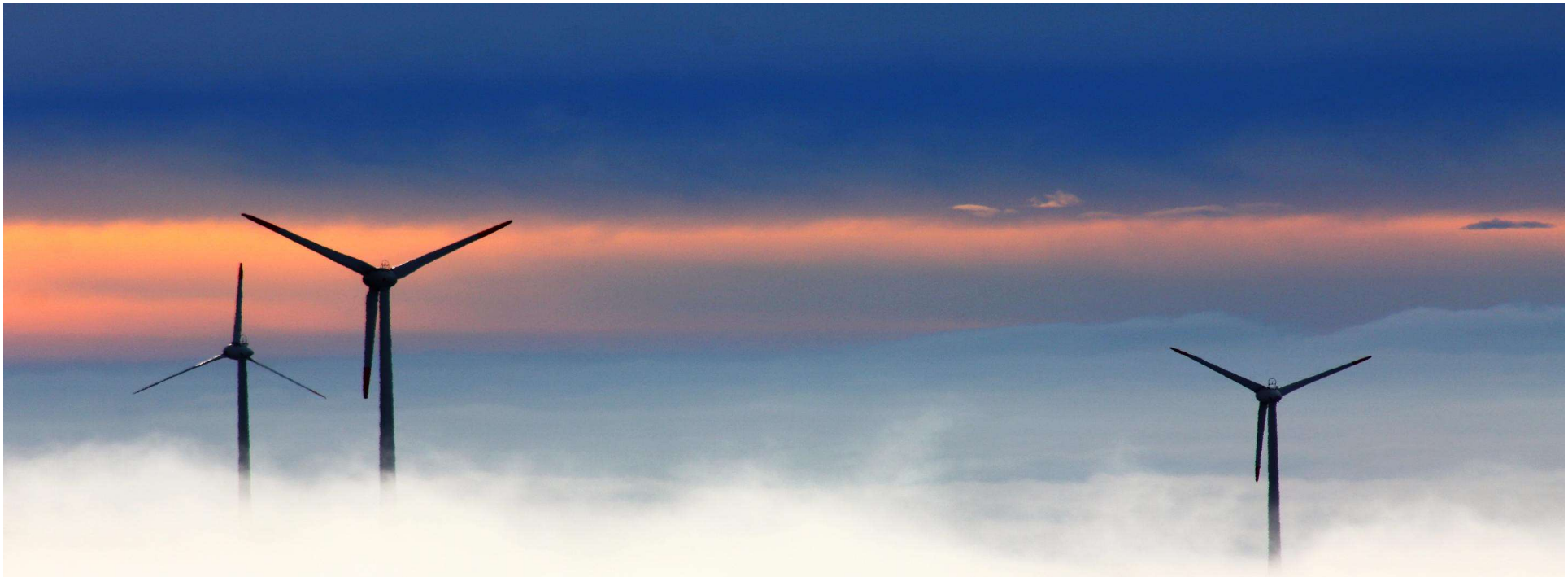


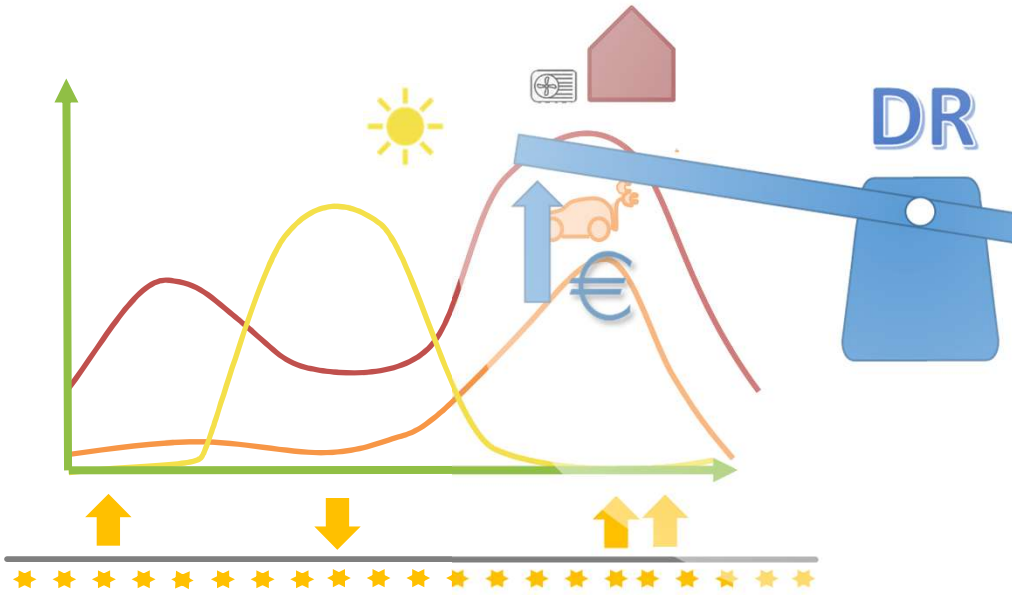
Energy Communities leveraging Flexibility from Active Connected Buildings

Chris Caerts (VITO)

FHP project is funded by European Union under the grant agreement no. 731231.

The challenge

Building: consumption and generation peaks



Medium-sized city

@ 30% penetration rate of HP & EV

Classification	Colour	Probability of Failure
Impossible	Dark green	0 %
Very Unlikely	Green	< 20%
Unlikely	Light Green	< 40%
Possibly	Yellow	< 60%
Likely	Orange	< 80%
Very Likely	Red	≤ 100%

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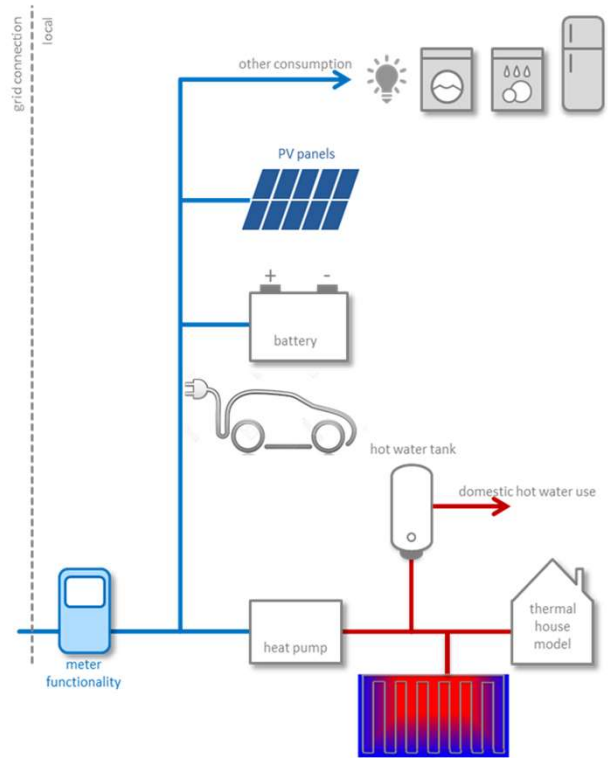
Buildings as clusters of Flexibility



Flexibility: shifting, modulating, buffering energy

Power-to-Heat: building thermal mass, DHW vessel, long-term (seasonal) storage

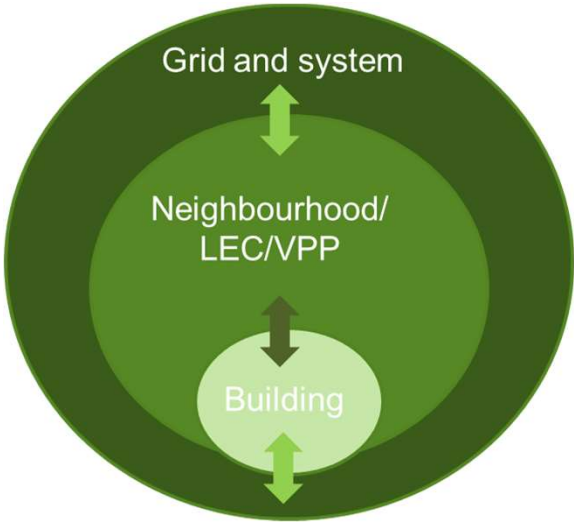
- Energetically large(st) source of flex, and supports decarbonization
- Flexibility provision = 2nd business case (next to heat)
- Challenge: On/Off ➔ finer granularity and more deterministic

Webinar: EHPA market report and statistics outlook 2019 | Thomas Nowak | 24.06.2019

FHP project is funded by European Union under the grant agreement no. 731231.

Need for local coordination: Energy Communities

- Mitigate local grid problems
  - ‘non-frequency ancillary services’
- Energy Community Optimization
  - Energy Exchanges/Trading
  - Aggregated service offering
  - ‘balancing responsibility’ of Energy Communities
- Ensure frequency/balance ancillary services do not cause local grid problems
  - TSO/DSO/**Prosumer** coordination



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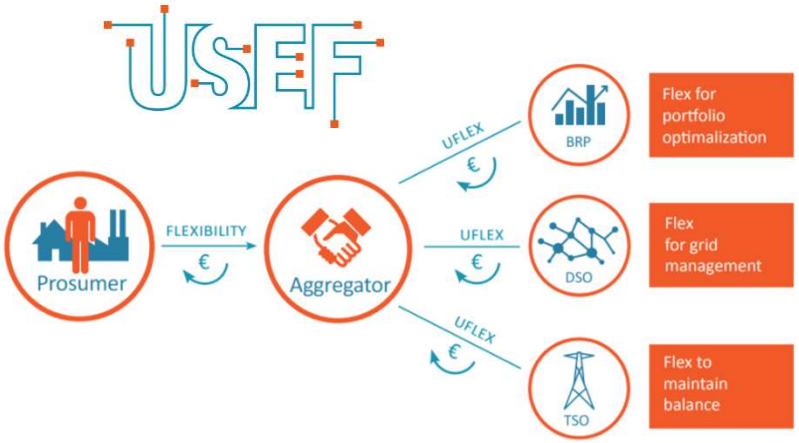
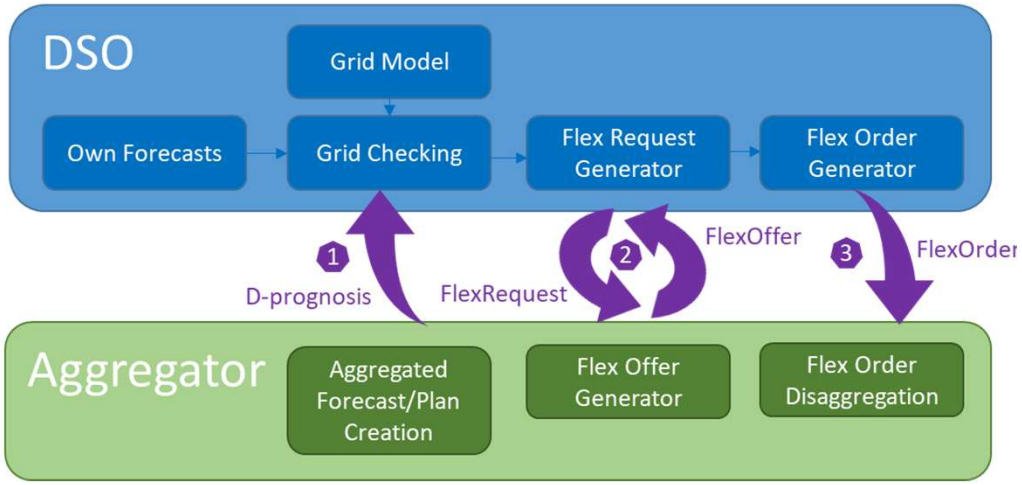
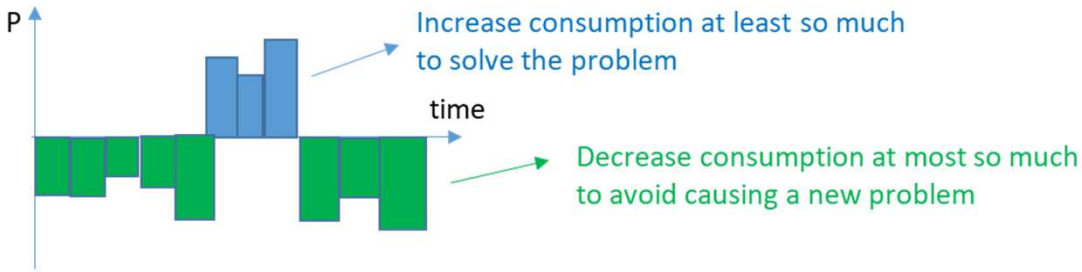
USEF: Universal Smart Energy Framework







1. Forecast (Plan) Prosumption
2. Request/Offer Flex
3. Order Flex

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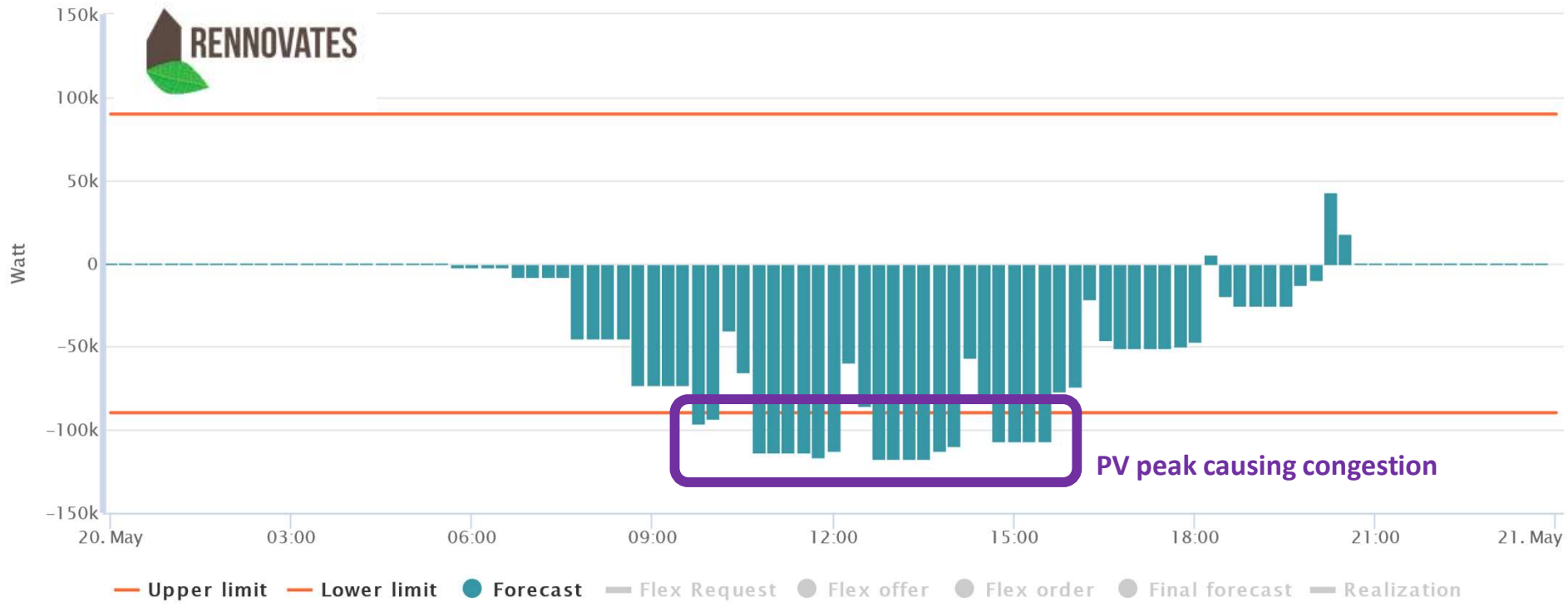
USEF Example: Forecast



Source: EnergyNxt platform (ICT group)

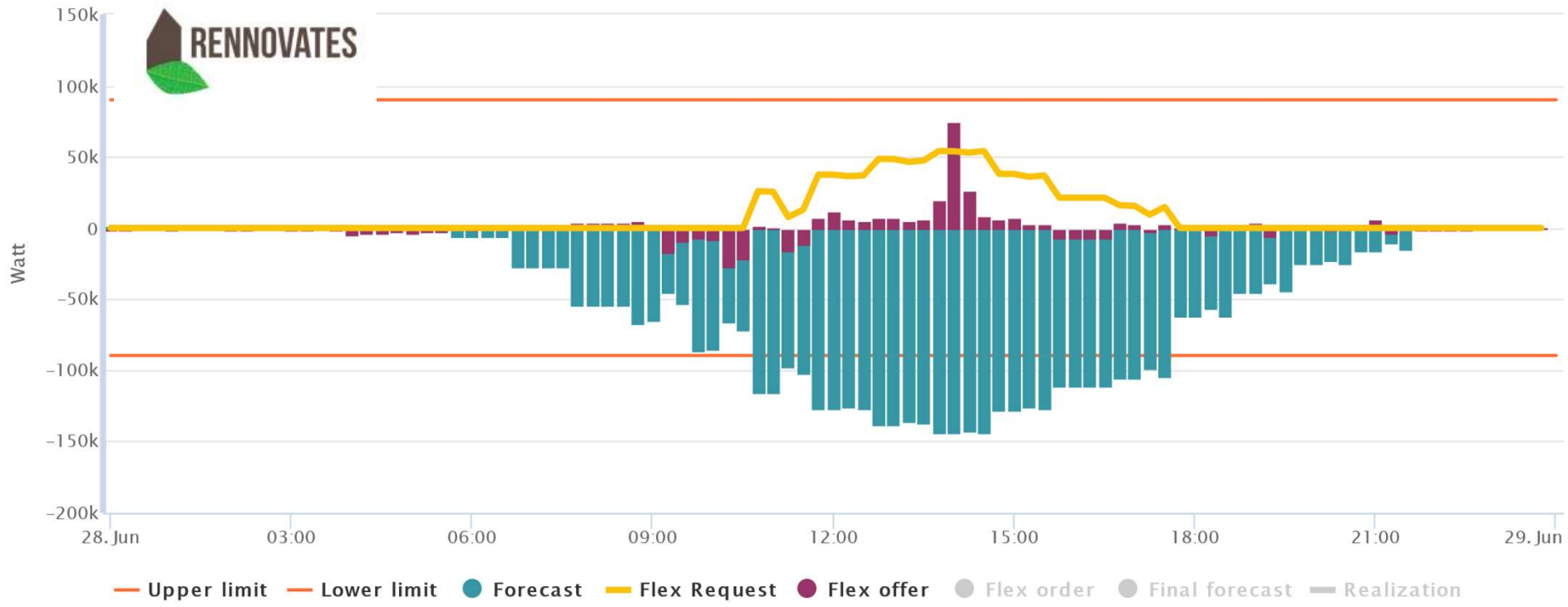
USEF Example: FlexRequest

Source: EnergyNxt platform (ICT group)

USEF Example: Matching Flex Offer

Source: EnergyNxt platform (ICT group)

USEF Example: Insufficient Flex



Source: EnergyNxt platform (ICT group)

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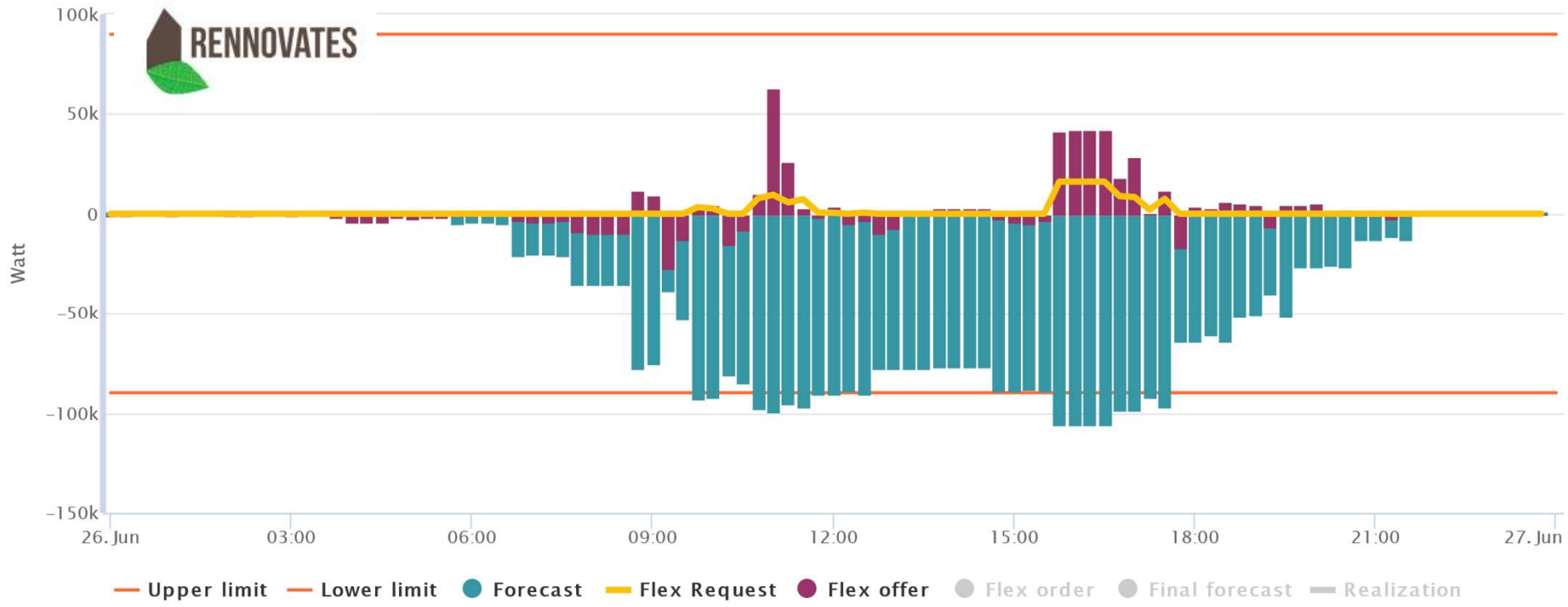
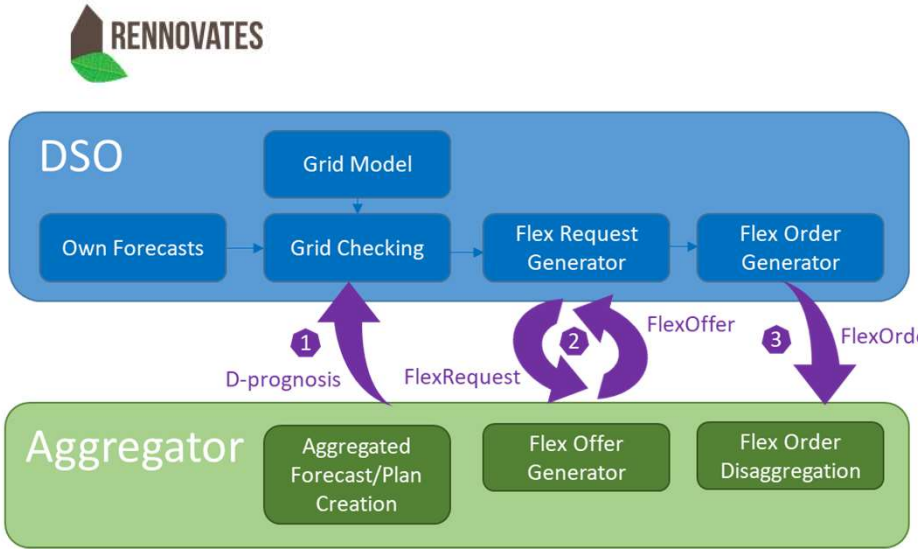
USEF Example: More than needed Flex

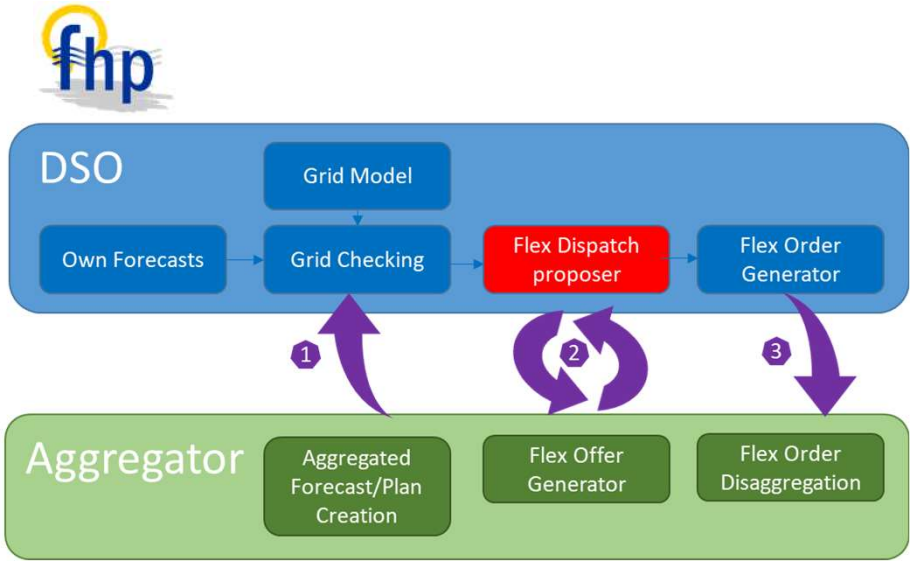


Source: EnergyNxt platform (ICT group)

FHP addition to USEF enabling Optimal Flex Dispatch



1. Forecast (Plan) Prosumption
2. Request/Offer Flex (iterate)
3. Order Flex



1. Forecast (Plan) Prosumption & Flex
2. Propose/Confirm Optimal Flex Dispatch
3. Order Flex Dispatch

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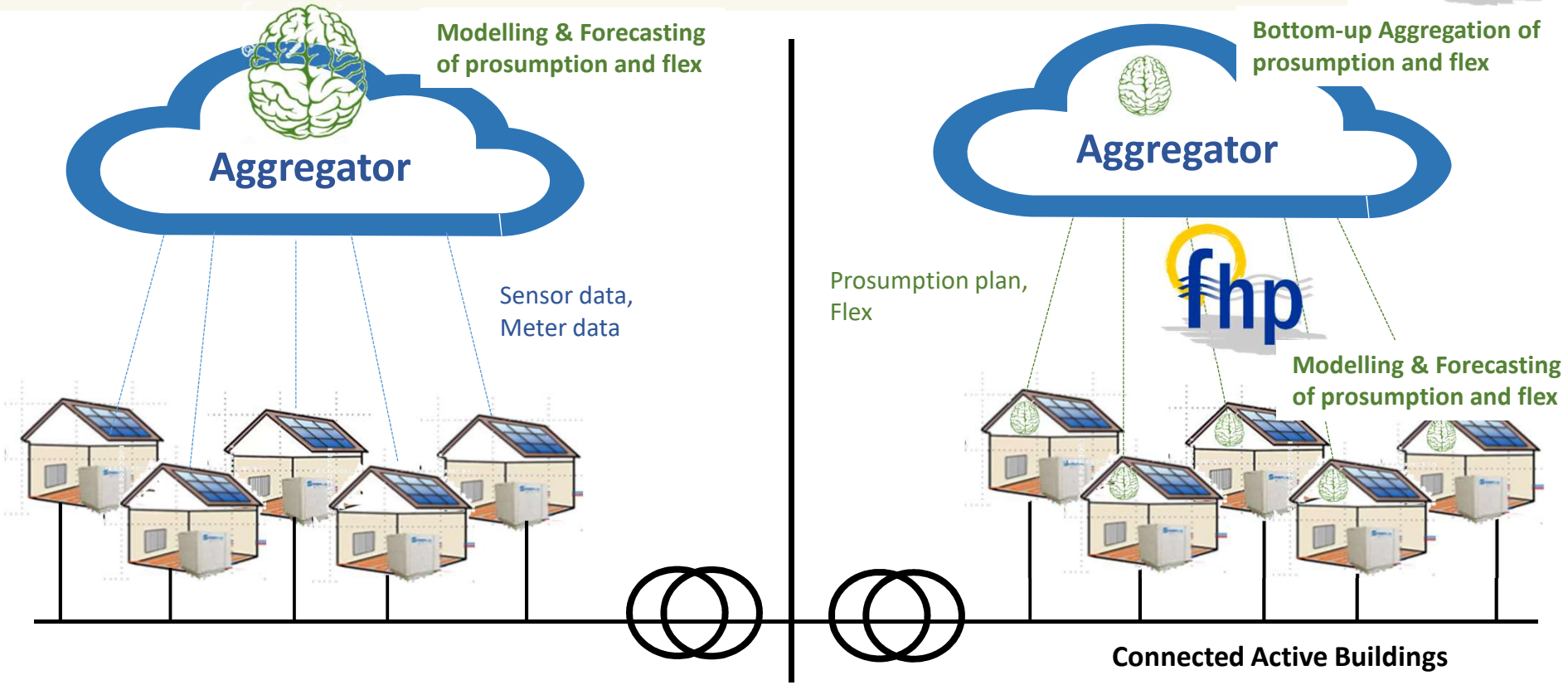
Flex Trading by Active Connected Buildings



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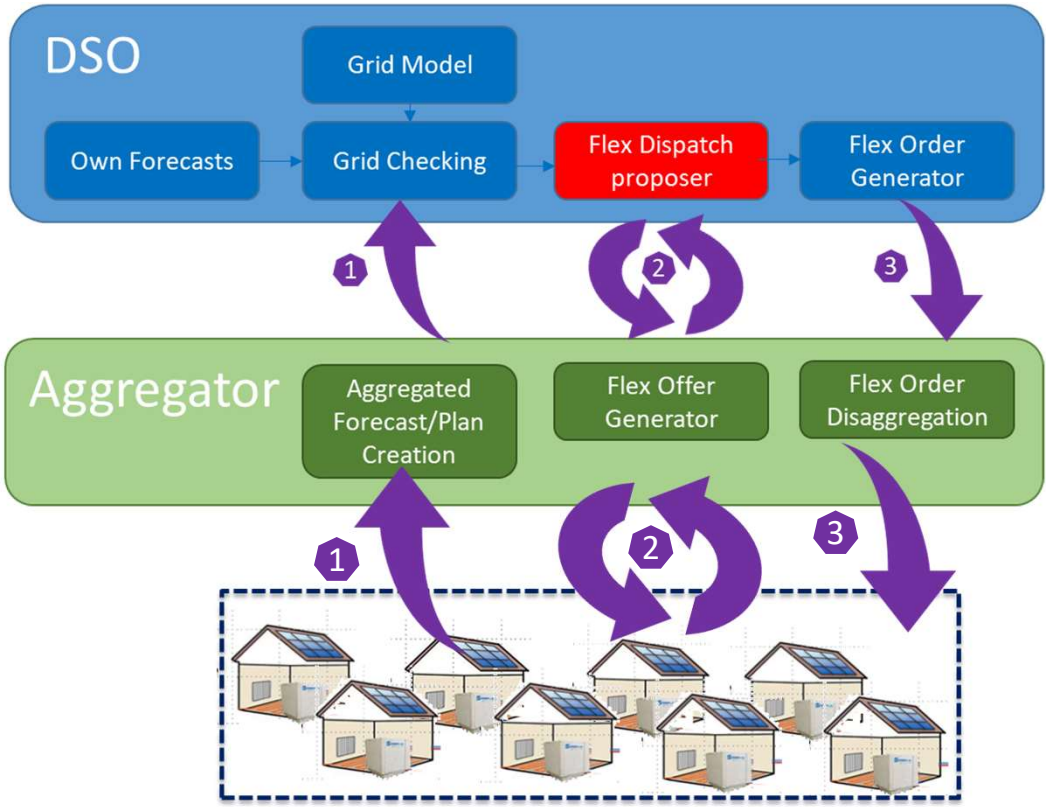
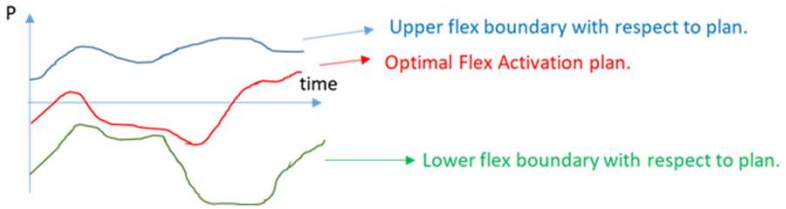
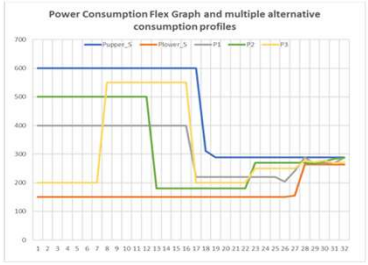
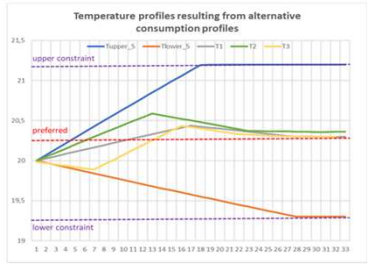
FHP Aggregation and Flex Trading process flow

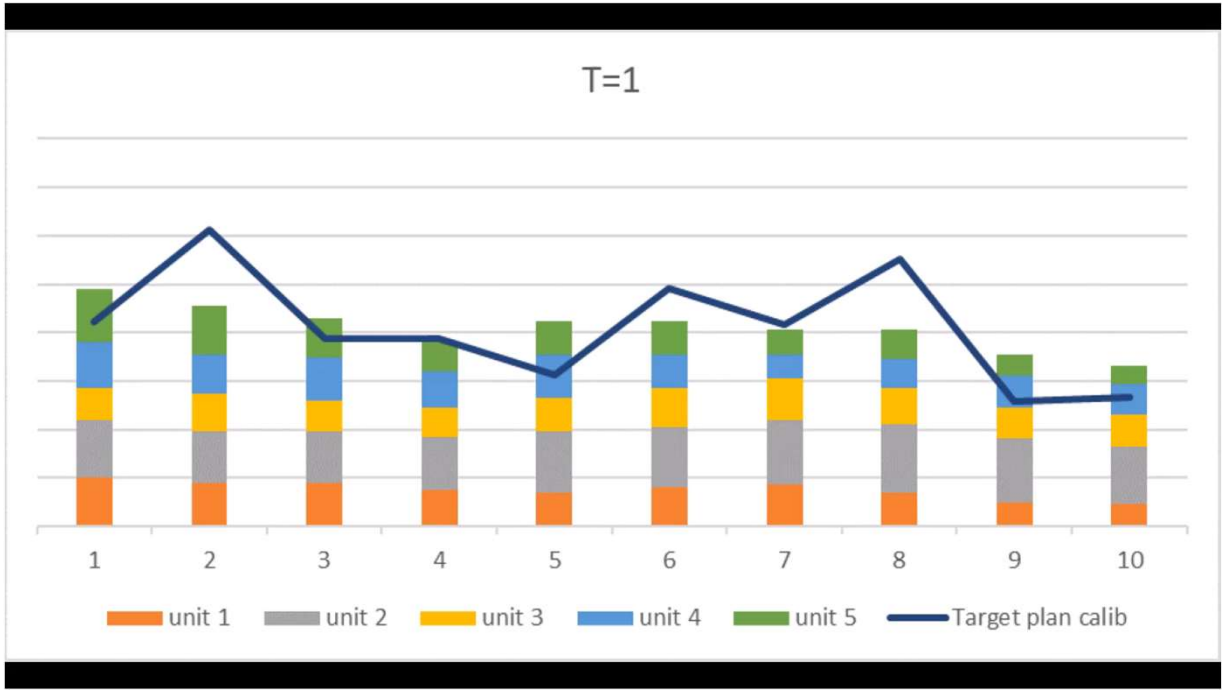








Disaggregation by decentralized optimization



Note: simplified animation created for concept visualization.

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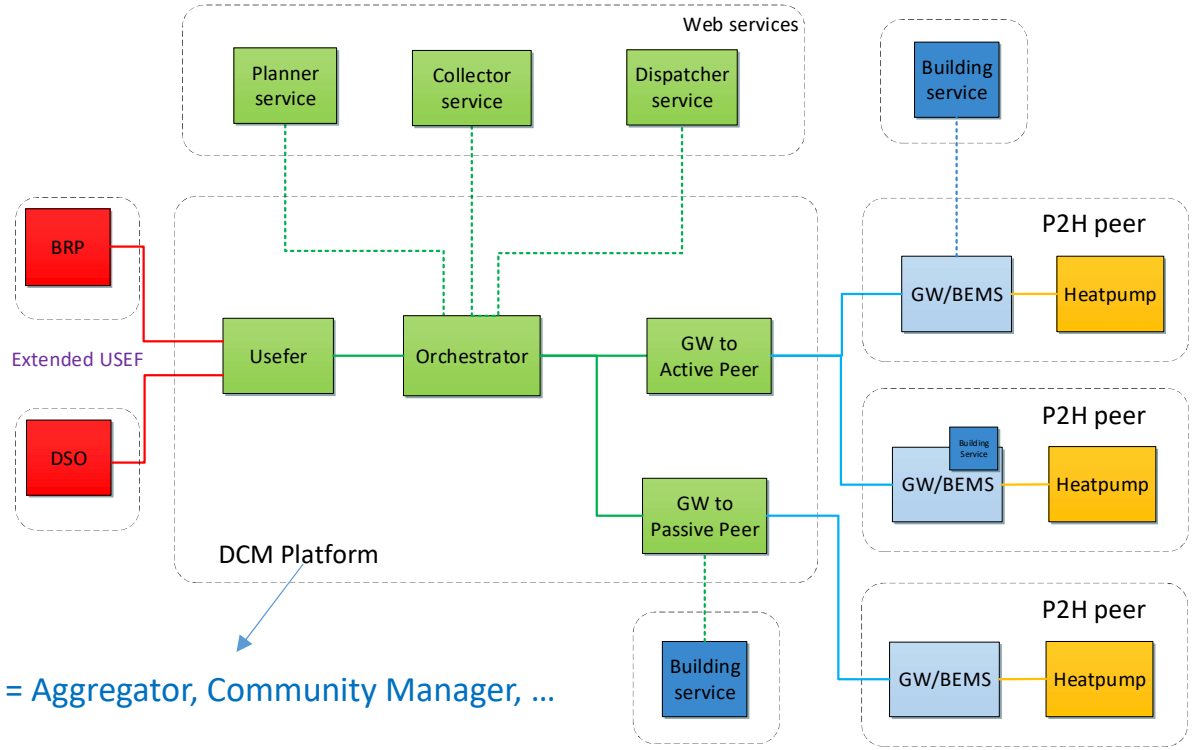
DCM*-centric Multi-Agent System

DCM = Dynamic Coalition Manager



Building Service:

- Create Optimal Plan and Flex Graph

DCM-Collector:

- Aggregates info from Building Service + optional additional processing

DCM-Planner:

- Cluster level optimisation
- Superimpose service e.g. for BRP

DSO:

- Optimal Flex Dispatch (versus USEF Flex Request)

DCM-Dispatcher

- Disaggregate Optimal Flex Dispatch request using distributed optimization (ADMM)

FHP project is funded by European Union under the grant agreement no. 731231.

Simple text partners bar

Thank you!

Questions?

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