 1.6 MWh ⬇
- Total flexibility requested: 1.6 MWh ⬆

- Total Delivered: 1.52 MWh ⬇
- Total Delivered: 1.496 MWh ⬆

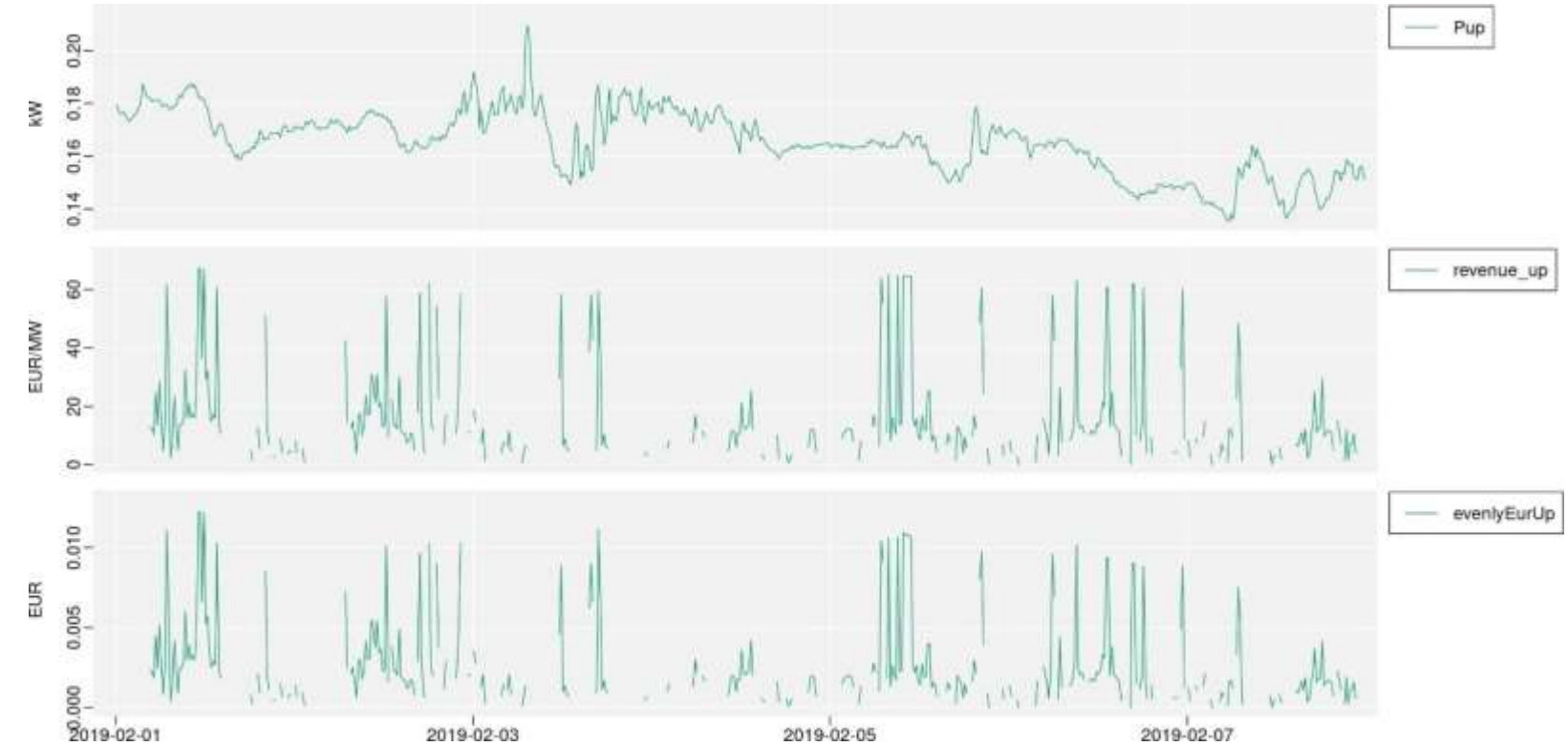
TenneT aFRR market characteristics for regulation up: a good opportunity for aggregated residential demand response



3-year statistics about prices and activations of regulation up offers in the TenneT aFRR market

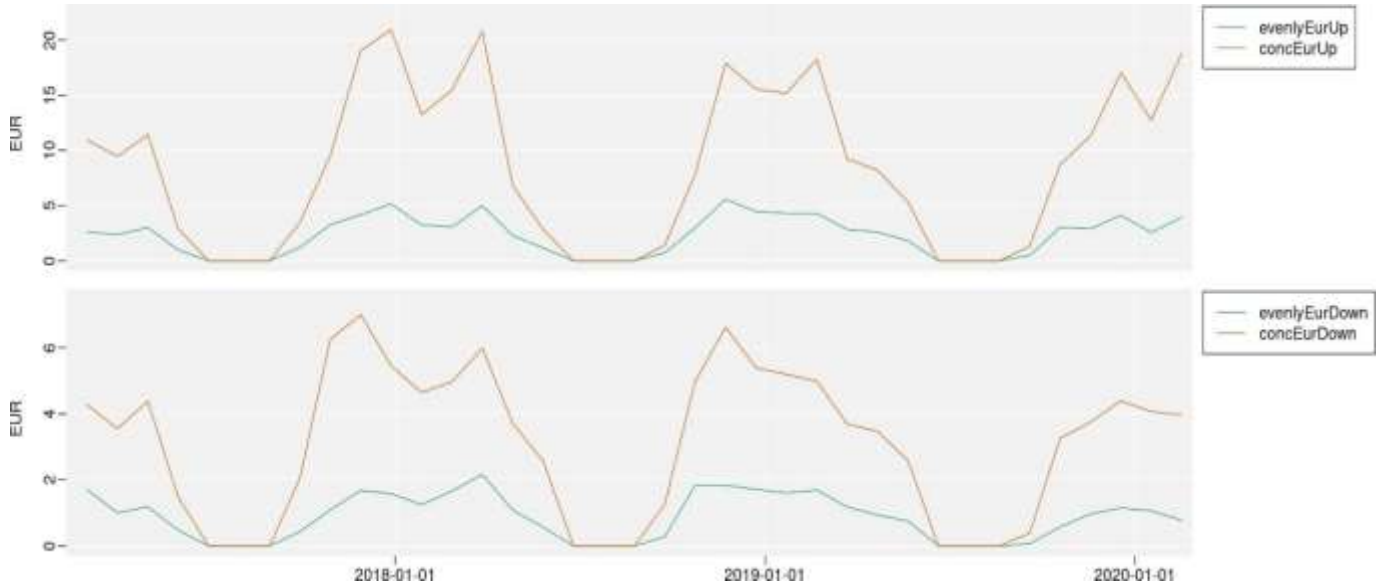
1 MW minimum bid size / market-based remuneration

Revenue projection: a heat-pump of a 1MW bid bundle in TenneT aFRR market



Available regulation up from a FLEXCoop managed heat pump, market prices for delivery of regulation up and final remuneration: an analytical projection during a winter week

Revenues vs. comfort trade-off from the delivery of demand flexibility from residential heat pumps



- Comfort-aware flexibility delivery sacrifices revenues for SLA satisfaction & user acceptance
- Aggressive heat pump shutdown during flex delivery maximises potential revenue by denying service during flexibility delivery

Thank you for your attention..!!!

FLEXCoop

Straße 1
10589 Berlin, Germany
http://www.flexcoop.eu/

"This project has received funding from the *under the European Union's Horizon 2020 research and innovation programme* under grant agreement No 773909".

Project Coordinator
Fraunhofer FOKUS
silke.cuno@fokus.fraunhofer.de

Technical Manager
Hypertech
a.papanikolaou@hypertech.gr