CELEBRATING 40 YEARS ANNIVERSARY 1977-2017

15th IAEE European Conference 2017

'HEADING TOWARDS SUSTAINABLE ENERGY SYSTEMS: EVOLUTION OR REVOLUTION?'

3rd to 6th September 2017, Hofburg Congress Center, Vienna, Austria

Abstracts, Papers & Presentations available here!

The 15th IAEE European Conference takes place in Vienna, Austria, at the Hofburg Congress Center, 3rd to 6th September 2017. The main topic will be: "HEADING TOWARDS SUSTAINABLE ENERGY SYSTEMS: EVOLUTION OR REVOLUTION?".

In recent years, energy systems as well as Energy markets underwent remarkable changes, world-wide. Developments in oil, natural gas as well as electricity markets brought challenges of

TECHNISCHE UNIVERSITÄT WIEN

Energy Economics Group

Current and Improved Business Models of Aggregators in European Target Countries

Daniel Schwabeneder, Andreas Fleischhacker, Georg Lettner

15th IAEE European Conference 2017

Hofburg Congress Center, Vienna, Austria

3rd to 6th September 2017

This work is part of the BestRES project:

Best practices and implementation of innovative business models for Renewable Energy Aggregators

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°691689.

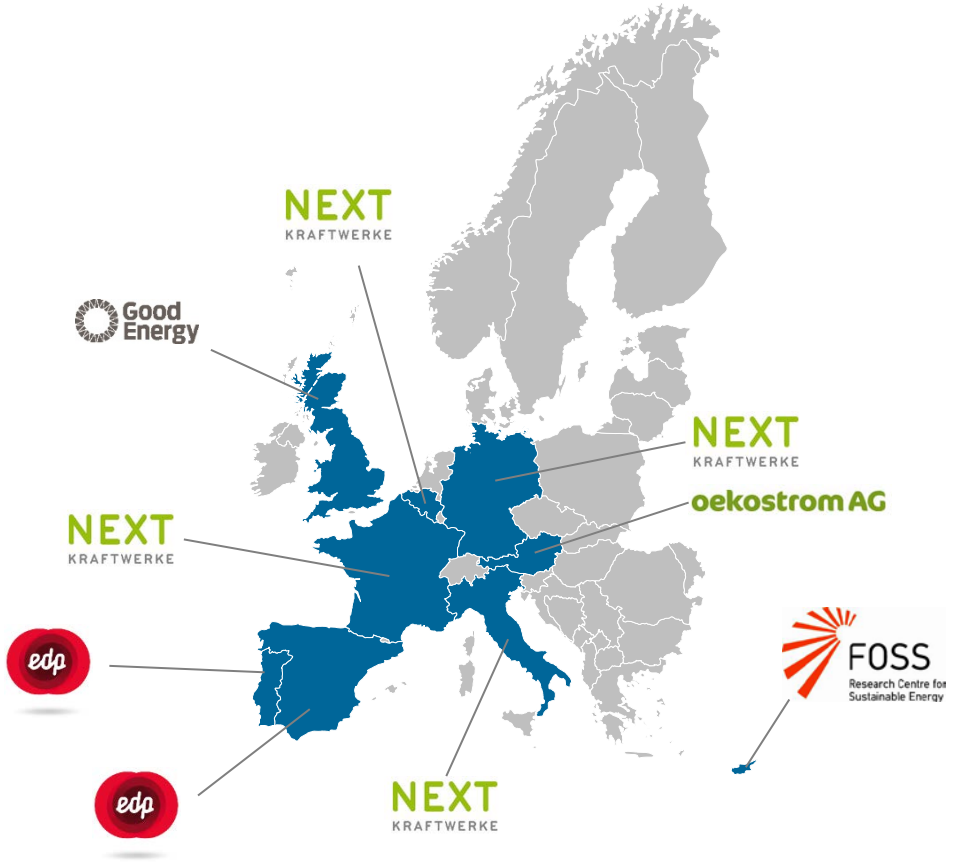
“Aggregation” and “Aggregators” as defined in BestRES

Aggregation:

“*a coordinated steering of vast amounts and types of consumers and producers*”

Aggregators:

“*legal entities that aggregate the load or generation of various demand and/or generation/production units and aim at optimizing energy supply and consumption either technically or economically*”



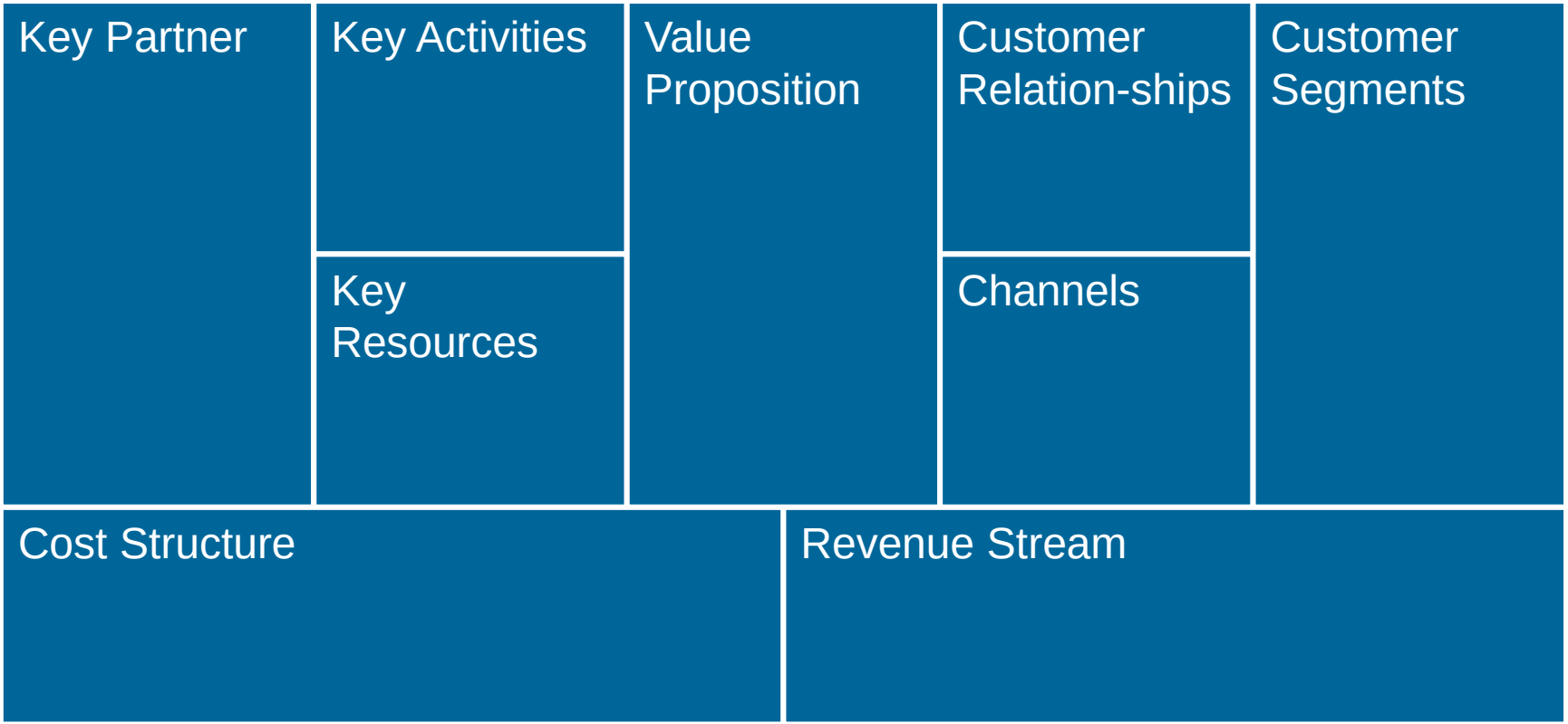
Methodology of BestRES

How do we find improved business models?

- *1st step:* Analyzing current business models (BM) for aggregators
- *2nd step:* Improving BM in a *qualitative* way
- *3rd step:* Analyzing improved BM in a *quantitative* way
- *4th step:* Implementation and monitoring of improved business models

Focus of this presentation

Qualitative Business Model analysis via the BM Canvas



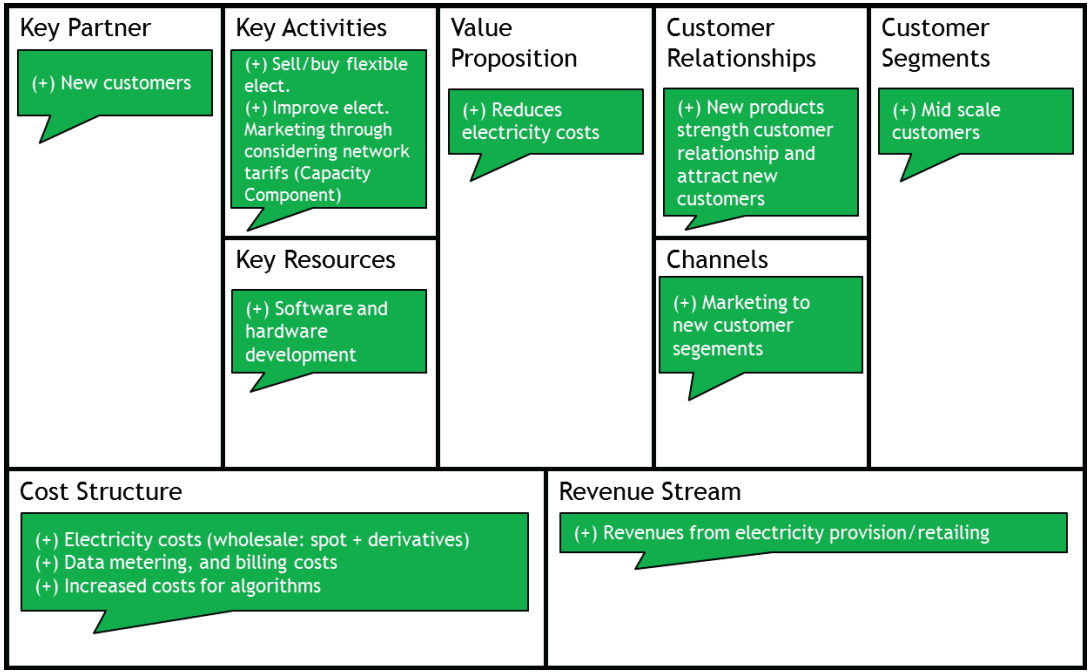
Selected example: Current Business Model for Next Kraftwerke Germany

- Next Kraftwerke Germany is a Combined Aggregator and Balance Responsible Party in Germany.
- They are pooling decentralized generators (PV, Wind, Biogas, Biomass CHP) and customers (commercial, industrial) for marketing on the day-ahead spot market and various reserve markets.
- The key assets are control systems, computer models, forecast algorithms and administration knowledge.
- Value is generated by offering balancing services and optimal scheduling of electricity generation, trading and consumption.

Selected Example: Improved Business Models for Next Kraftwerke Germany

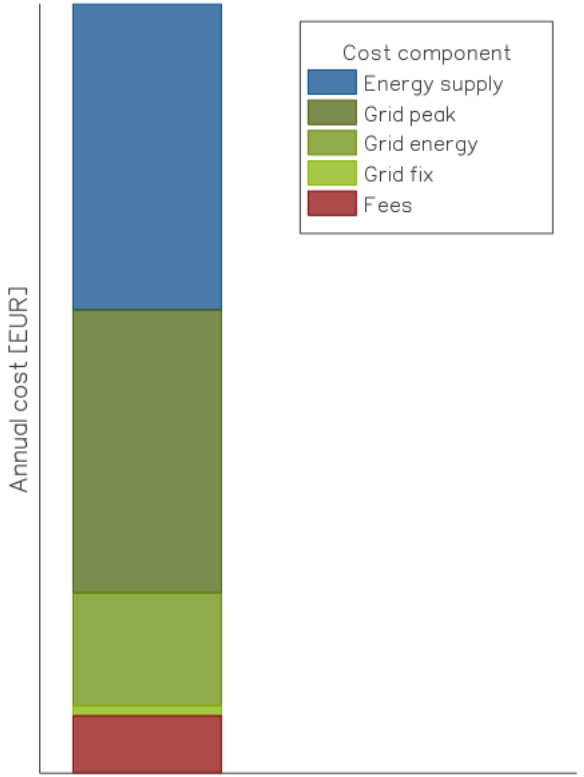
Supplying „mid-scale“ consumers with time variable tariffs including grid charges optimization

- Provide flexible customers with price signals (already implemented)
- Consider other tariff components like grid charges in the optimization algorithm.



Cost components of a electricity consumer

- Energy supply
- Grid charges
  - Fixed annual component [EUR/a]
  - Energy-dependent component [EUR/MWh]
  - Peak-load pricing component [EUR/MW] (for the maximum load per year/month)
- Fees

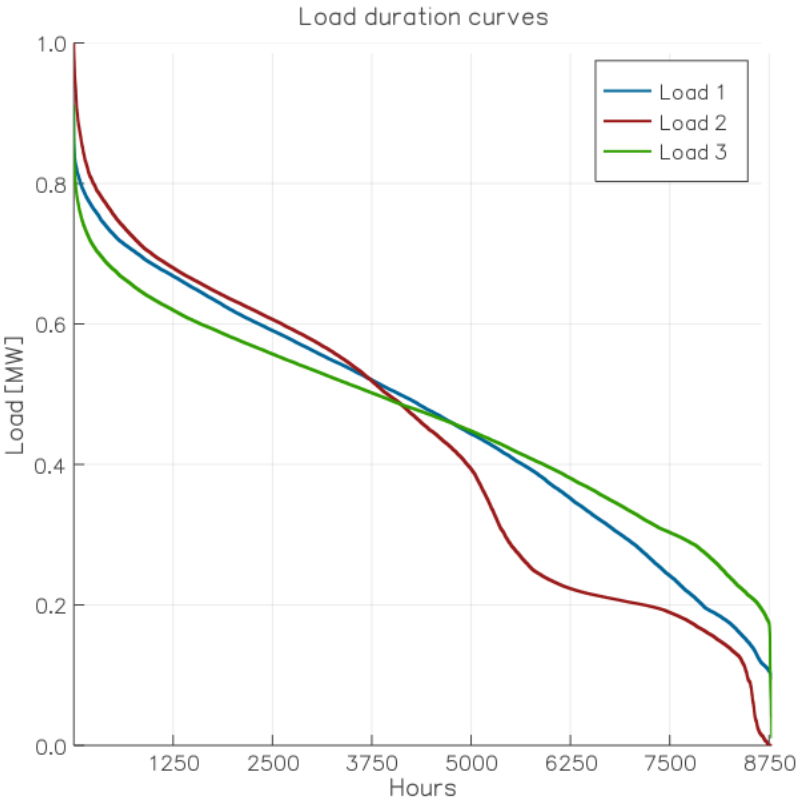


Model and scenarios

- For the quantitative evaluation of the potential of the improved BM a linear mixed-integer optimization model has been implemented.
- It minimizes the cost for purchasing energy for flexible loads from the day-ahead spot market
- Three scenarios are compared:
  - Baseline (no optimization)
  - Spot (optimization considering the market prices only)
  - Grid (optimization considering both market prices and grid charges)
- Both, an annual and a monthly peak-load pricing component are considered for the grid charges

Loads

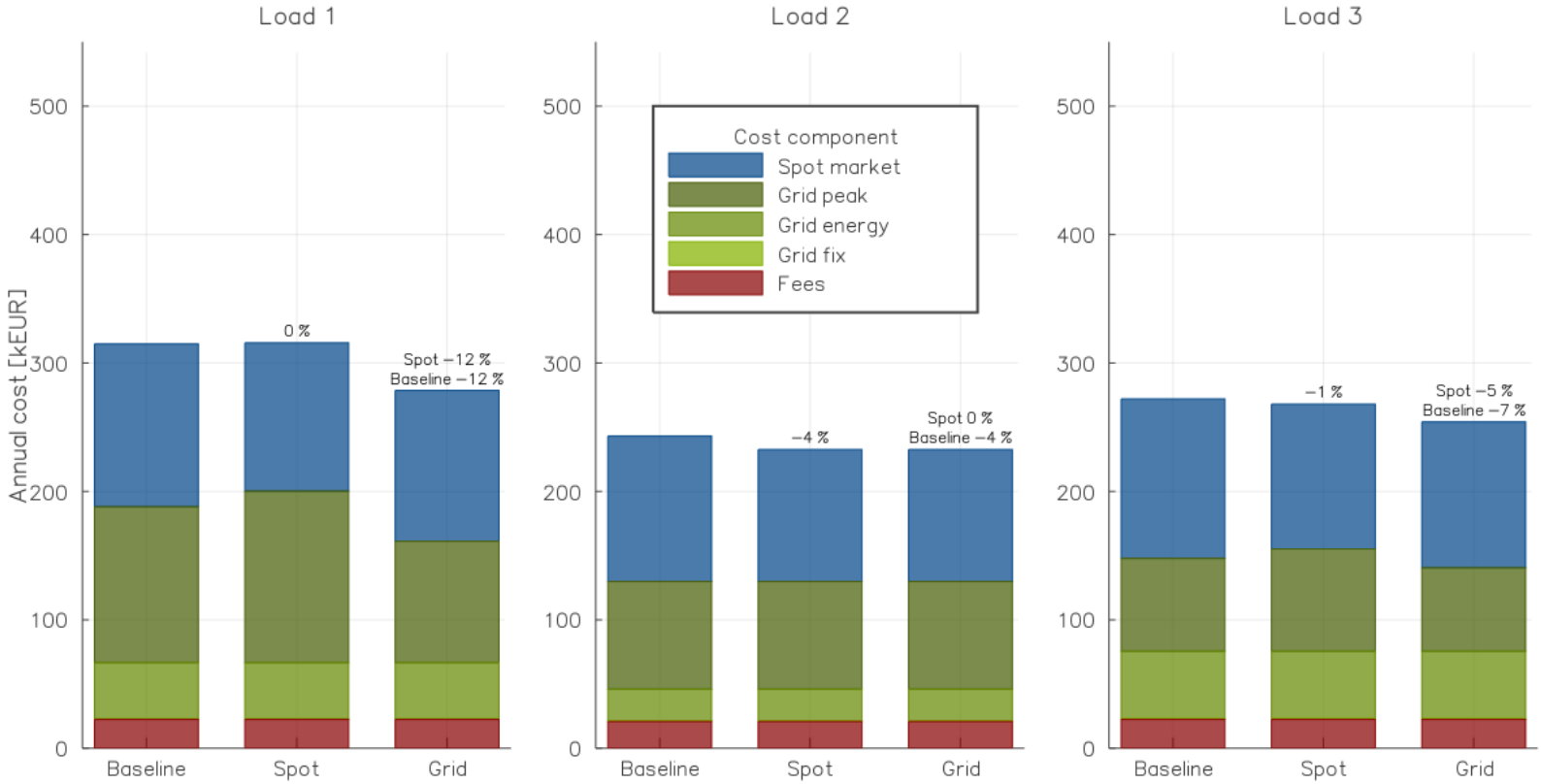
- Three different loads of consumers connected to the medium voltage network are considered
- Three different gird tariffs (MITNETZ STROM, Westnetz, Netze BW) are considered for the loads



Flexibility options

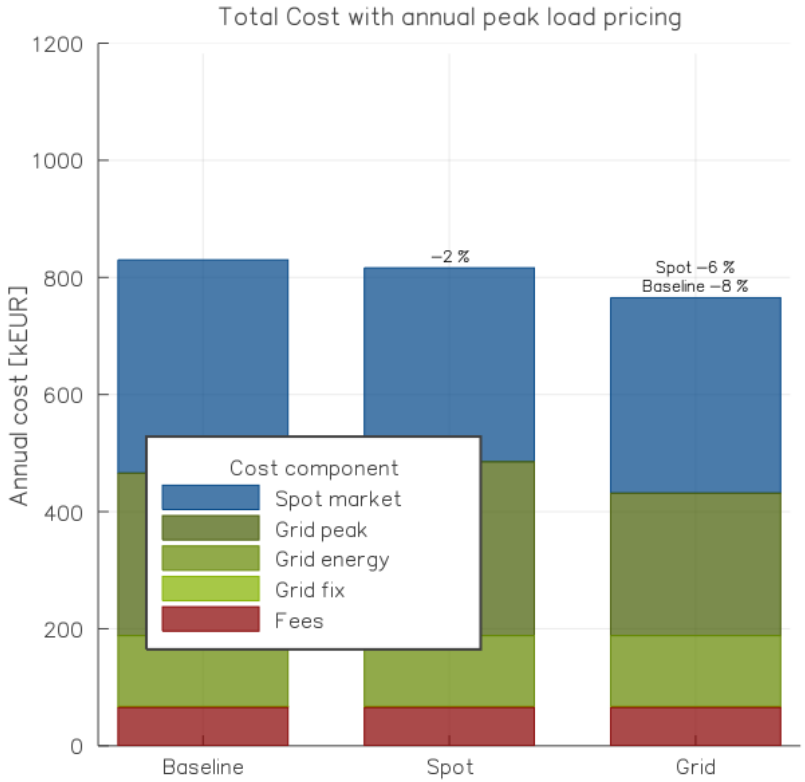
- The loads can be changed flexibly according to price signals with the following restrictions:
  - A load reduction/increase has to last for at least 3 hours.
  - There has to be a pause of at least 1 hour between to flexibility activations.
  - The load reduction/increase has to be between 0.1 MW and 0.3 MW.
  - Maximally 2 load reductions and increases are allowed per day.
  - Load reductions/increases are only allowed on weekdays
  - The total daily consumption may not be changed by the flexibility activations.

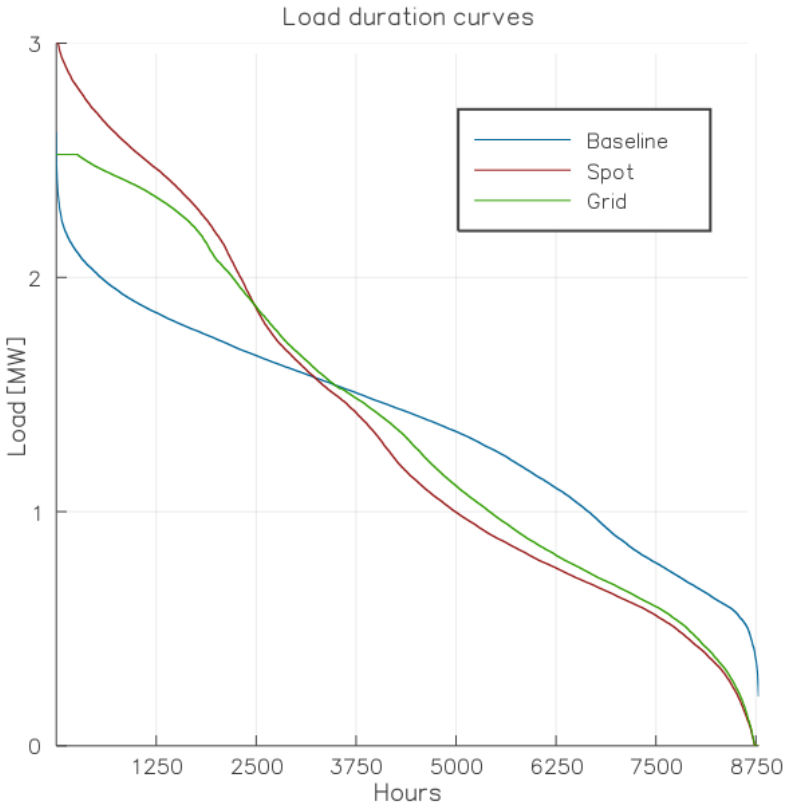
Results with annual peak-load pricing



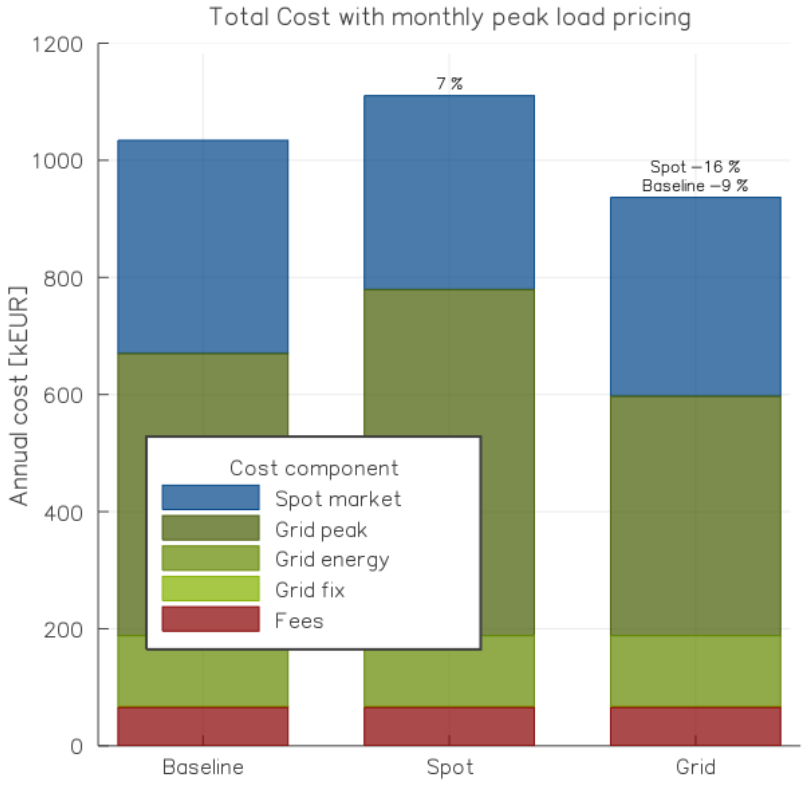
Load 2 has its highest load at a time where the flexibility must not be active.

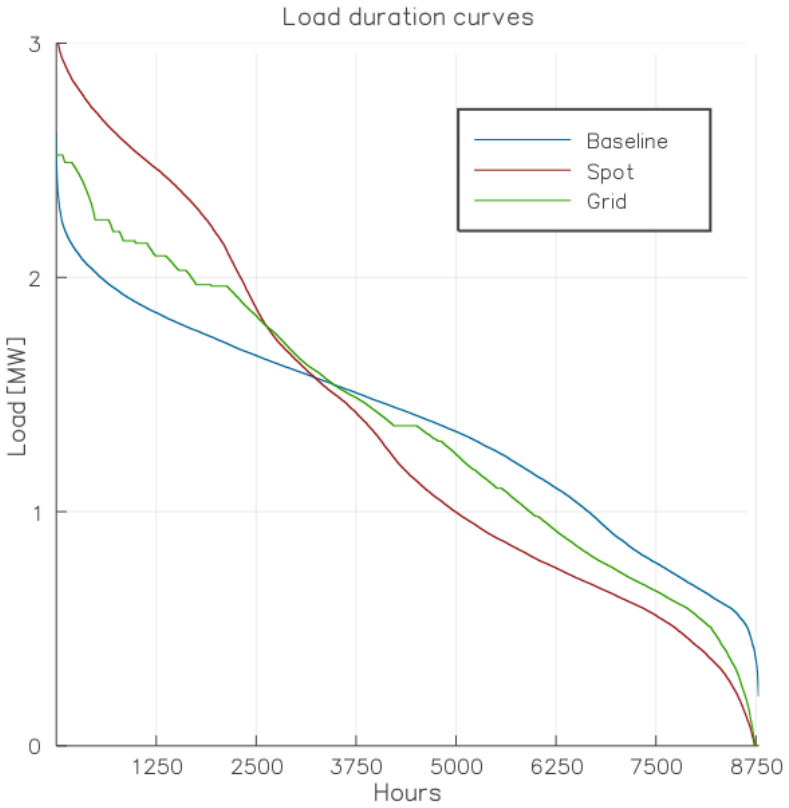
Results with annual peak-load pricing





Results with monthly peak-load pricing





Complete Business Model analysis (outlook)

- A certain share of the customer cost reduction can be the Aggregator‘s revenue in this business model.
- For a complete analysis this has to be compared to the additional cost of optimally managing demand response of customers loads:
  - Costs for software development
  - Costs for data metering and billing
- If the additional cost is lower than the customers cost reduction this is an improved Business Model, where both, the aggregator and the customer can benefit.

Conclusions:

- For both, annual and monthly peak-load pricing tariffs, the improved business model can increase the Aggregator‘s revenue (by up to 8% of the original customers electricity cost for the analyzed loads).
- The load characteristics have to be taken into account for the implementation of this business model.
- It has to be noted that these results are optimal with perfect foresight of prices and loads. Real life algorithms do not have this kind of information.
- This is work in progress. In the future additional costs need to be taken into account and other business models have to be analyzed in detail.

DANIEL SCHWABENEDER

Technische Universität Wien
Institute of Energy Systems and Electrical Drives
Energy Economics Group – EEG

Gußhausstraße 25-29 / E370-3
1040 Vienna, Austria

[P] +43 1 58801 370 375
[E] schwabeneder@eeg.tuwien.ac.at
[W] www.eeg.tuwien.ac.at