An innovative flexibility management and optimization framework for demand side aggregators

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Rationale and Motivation

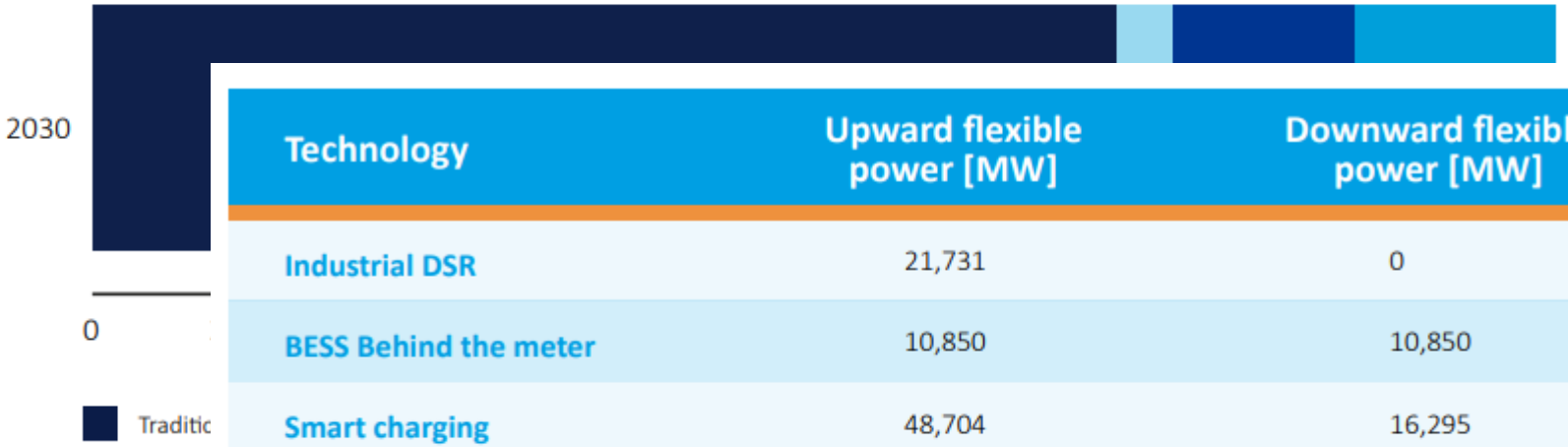
- **Current Status and E.U. Energy Goals :**

✓ Since 2014, the strategy of the European Union has been clear: “we need to drive a clean, secure and efficient energy transition to face climate and energy challenges”. This is also why the European Commission proposed in November 2016 an ambitious “Clean Energy for All Europeans” package and then updated with the European Green Deal and the **Fit for 55% package**

✓ The new geopolitical situation mandates for a rapid transition towards this direction → **REPowerEU** as the plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition

✓ The **potential of demand flexibility** is rapidly expanding and new surveys clearly quantify the benefit from DSF (direct and indirect)

How to reach the penetration of DSF



Technology	Upward flexible power [MW]	Downward flexible power [MW]
Industrial DSR	21,731	0
BESS Behind the meter	10,850	10,850
Smart charging	48,704	16,295
V2G	25,594	25,594
Residential electric heating	32,841	73,385
Industrial electric heating	7,082	0
Industrial heating – CHP	6,355	482
District heating – CHP	10,581	3,500
Total	**163,738**	**130,106**

Available flexible power

How to reach the penetration of DSF

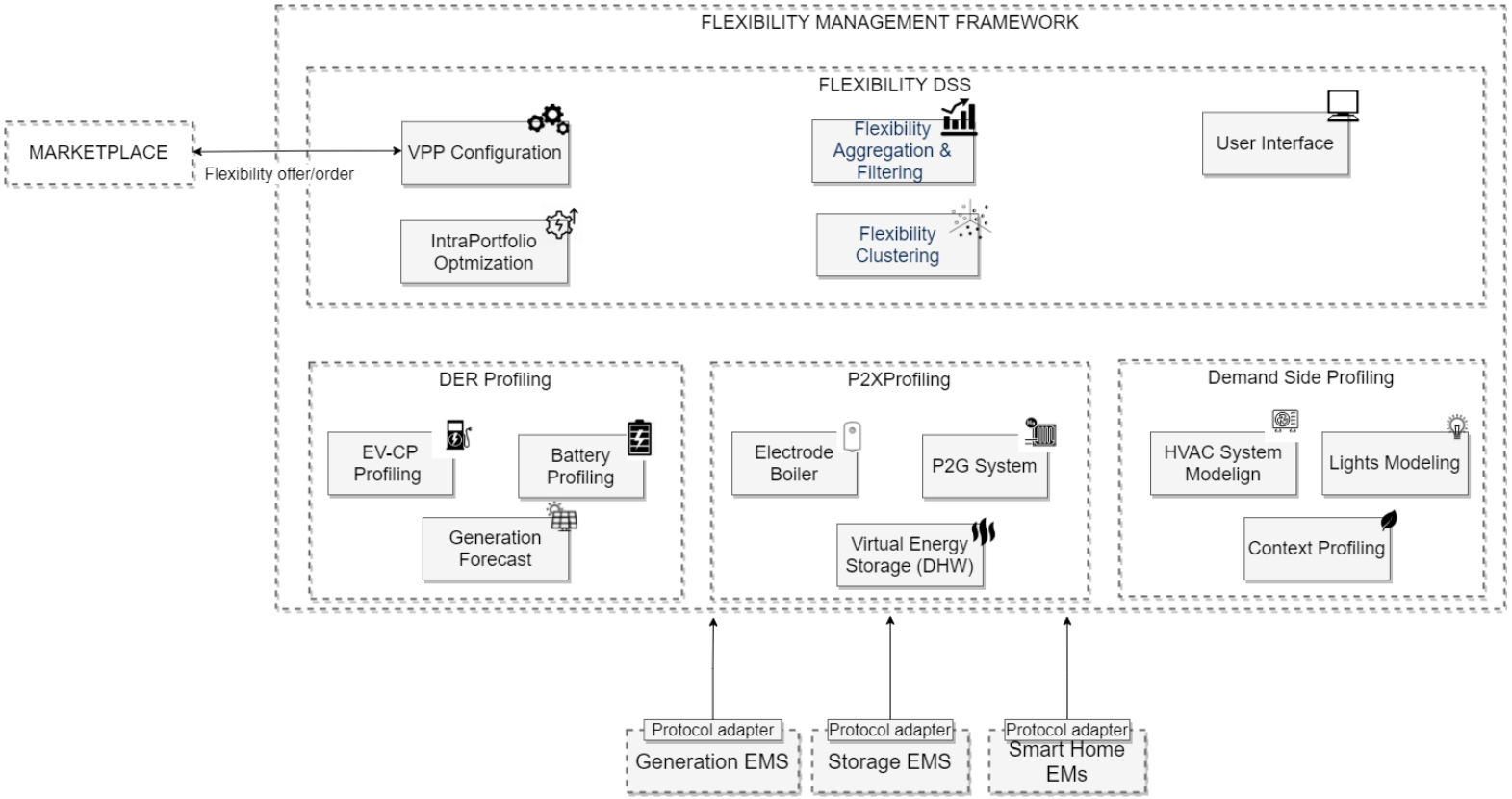
Year 2030 – EU 27	Savings and revenues (million €)	% Relative to no-DSF costs (%)	Average saving/revenue per kWh (€/kWh)
Smart charging + V2G	9,936	48%	0.07

Year 2030 – EU 27	Potential savings	% Relative to no-DSF	Potential savings per capita[16]
Cost to serve load	€301.5 billion	-48%	€673.5
Adequacy	€2.7 billion	-100%	€6.0
Balancing	€0.3–0.7 billion	[-66%,-43%]	€0.7–1.6
Infrastructure[17]	€11.1–29.1 billion	[-80%,-27%]	€27.8–65
Emissions	37.5 Mt	-8%	83.8 kg

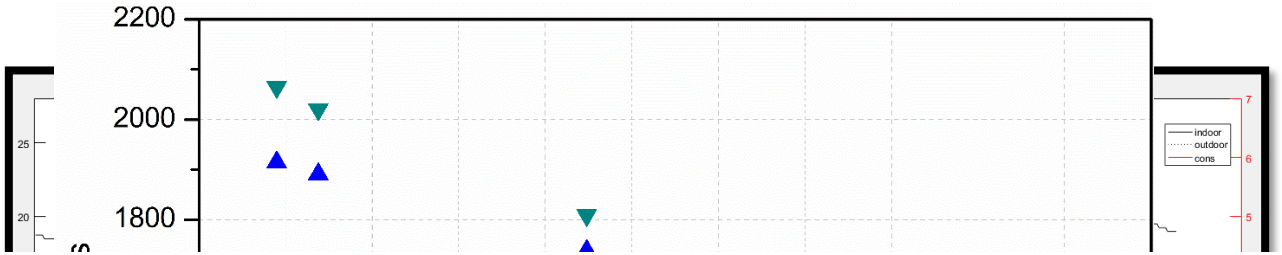
Indirect consumer benefits

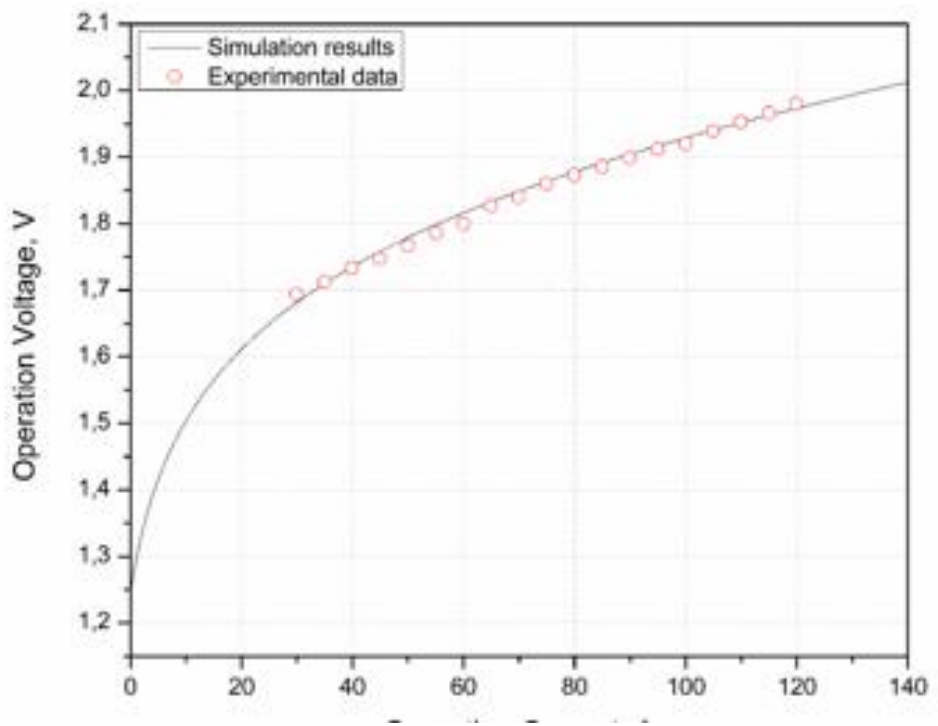
A Holistic Flexibility Management Framework

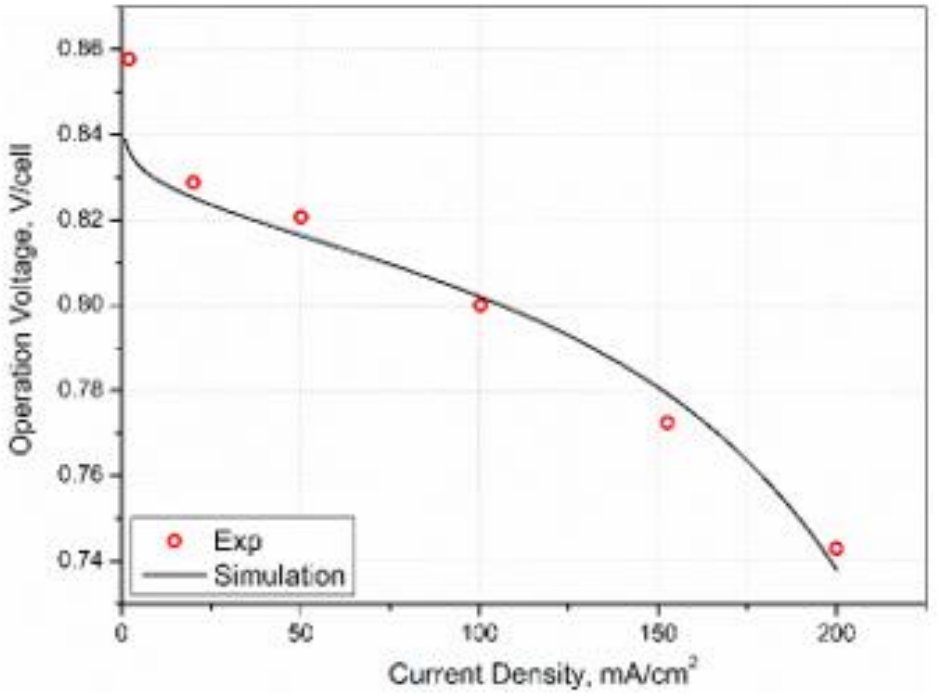
It is the tool for flexibility managers to take advantage of the value of energy storage along with other demand flexibility resources towards the establishment of a holistic framework for flexibility extraction, profiling, forecasting, classification, clustering and management to serve different market and grid needs



The role of Flexibility Agents







Comparison between simulated and experimental values for the P2G system

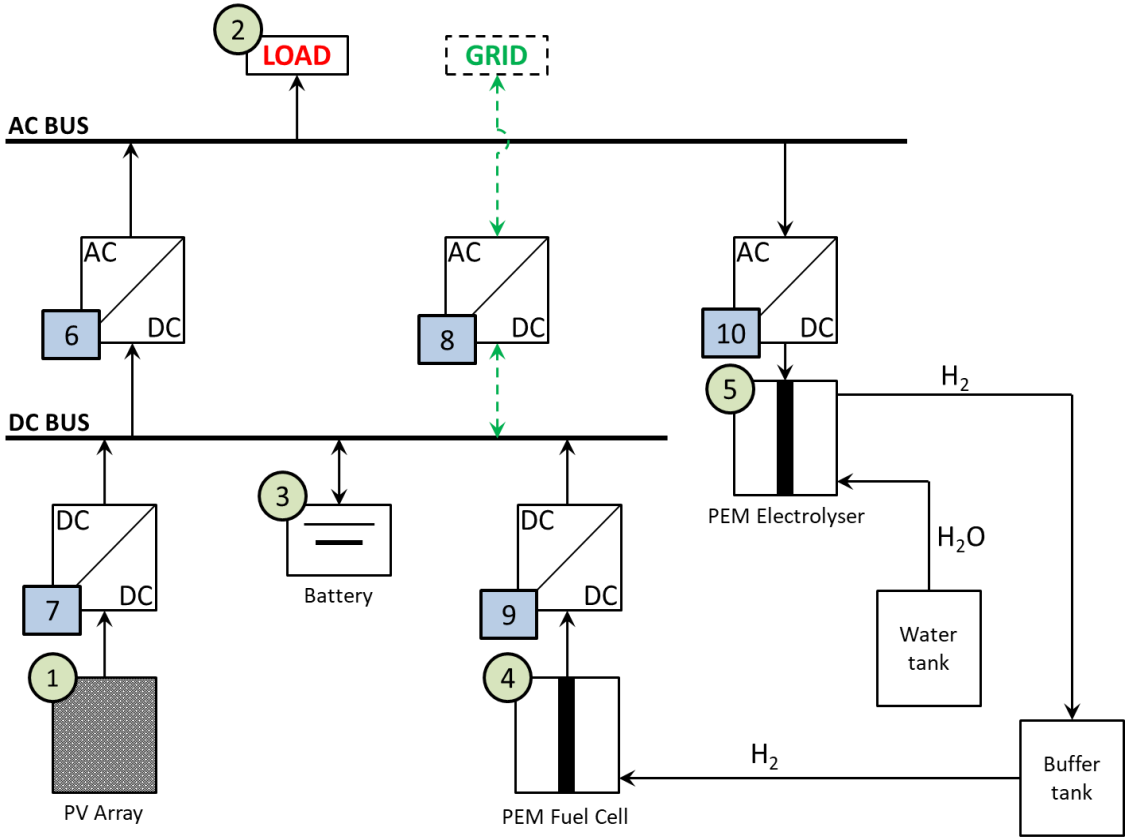
The objective of flex optimization

There are four different types of analytics features supported by the application, namely:

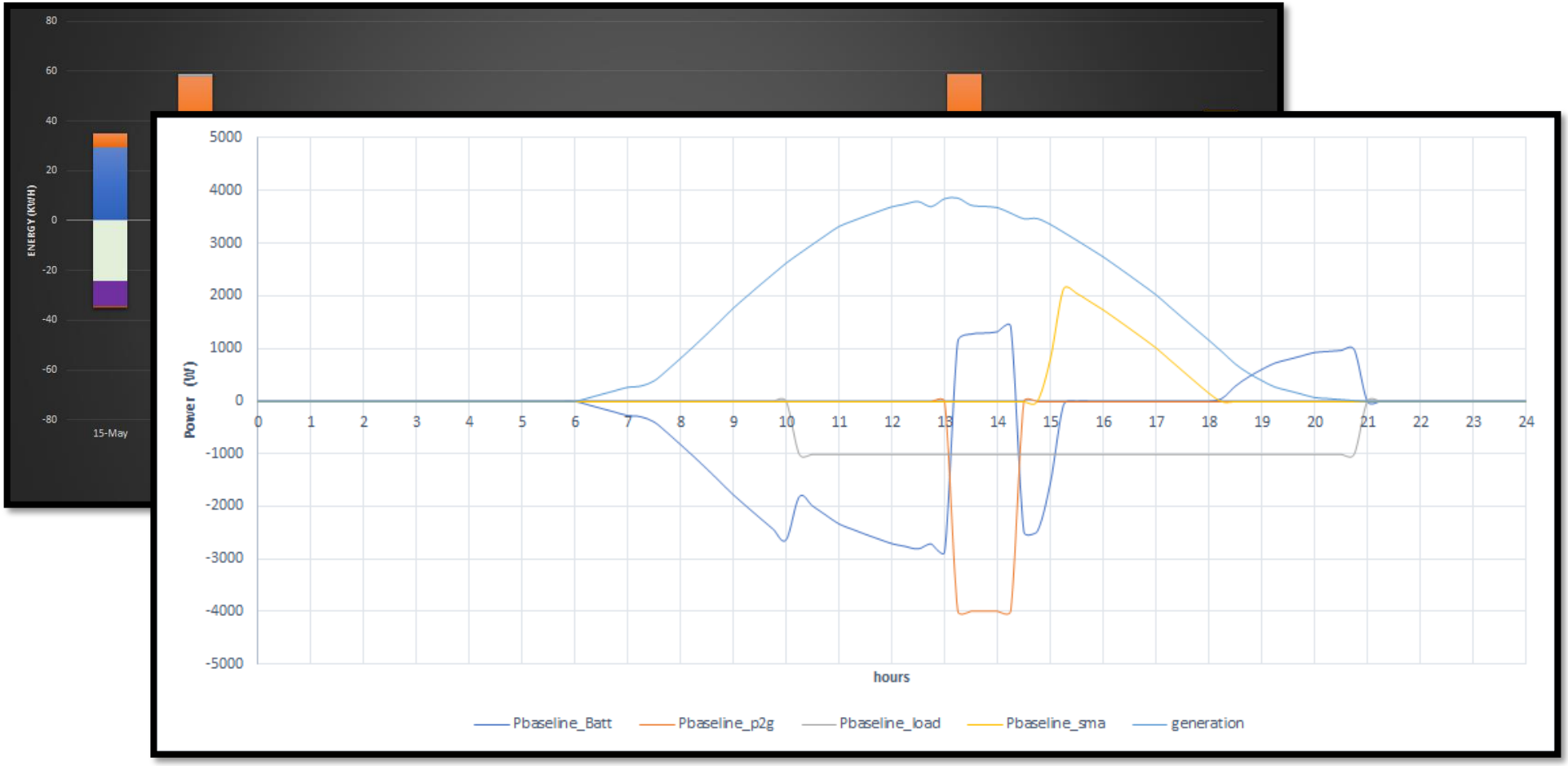
- **Flexibility Aggregation & Filtering** to enable search over the flexible assets available at the portfolio of the aggregator and further aggregation of flexibility profiling data (from the flexibility sources) in order to address the business needs of the aggregator.
- **Flexibility Clustering** to provide fine grained analytics techniques for the management of the flexibility sources available in the portfolio of the aggregator.
- **VPP Configuration** to facilitate the optimal placement of the flexibility sources to 3rd party business campaigns. These business campaigns are triggered by the market as the innovative flexibility marketplaces are evolving now in Europe.
- **Intra portfolio optimization** to facilitate the optimal management of the flexibility sources within the portfolio of the business stakeholder of the tool → **focus on self consumption maximization**

Demonstration Activities & Evaluation

Pilot Demo Site in Xanthi

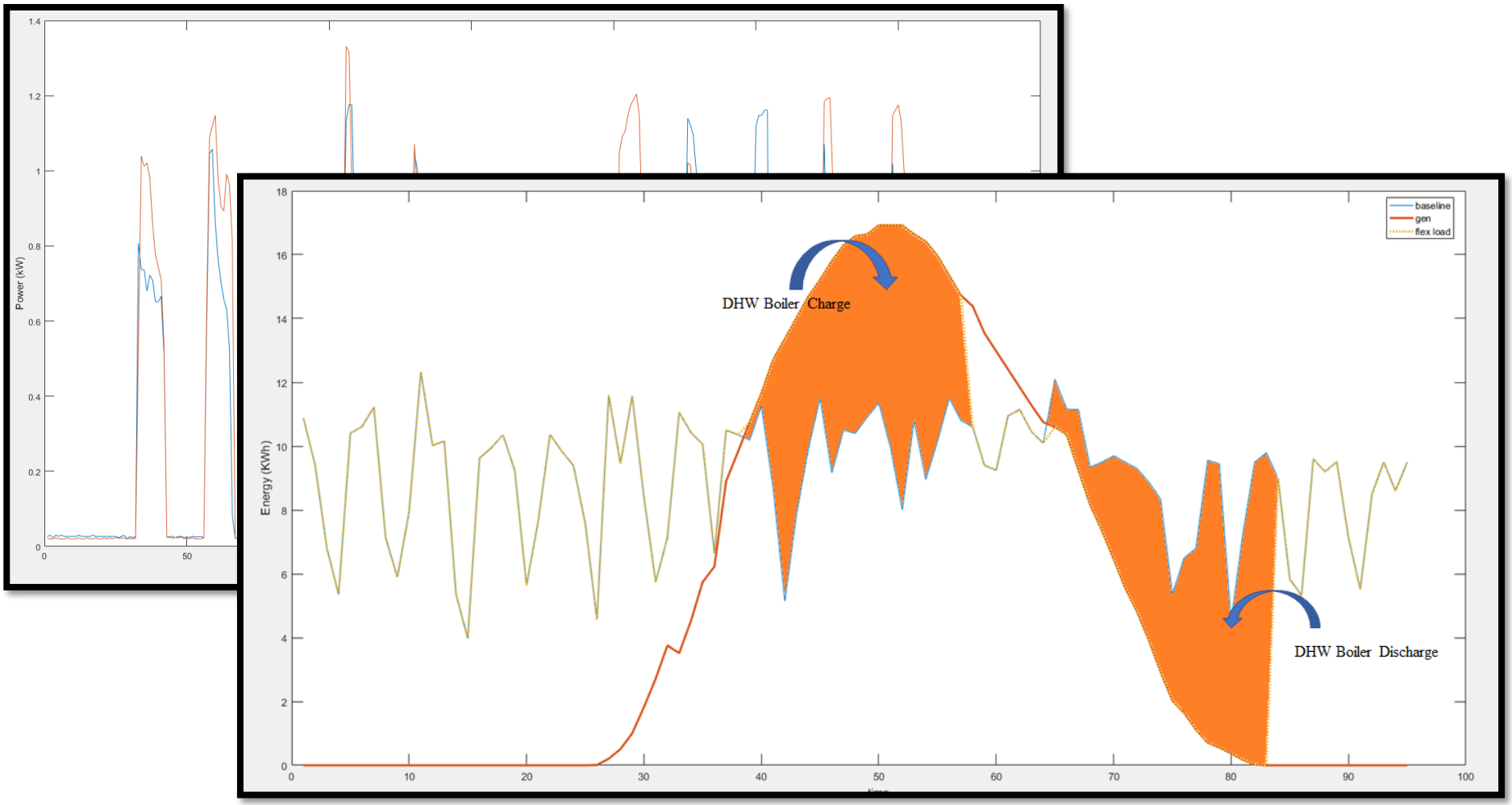


Impact Assessment Analysis Prelim Results



Self consumption optimization over a typical day

Impact Assessment Analysis Prelim Results



Self consumption optimization by shifting DHW

Questions

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http://xflexproject.eu/