

One Grid – Many Objectives: Dynamic Curtailment of Flexible Assets for Higher Grid Utilization

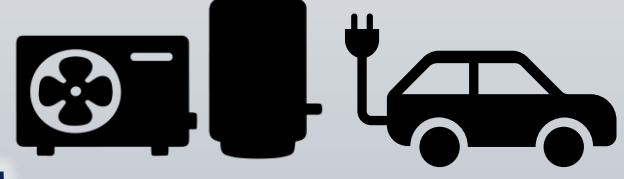
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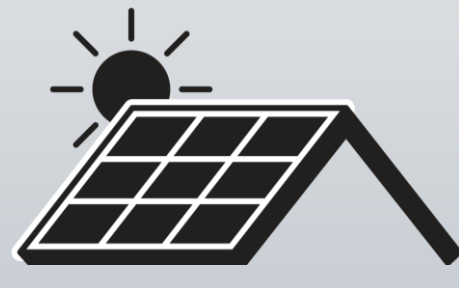
1 Background

The shift towards a sustainable energy system yields three major changes in the electricity grid:

1. Electrification of the heating & transport sector



2. Expansion of rooftop PV systems



3. Phase out of large thermal power plants



Distributed Energy Resources (DER)

Due to these changes and the resulting effects on the grid, we encounter new paradigms:

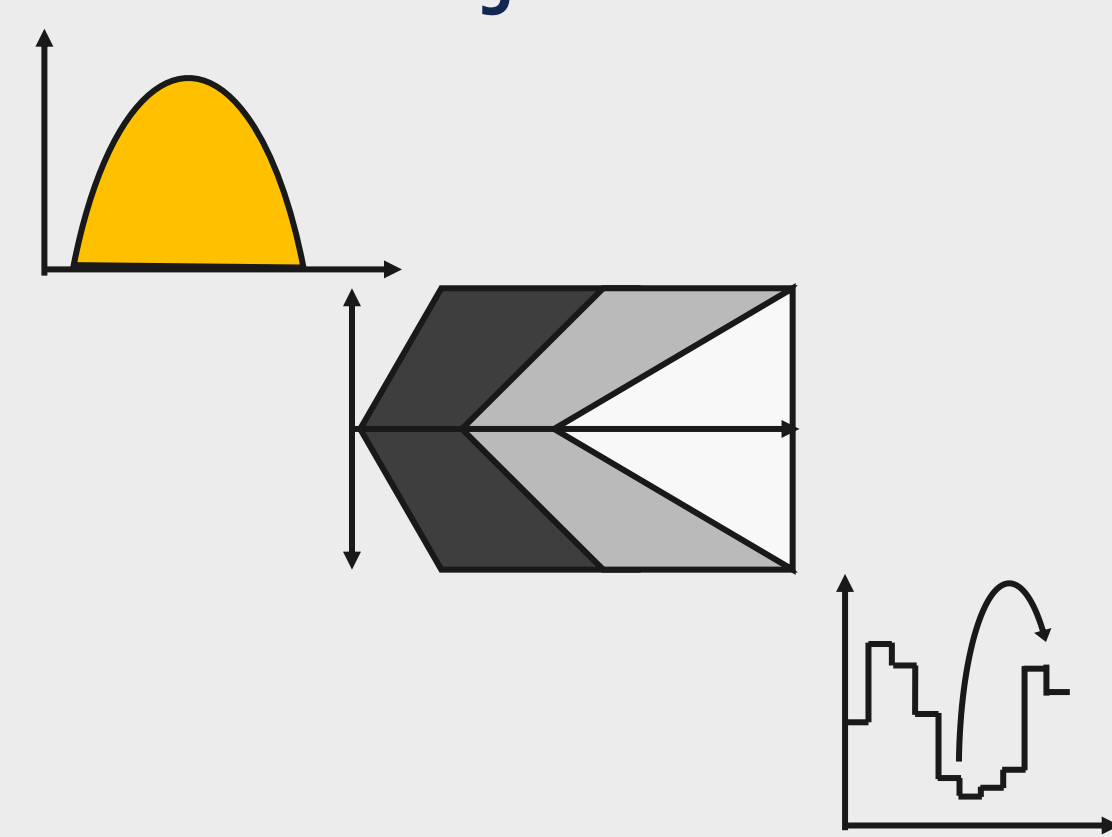
(A) Grid reinforcement cannot match DER expansion speed

(B) New business cases for DER aggregators

2 Business Cases for DER Aggregators

Aggregators actuate DER according to their business case. The grid operator cannot predict the resulting grid load adequately, if a significant share of flexible consumers is controlled by external signals. The different symbols indicate affiliations to different objectives:

- ♣ Local energy communities
- ♠ Primary control reserve
- ♥ Secondary control reserve
- ♦ Short term market arbitrage



3 Grid Operation with dynamic curtailment

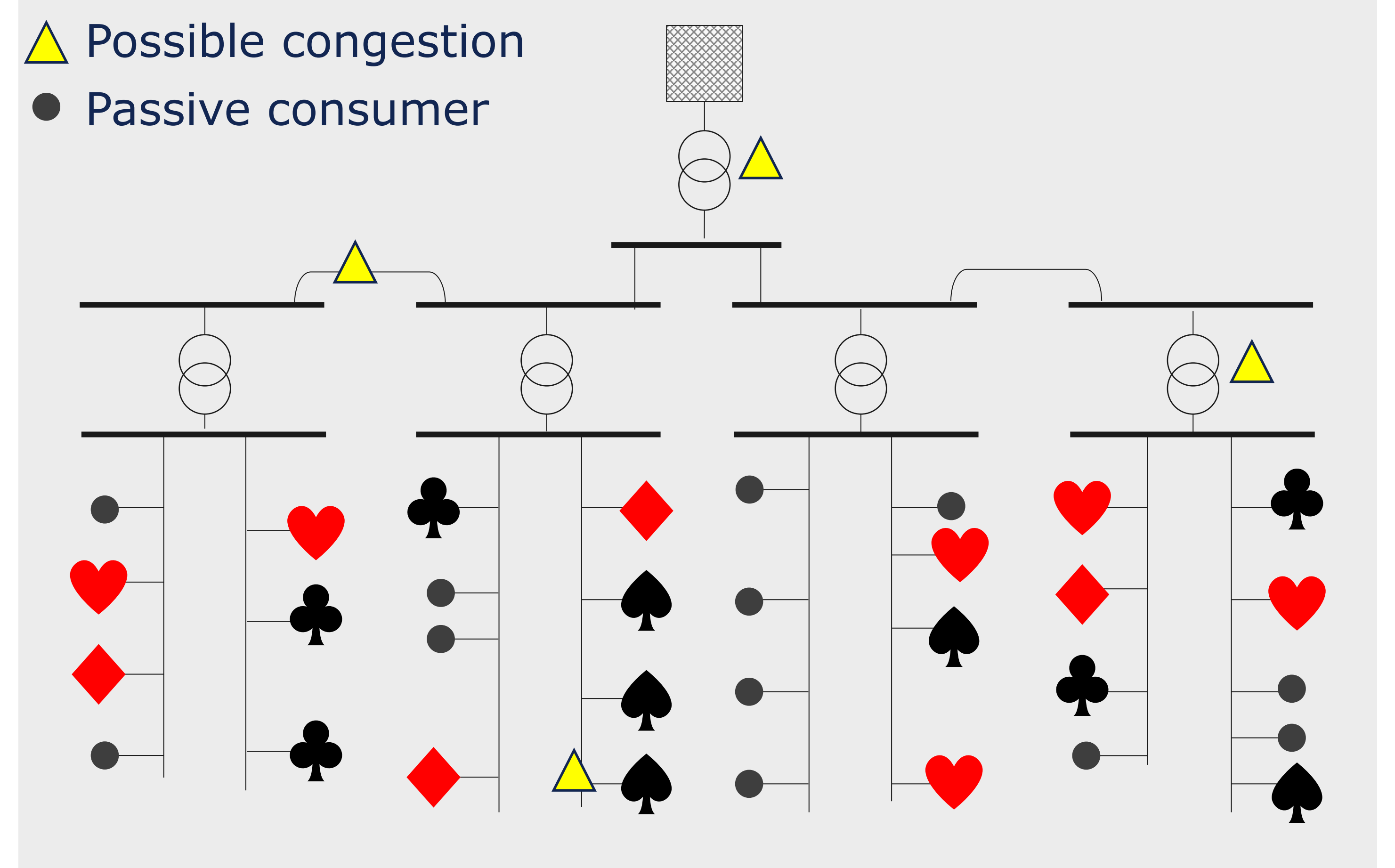
Existing demand side management (DSM) concepts for peak shaving are of limited use in the presented scenario, as they often rely on forecasts. Achieving high grid utilization while preventing limit violations under disturbances can be realised by applying dynamic limitations to DER in contrast to static or preventive limits.

A new operating principle could allow to connect more consumers than under static hosting capacity:

Closed loop online curtailment of DER allows higher average grid utilization.

4 Exemplary Scenario

Passive consumers and DER belonging to different aggregators make forecasting the grid load difficult.



5 Research Directions

- 🎯 **Use measurements to monitor the grid load**
A higher base utilization of the grid can be achieved, if live measurements are available that allow to mitigate congestions in real-time
- 🎯 **Implement fairness metrics to distribute curtailment**
Different concepts of fair distribution are investigated
- How can compensation for disadvantaged agents be determined based on the controller design?**
- 🎯 The connection point to the grid topology and neighboring agents will directly influence the amount of curtailment an agent undergoes.
- How can aggregators react to curtailment of their asset pool in operation?**
- 🎯 Aggregators must fulfil their obligations even if DER in their portfolio deviate from the requested operating point.

Get in Touch

If you are interested in exchanging ideas or collaborating on the presented topics, please feel free to reach out:

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