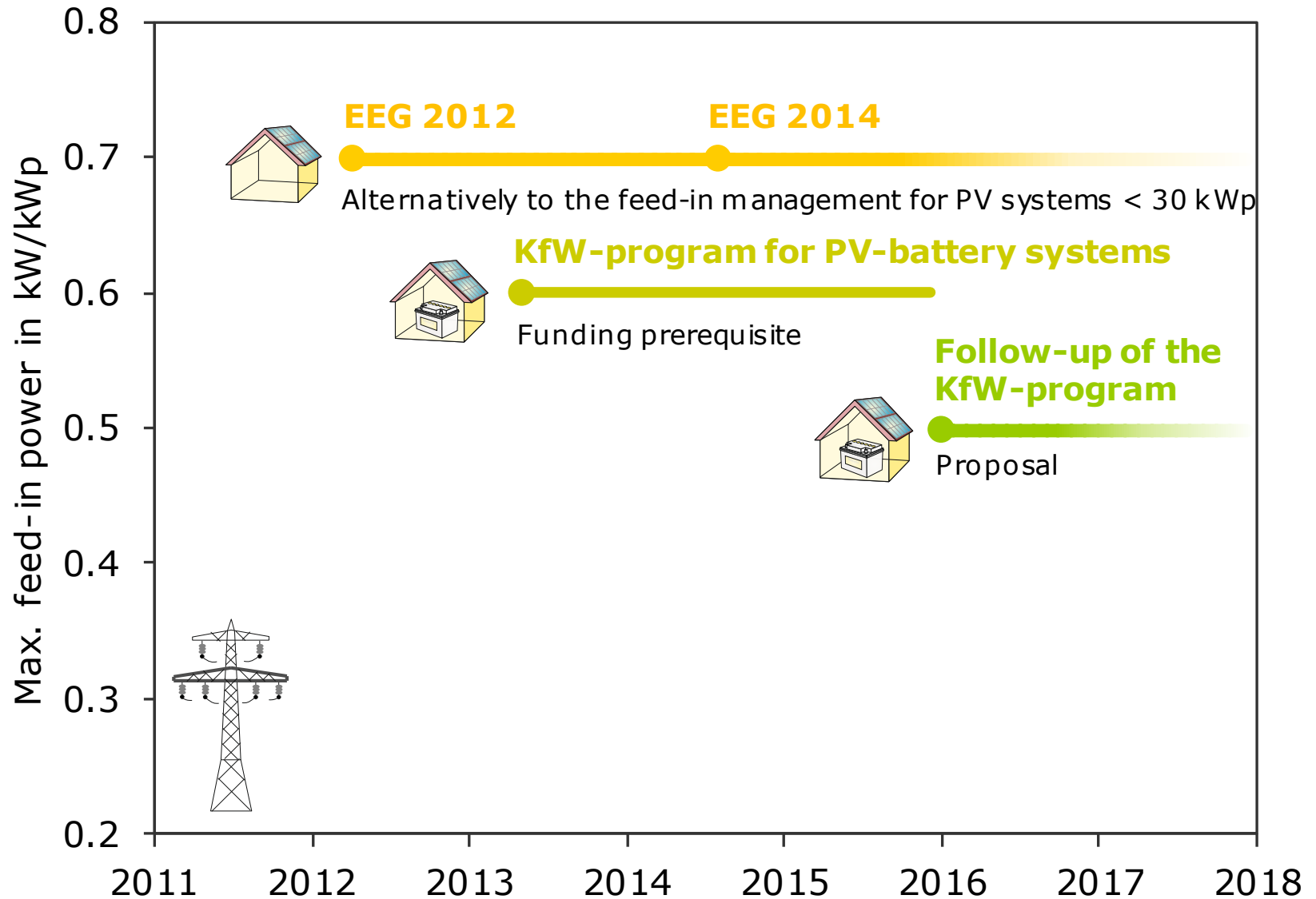# Grid Feed-in Behavior of Distributed PV Battery Systems

Johannes Weniger, Joseph Bergner, David Beier, Tjarko Tjaden, Volker Quaschning

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Incentives for the feed-in limitation in Germany

Max. feed-in power in kW/kWp

EEG 2012   **EEG 2014**

Alternatively to the feed-in management for PV systems < 30 kWp

KfW-program for PV-battery systems

Funding prerequisite

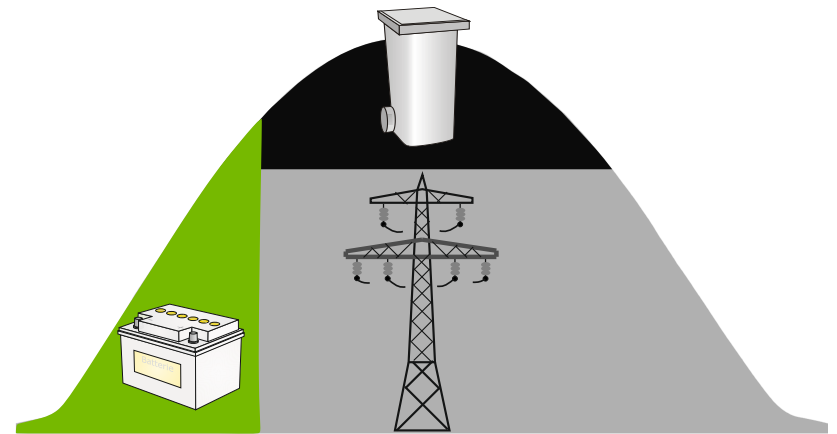**Follow-up of the KfW-program**

Proposal

htw

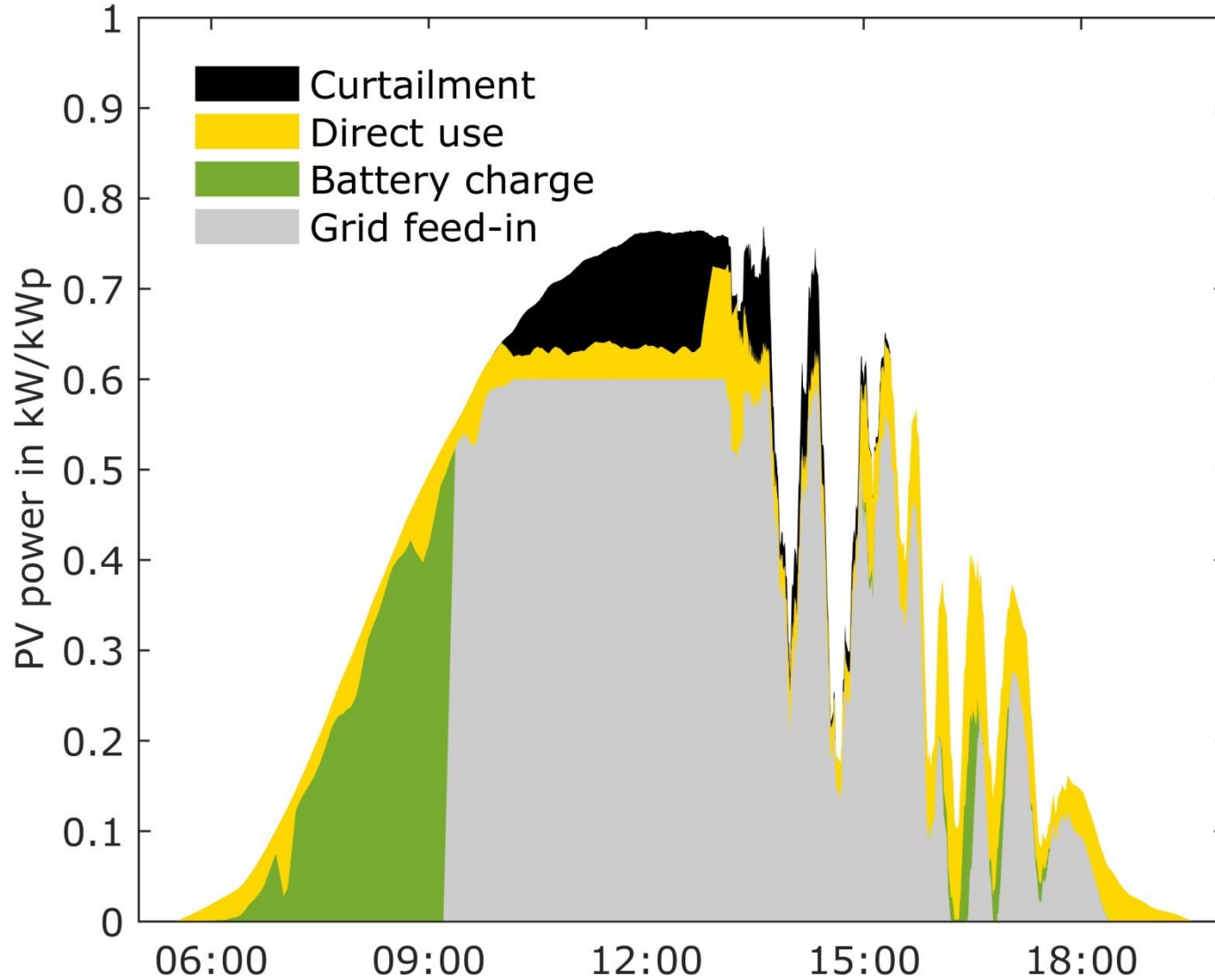# Operation strategies to realize a feed-in limitation
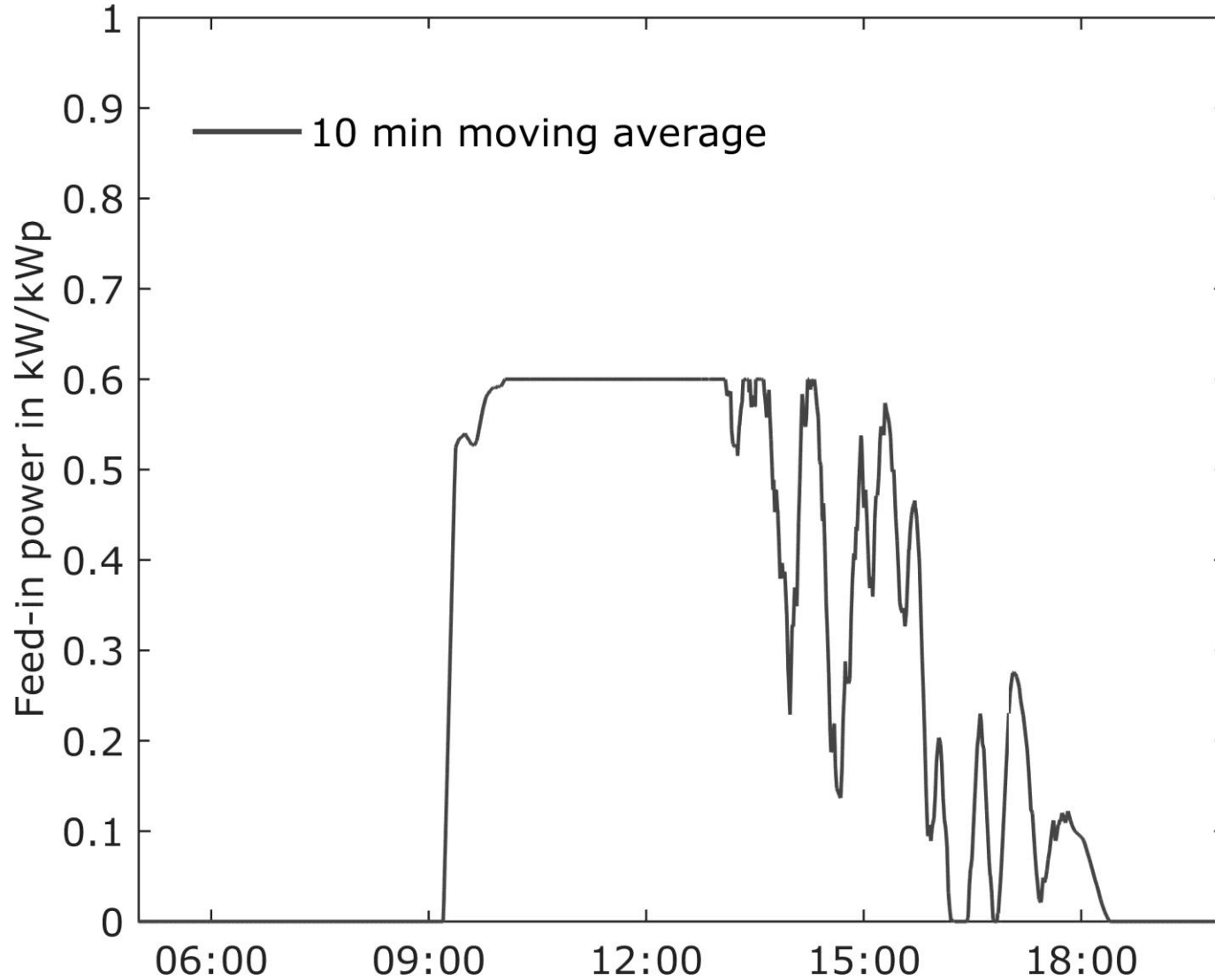
Peak-shaving by battery charging
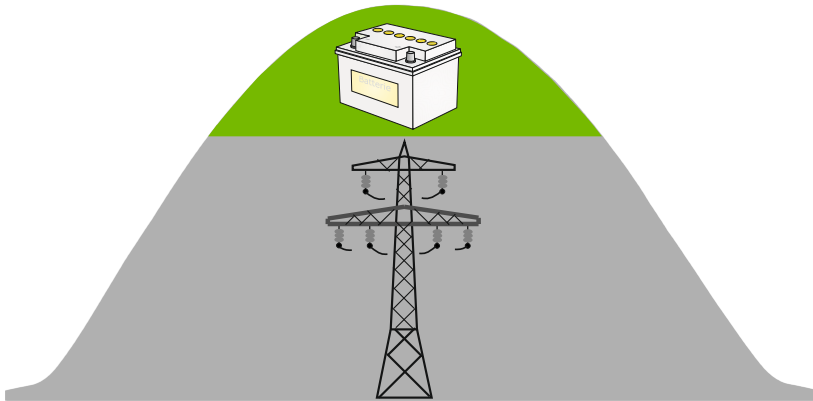
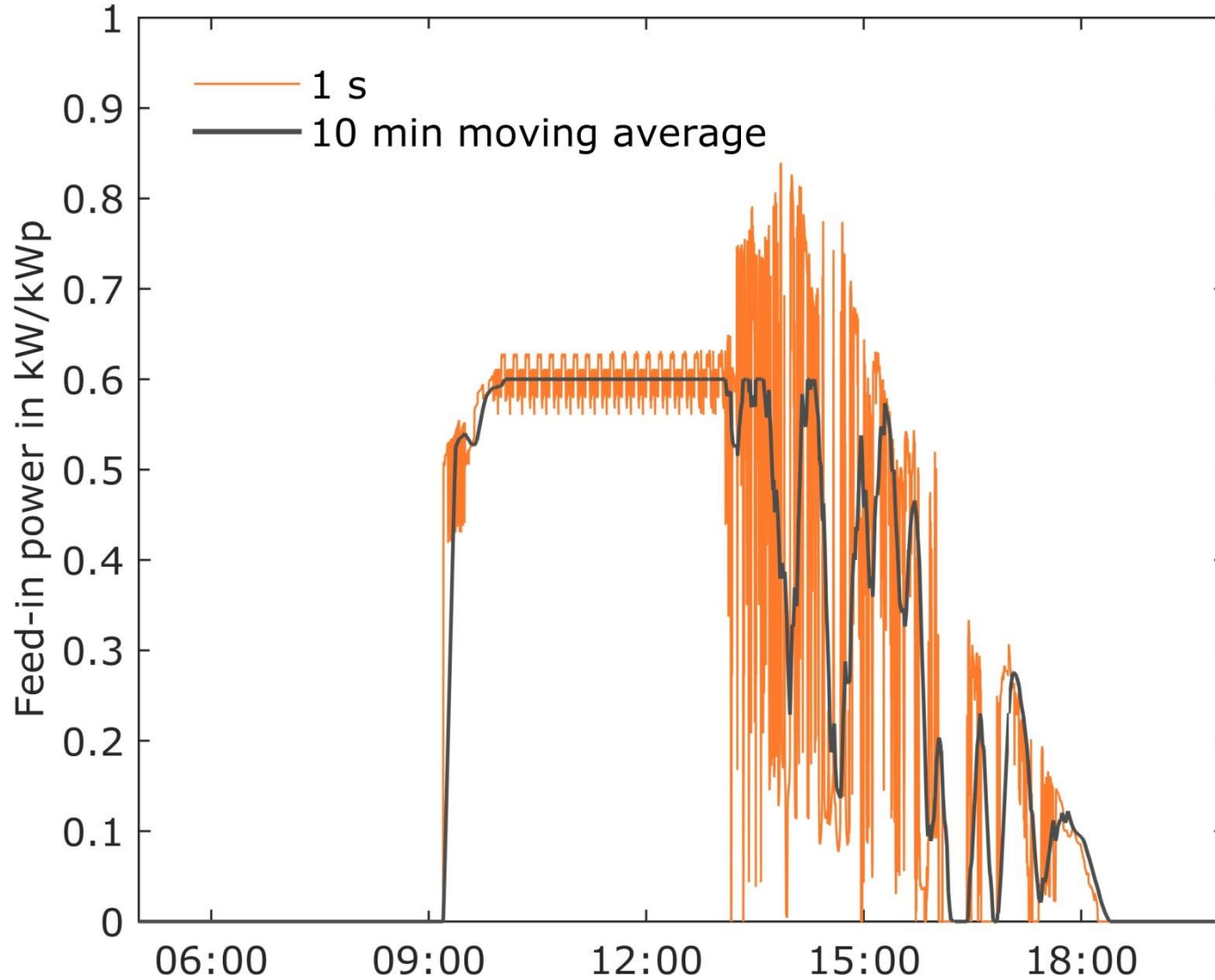**Peak-shaving by PV curtailment**

htw.

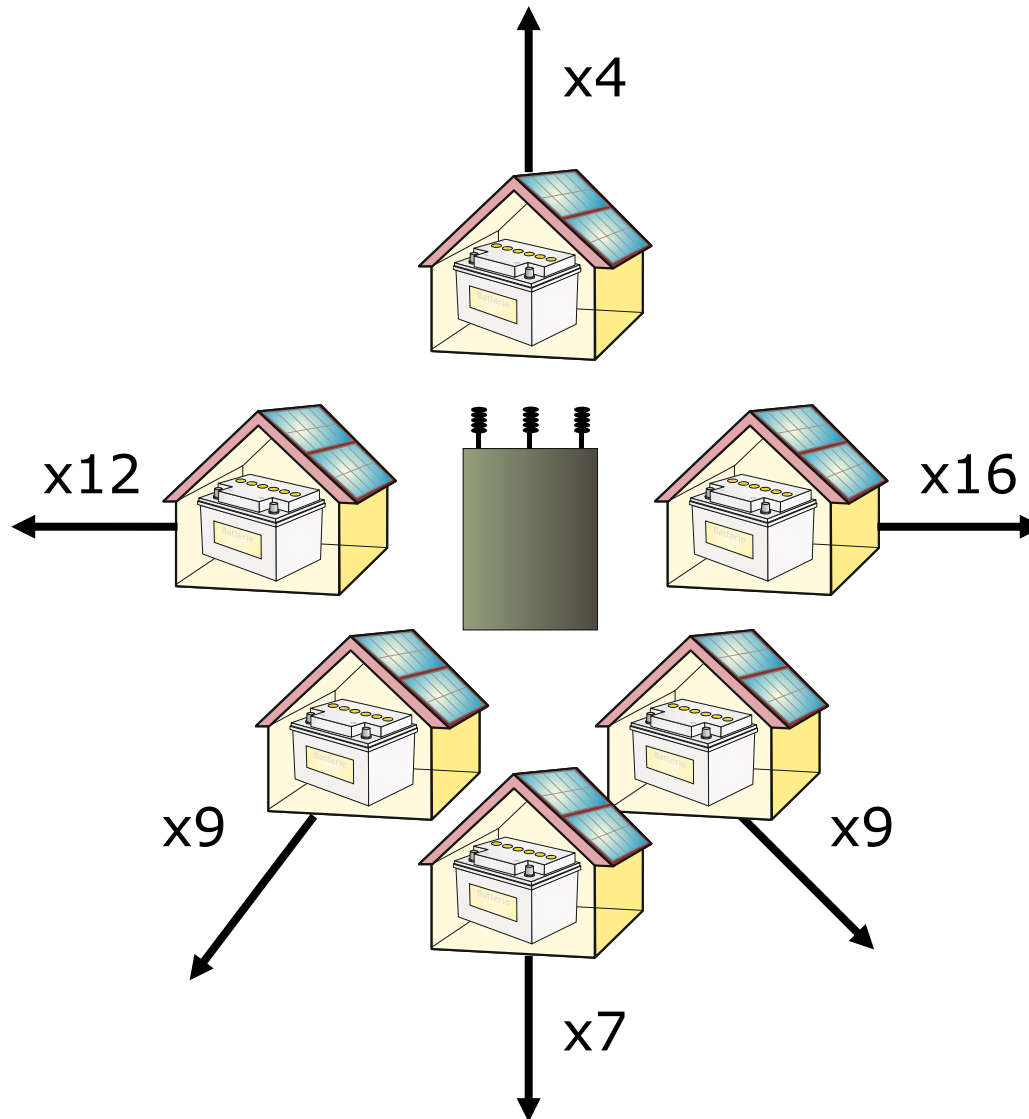# Energy flows of a single PV battery system

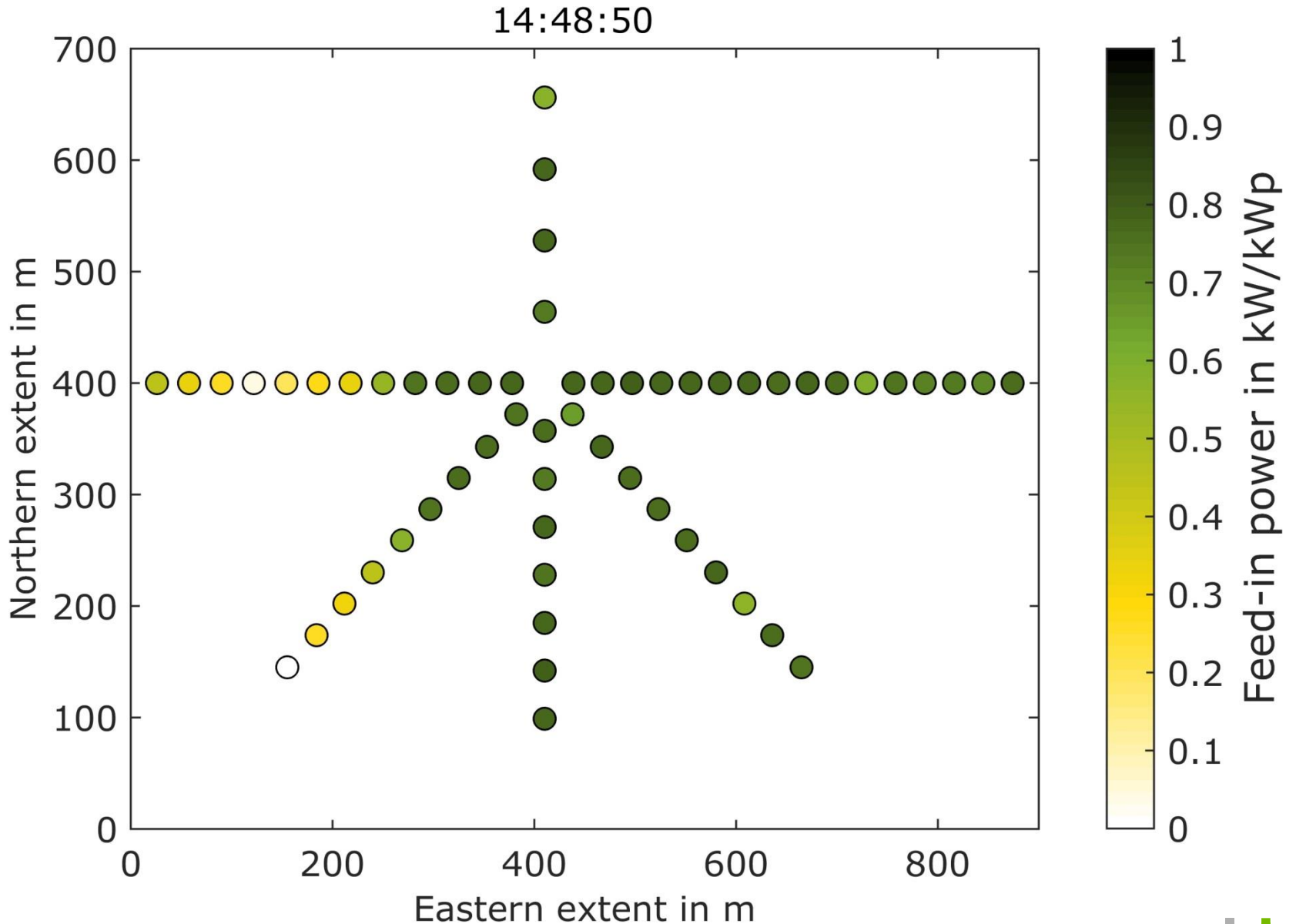# Grid feed-in behavior of a single PV battery system

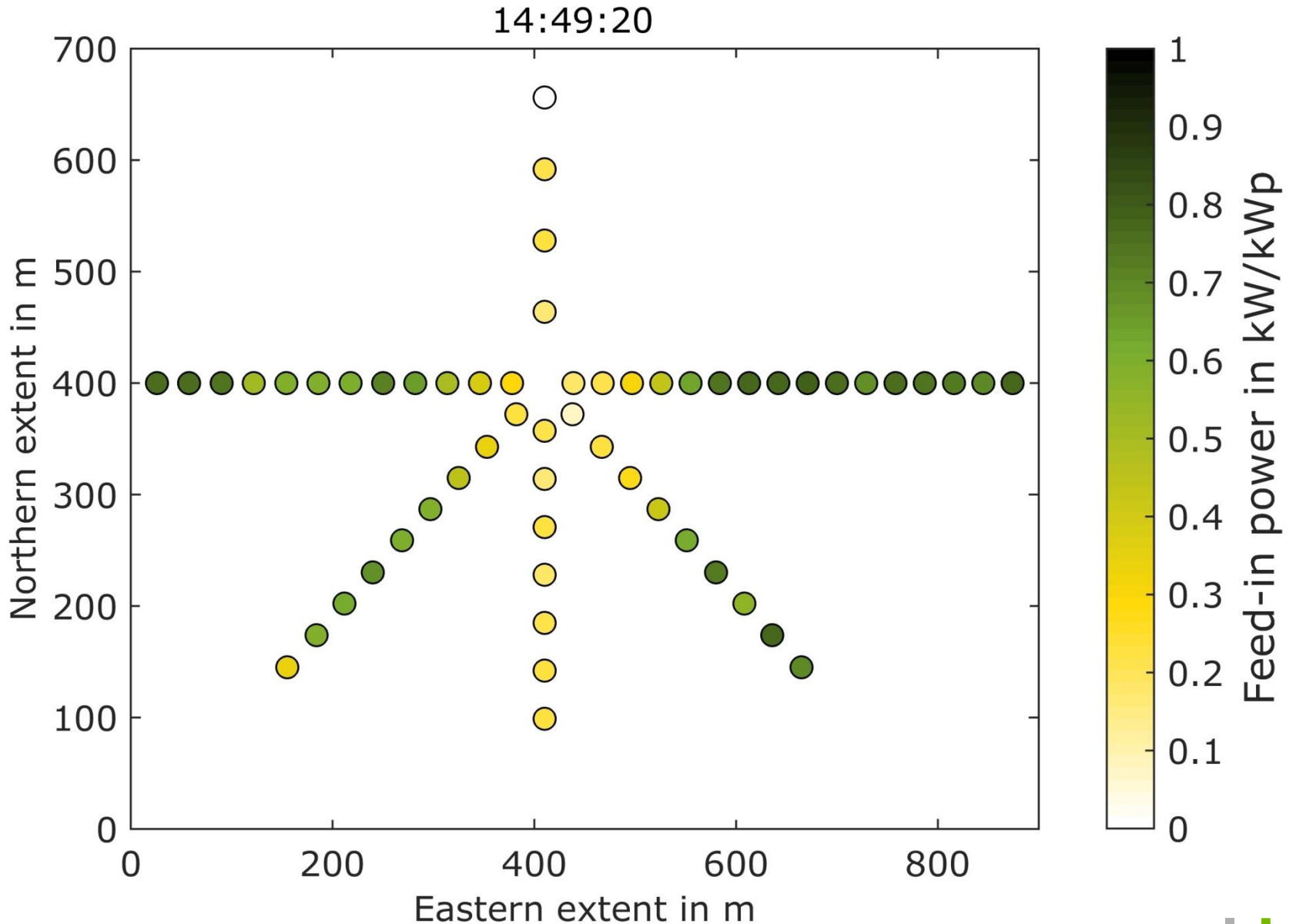# Grid feed-in behavior of a single PV battery system

htw.

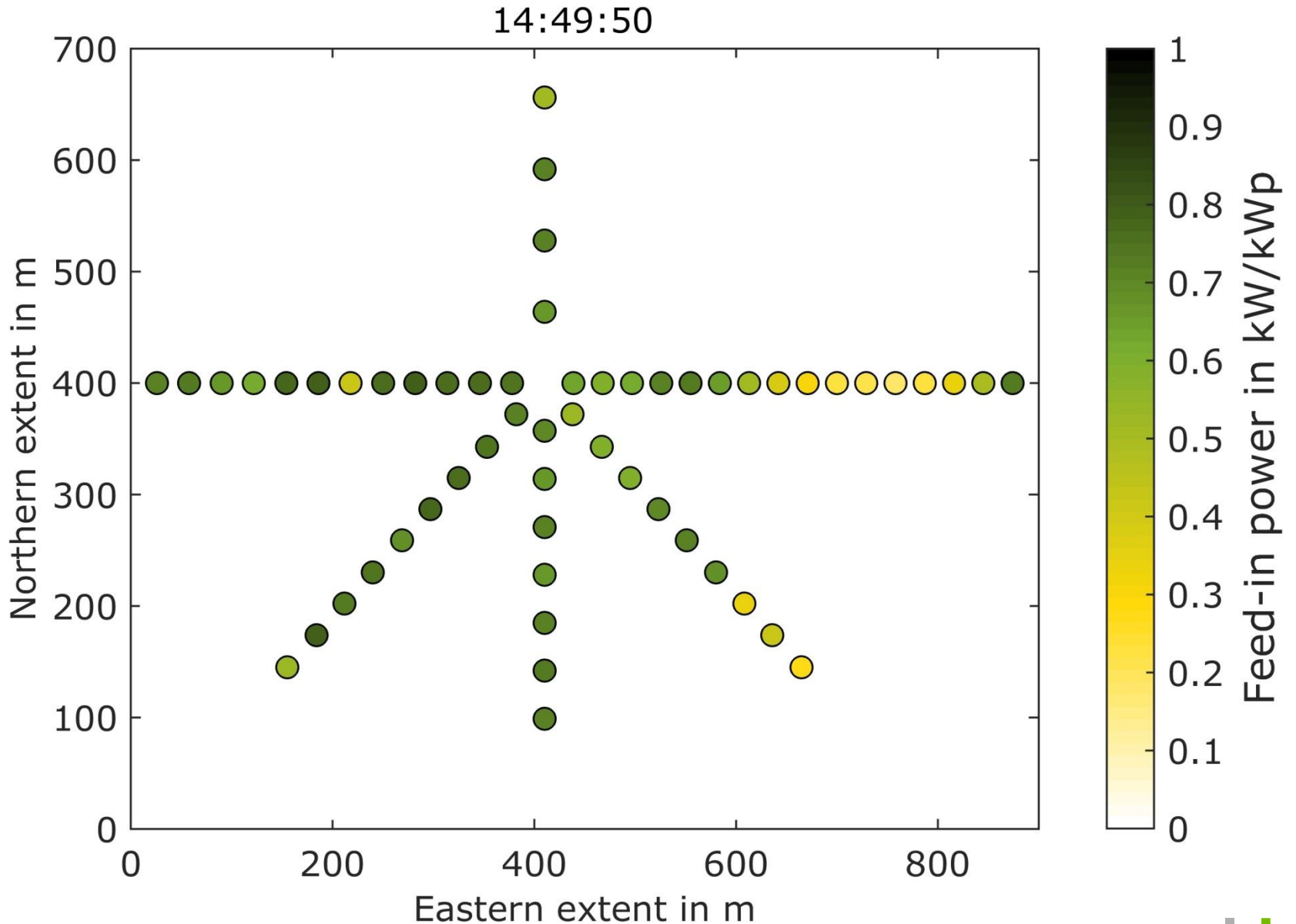# Simulation set-up of the distributed PV battery systems

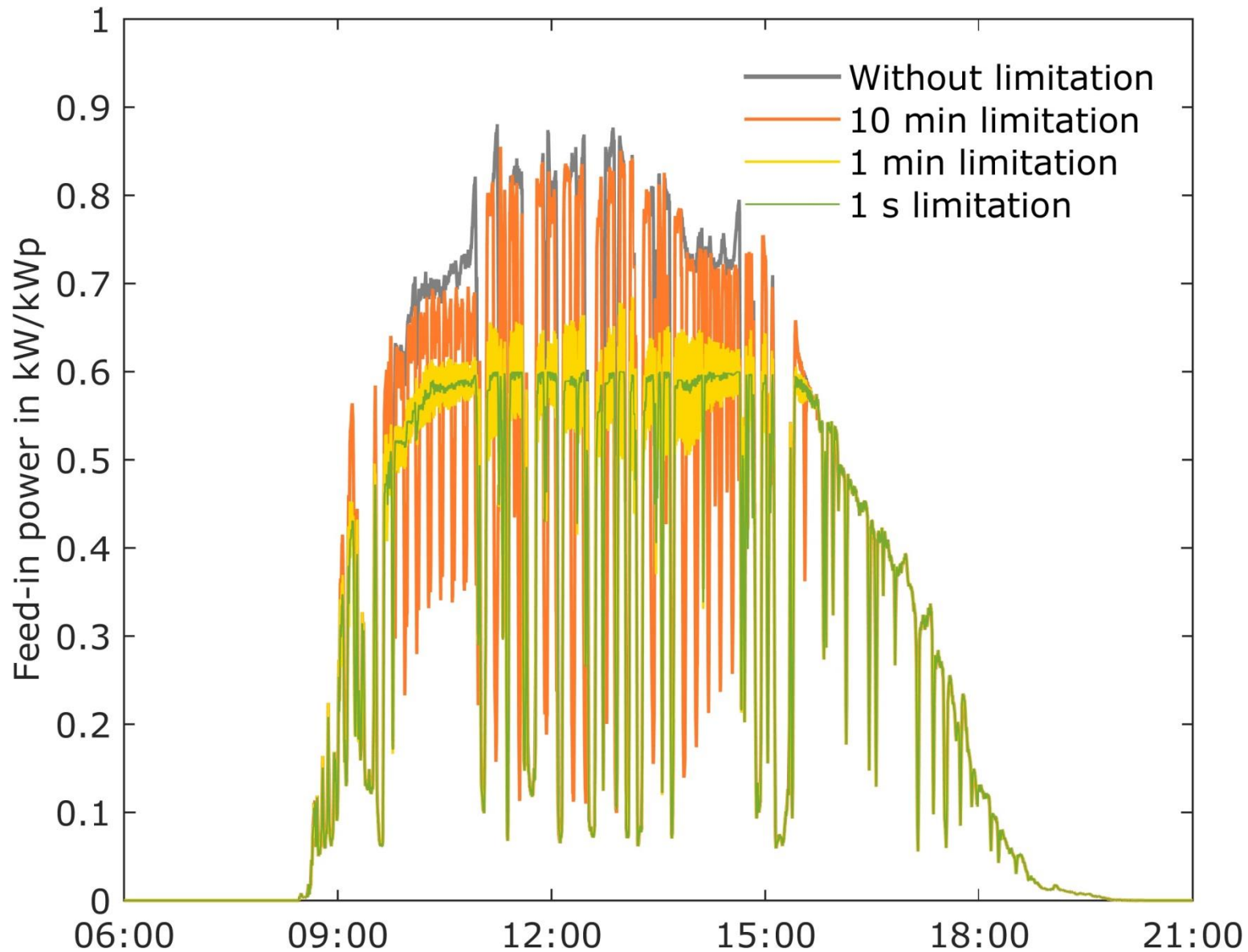# Grid feed-in behavior of distributed PV battery systems

Grid feed-in behavior of distributed PV battery systems

Grid feed-in behavior of distributed PV battery systems

Cumulative feed-in power of the PV battery systems

Conclusion

- Shaving feed-in peaks without shifting the battery charging causes **unnecessary curtailment losses**.

- Limiting the feed-in power to their 10 min moving average does **not avoid short-term feed-in peaks**.

- Feed-in peaks can be mitigated by **reducing the averaging interval** from 10 min to 1 min or less.

- A reduction of the feed-in limit to 0.5 kW/kWp can **improve the grid integration** of PV battery systems further.

- Distributed battery systems can **increase the hosting capacity** of the electricity grid for PV systems.

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