Hochschule für Technik
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Grid Integration of PV Battery Systems with Forecast-Based Operation Strategies

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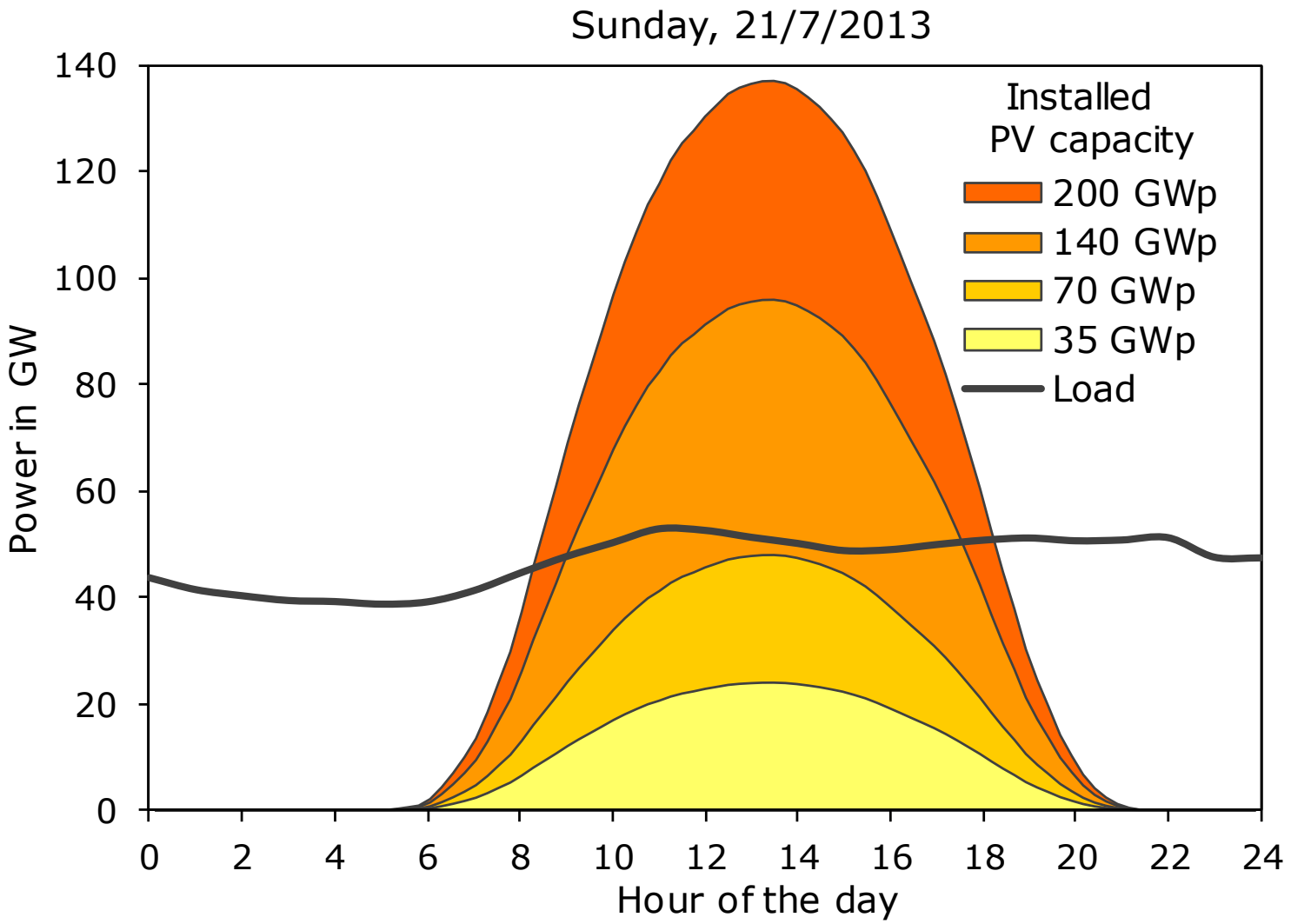
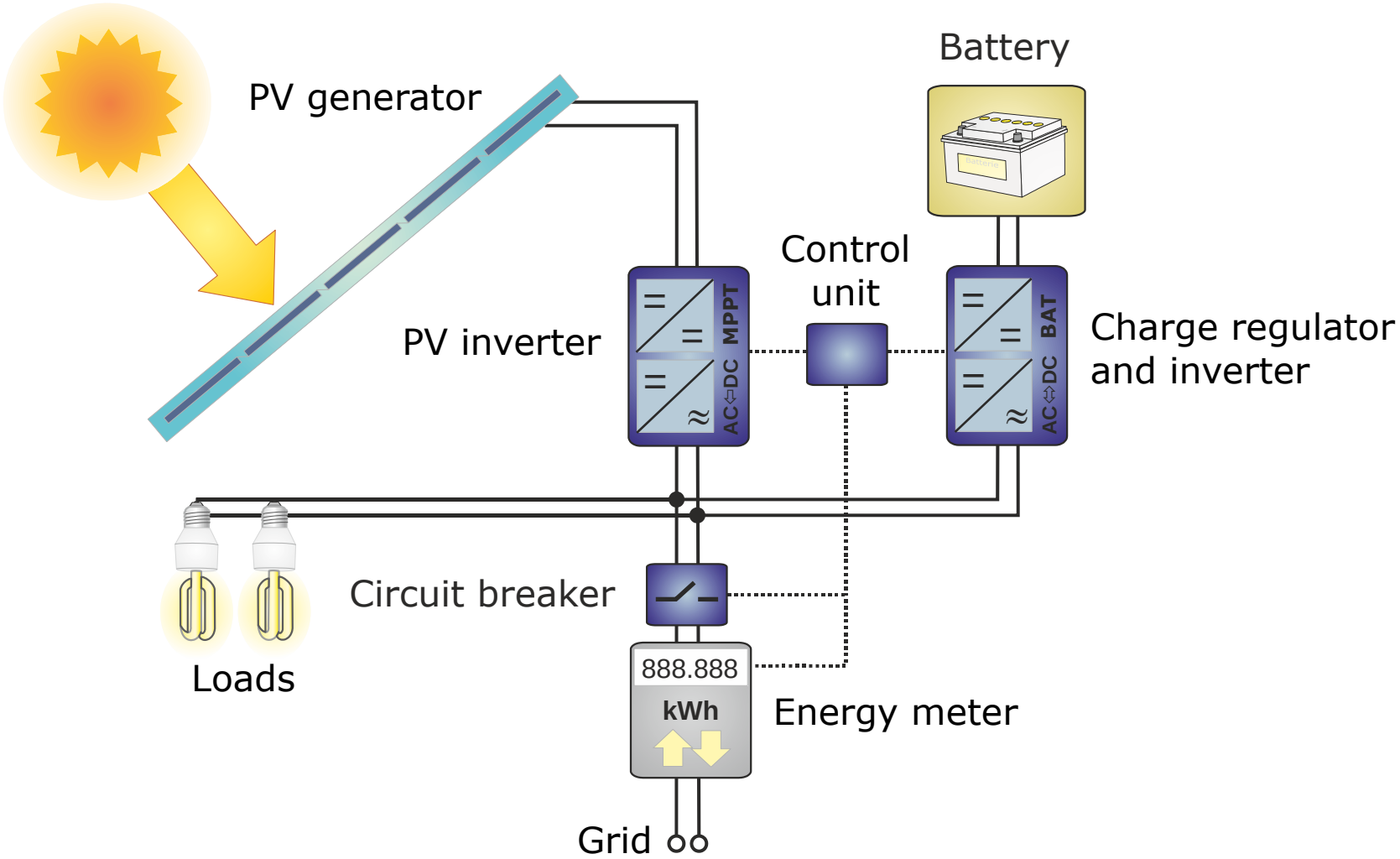
Impact of PV on the electricity supply in Germany



Data: ENTSO-E (load), EEX (PV generation for the PV capacity of 35 GWp)

Combining PV systems with storage batteries



Operation strategies of PV battery systems

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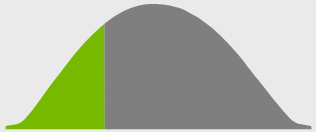
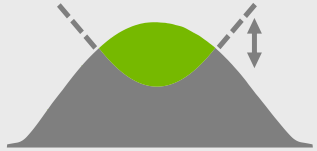
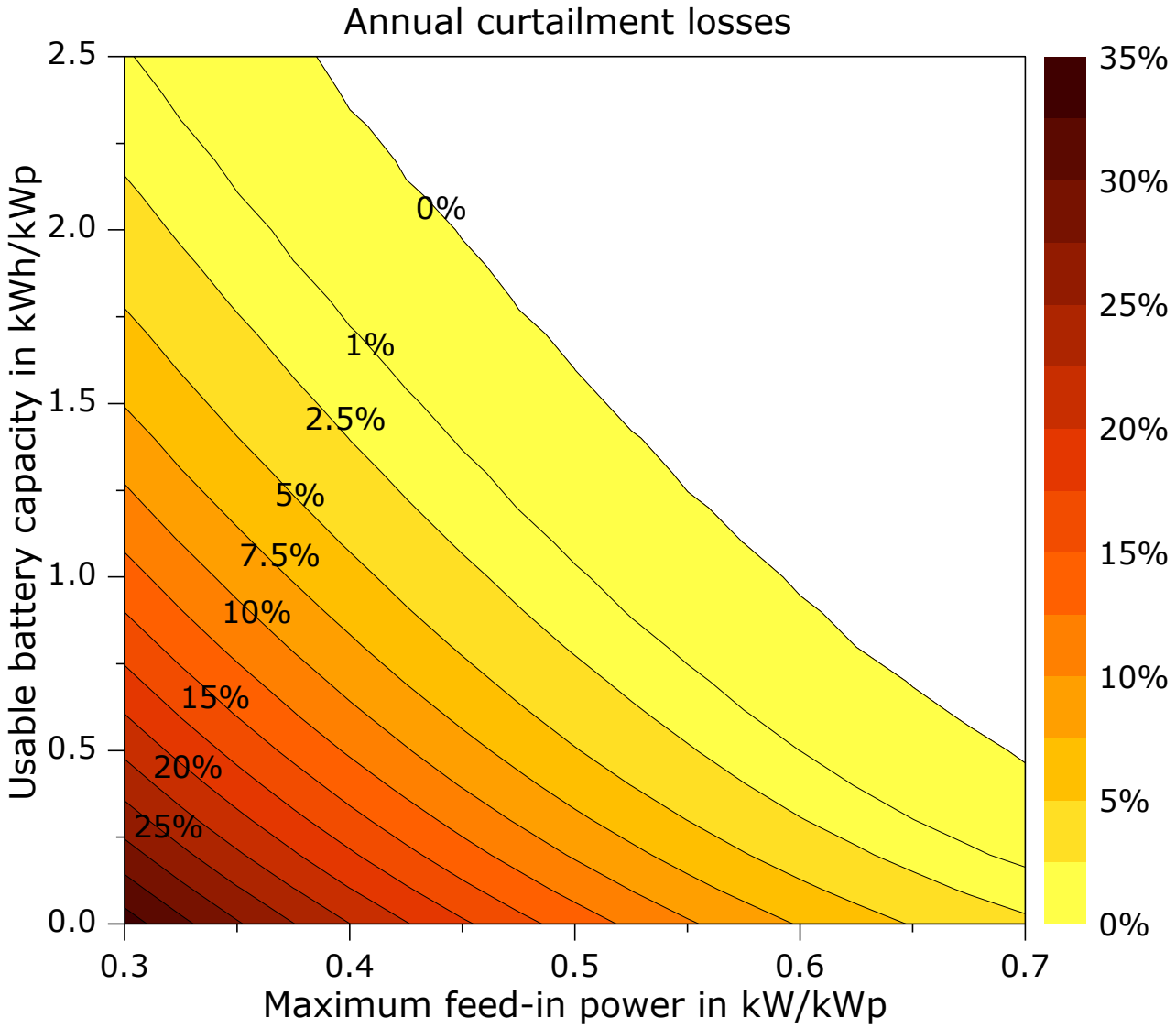
Battery charge
Grid feed-in
Feed-in limit

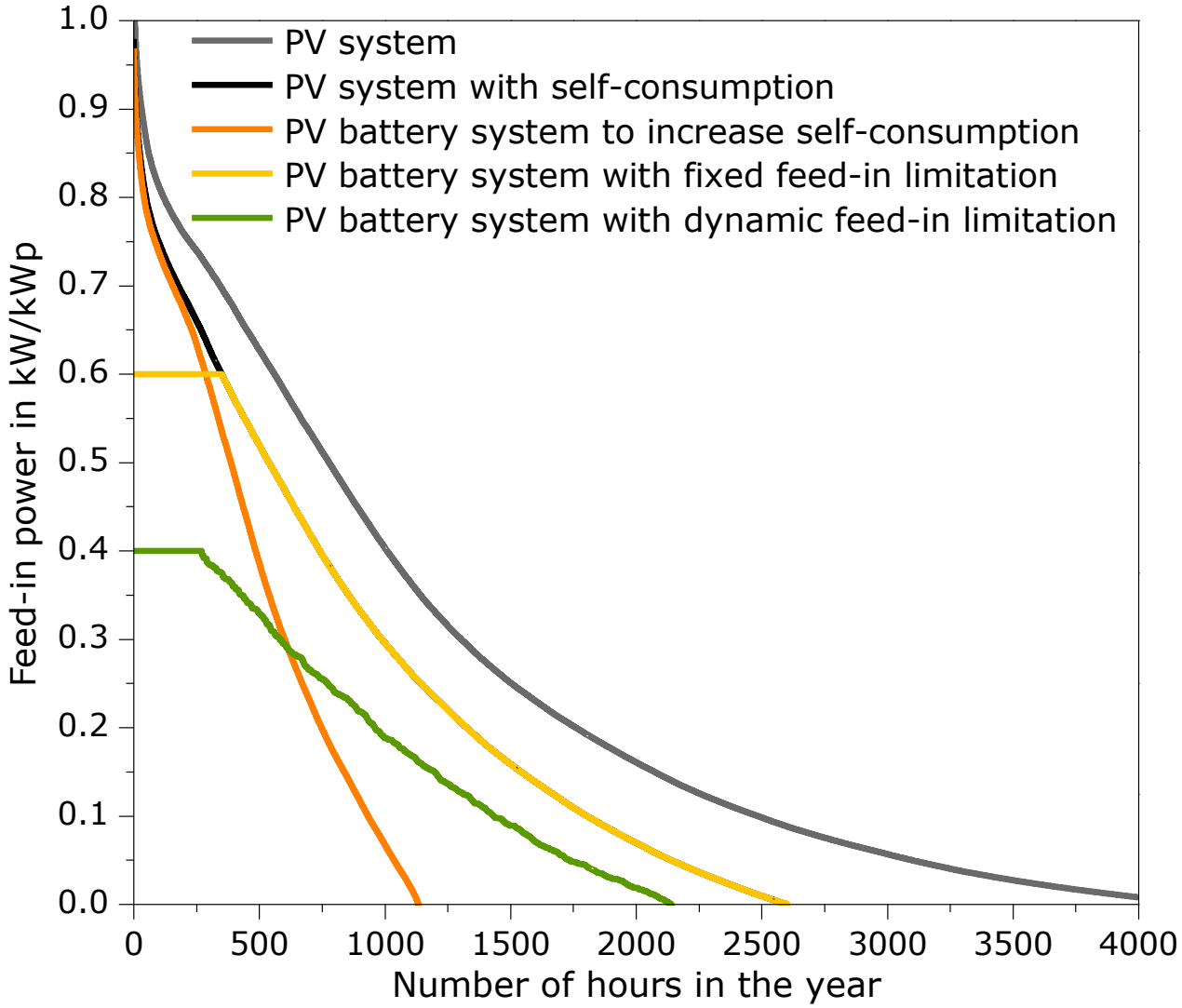
	Increasing self-consumption	Fixed feed-in limitation	Dynamic feed-in limitation
			
Optimal local PV use	●		●
Reduced grid load		●	●
Forecast-based			●
Balancing capability			●

Sizing of PV battery systems for fixed feed-in limitation



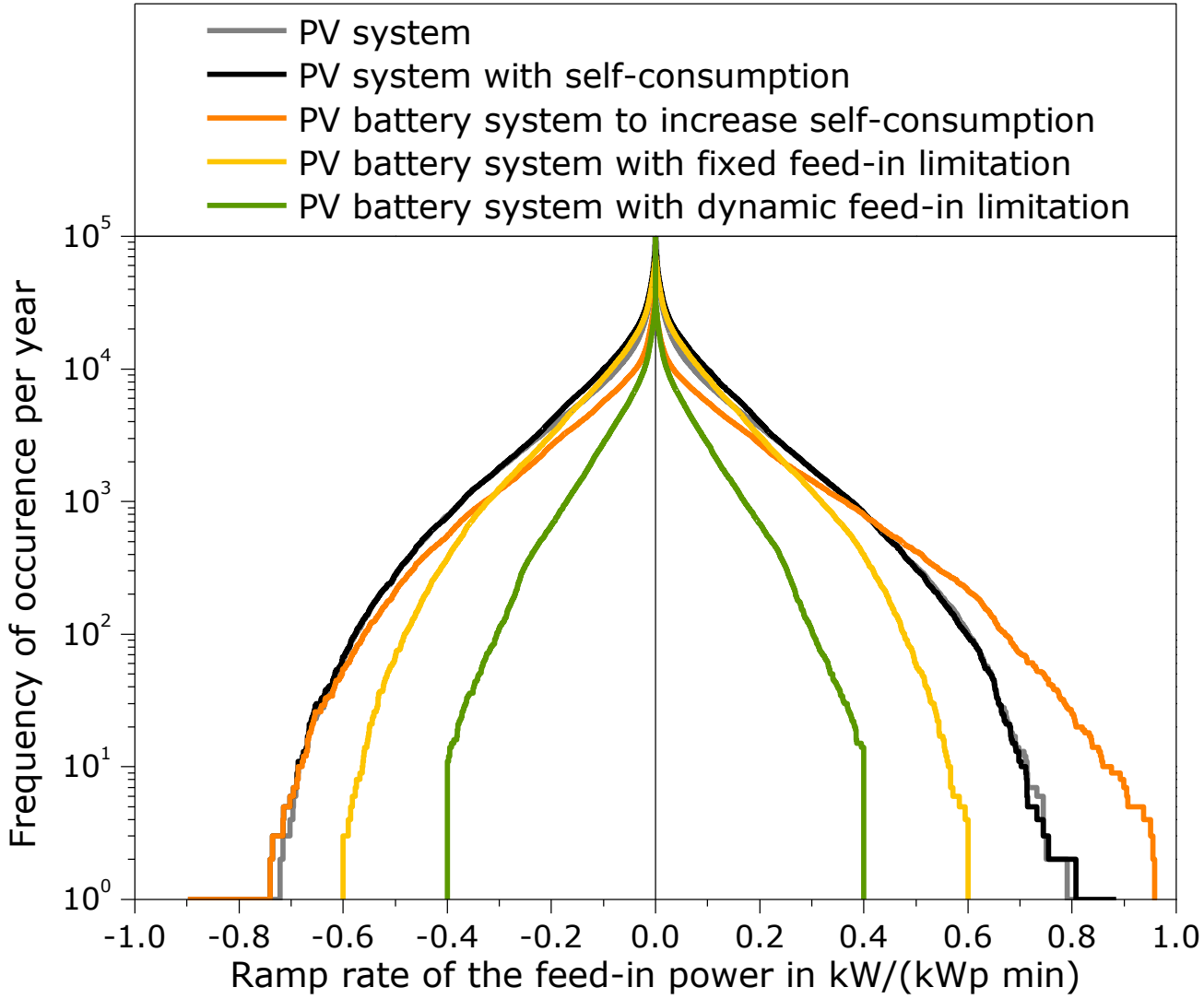
Assumptions: no direct use of PV power by the load, complete discharge of the battery at night
meteorological data: BSRN/DWD Lindenberg, Germany

Annual duration curve of the feed-in power



PV system size 4 kWp, usable battery capacity 4 kWh, annual load demand 4 MWh
load data: VDI 4655, meteorological data: BSRN/DWD Lindenberg, Germany

Ramp rates of the feed-in power



PV system size 4 kWp, usable battery capacity 4 kWh, annual load demand 4 MWh
load data: VDI 4655, meteorological data: BSRN/DWD Lindenberg, Germany

Conclusion

- By implementing forecasts of the PV power and load into the operation of PV battery systems, the self-consumption can be increased and the feed-in power can be reduced.
- With forecast-based operation strategies not only the peaks but also the ramps of the feed-in power are reduced.
- A dynamic feed-in limitation is also able to balance the feed-in profiles of existing PV systems.
- Decentralised battery systems can increase the hosting capacity of the electricity grid for PV systems.
- The conjunction of PV systems with batteries is of decisive importance to tap the whole PV potential.