

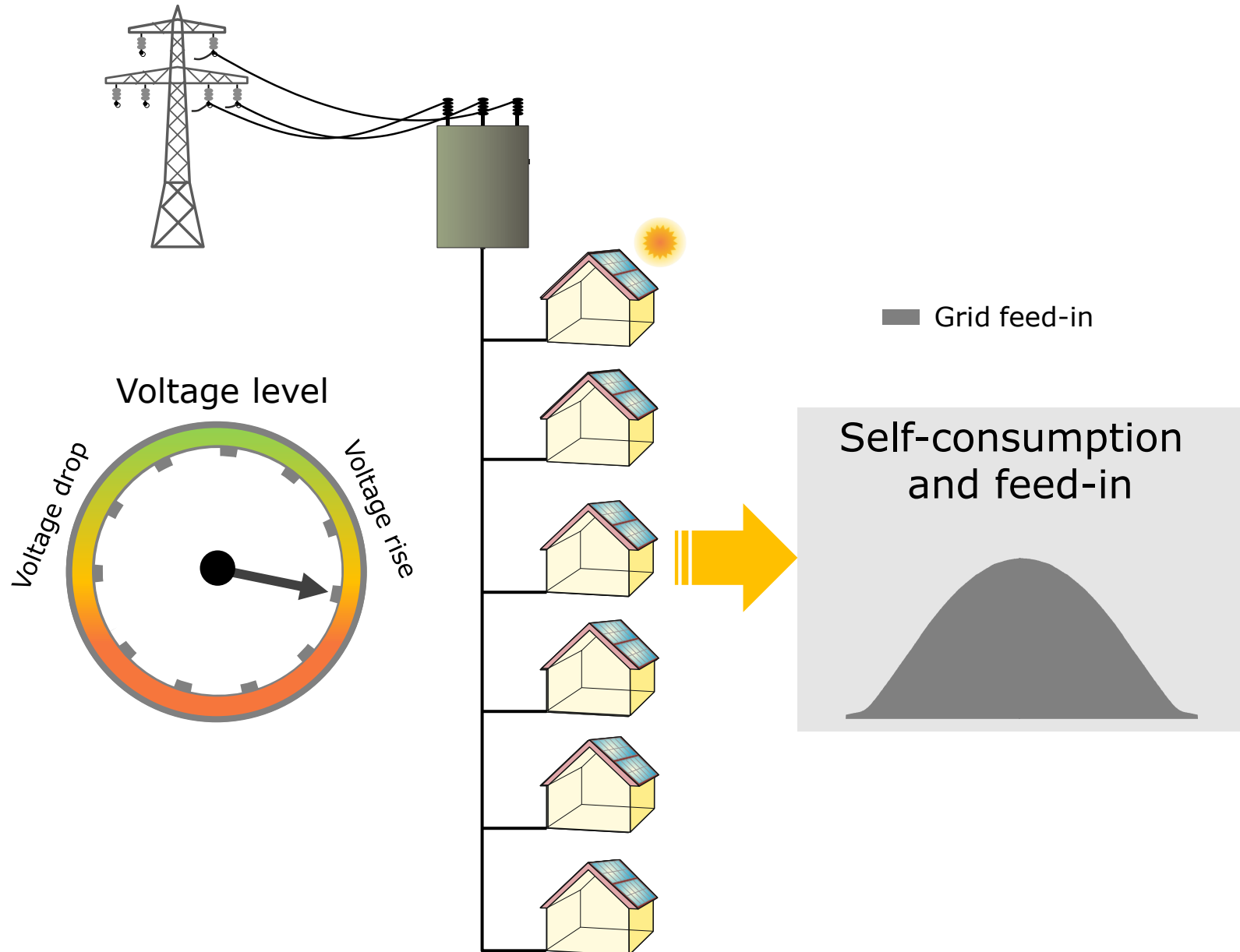


Feed-in Power Limitation of Grid-Connected PV Battery Systems with Autonomous Forecast-Based Operation Strategies

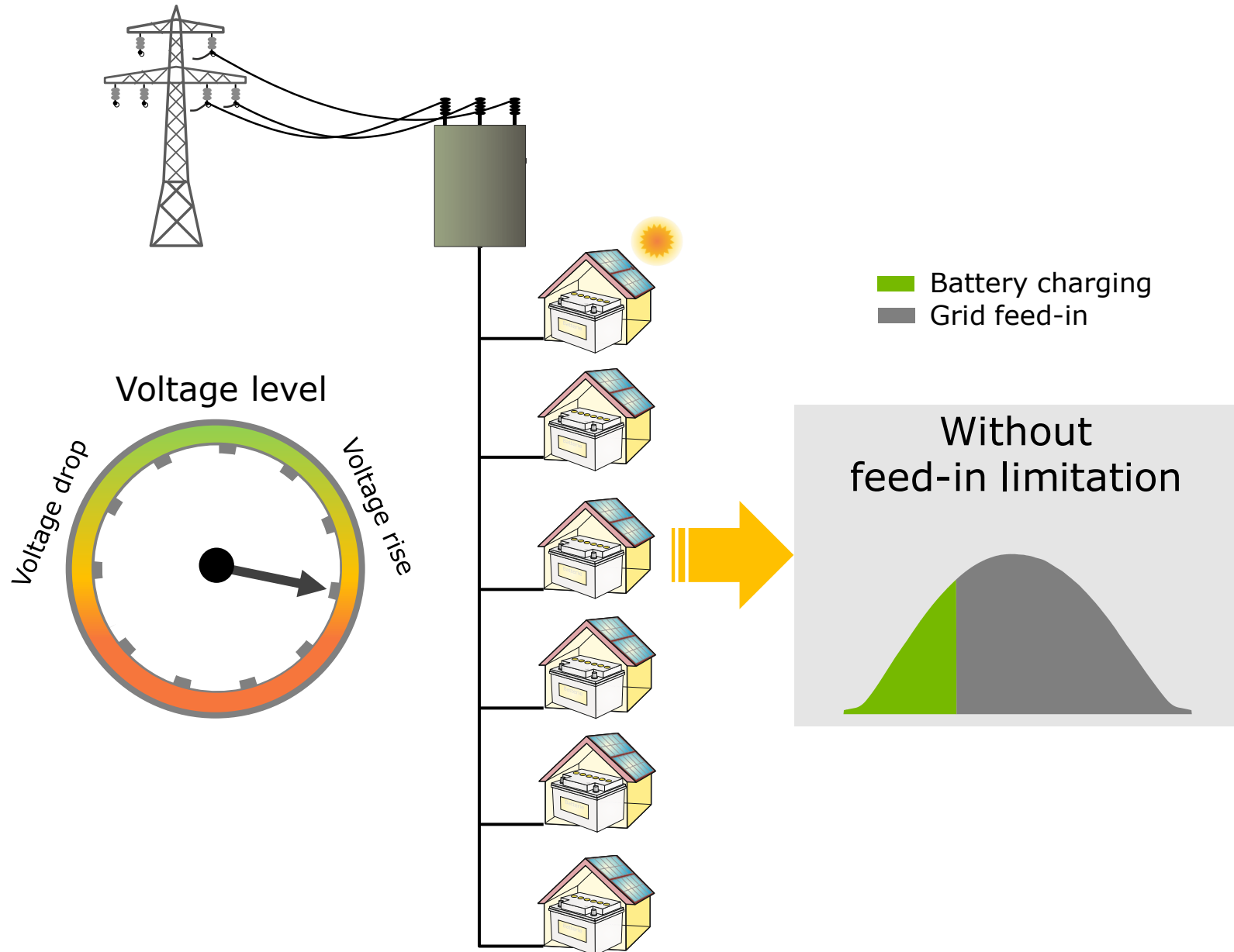
Joseph Bergner, Johannes Weniger, Tjarko Tjaden, Volker Quaschnig
HTW Berlin - University of Applied Sciences, Germany

29th European PV Solar Energy Conference and Exhibition
24th September 2014, Amsterdam, The Netherlands

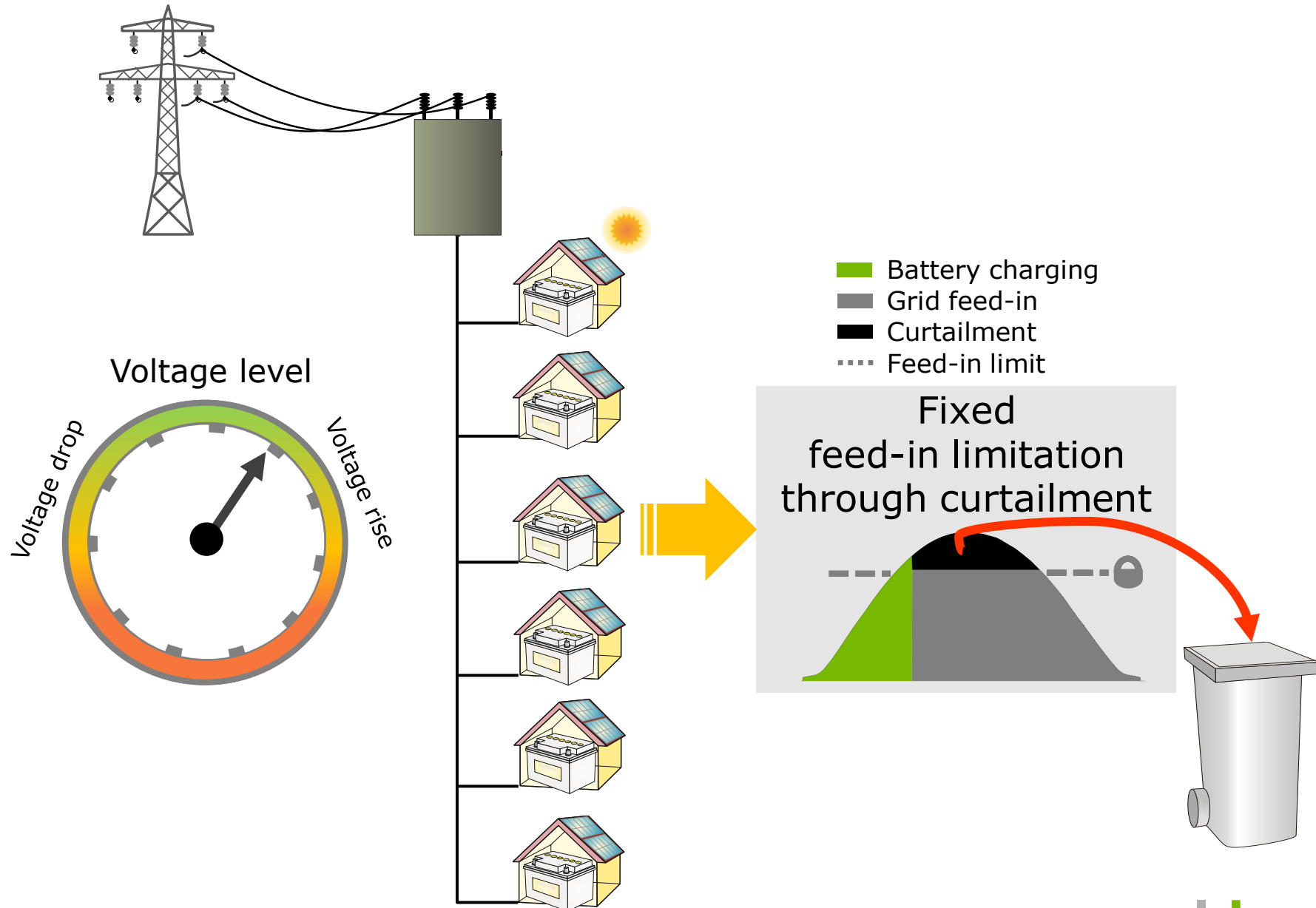
Impact of the PV operation in the low voltage grid



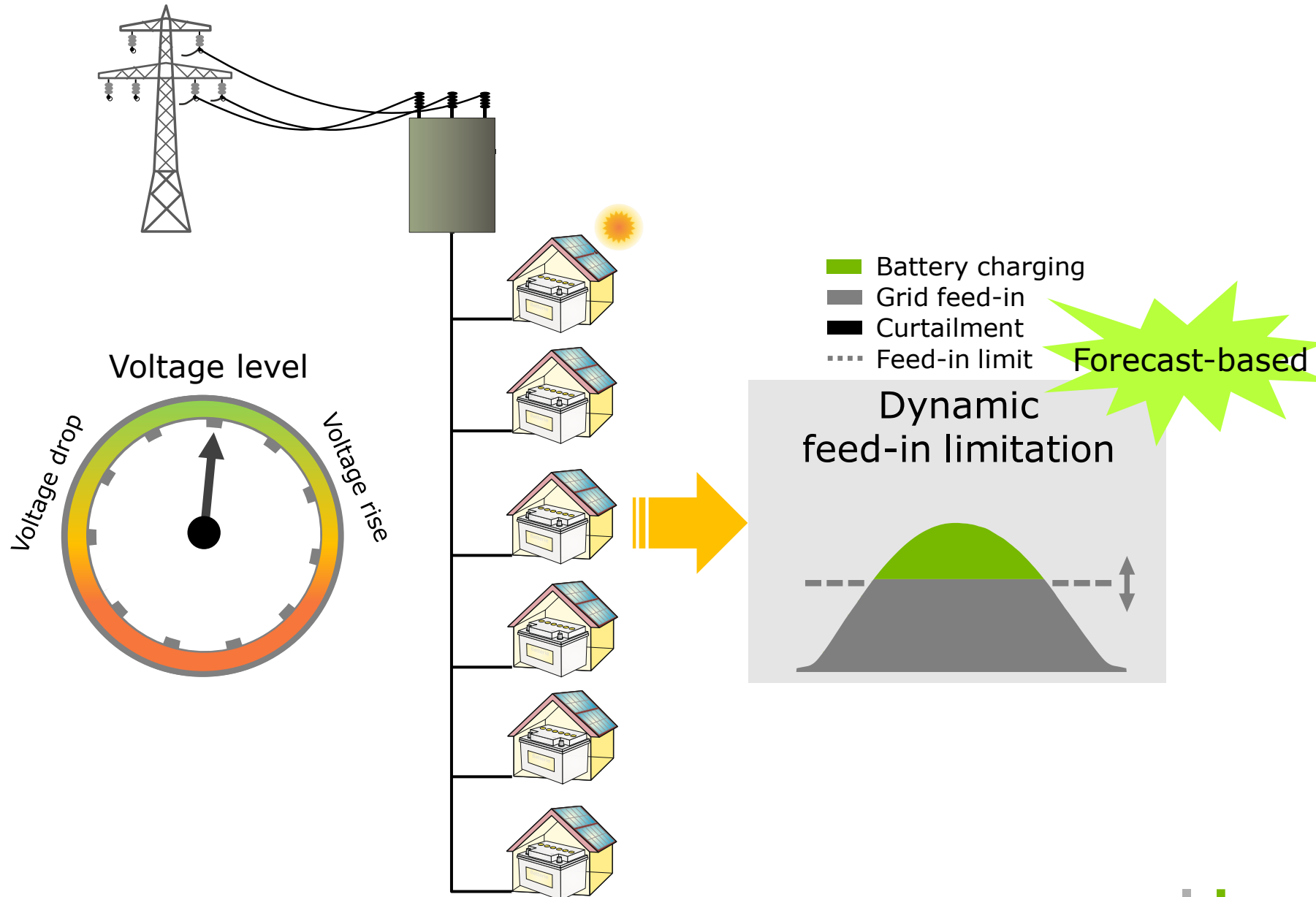
Impact of the PV operation in the low voltage grid



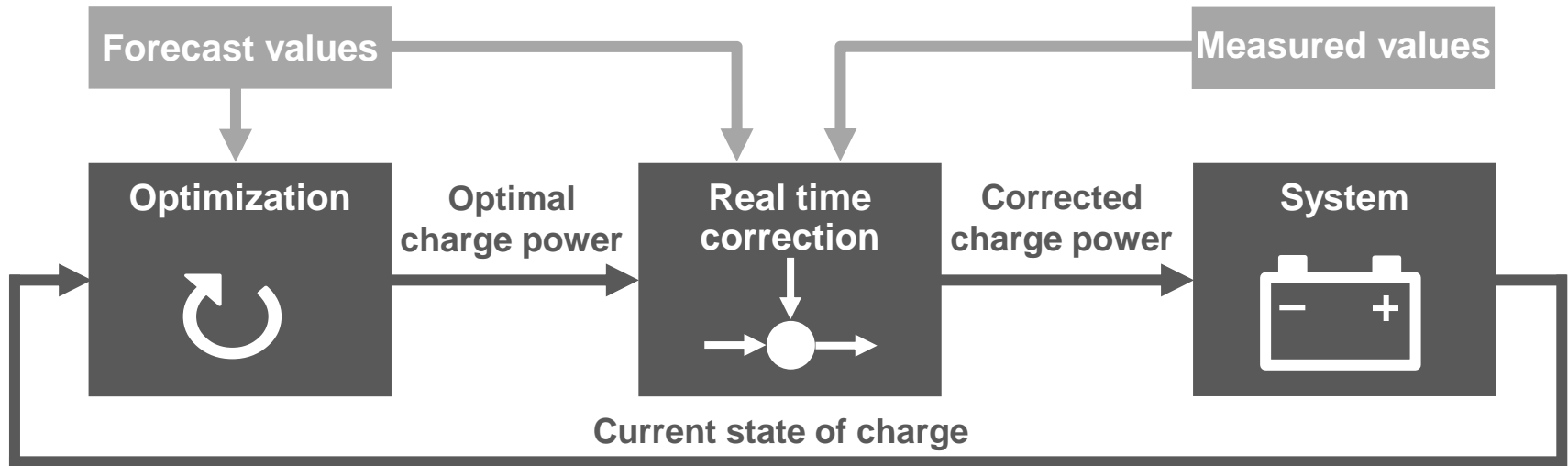
Impact of the PV operation in the low voltage grid



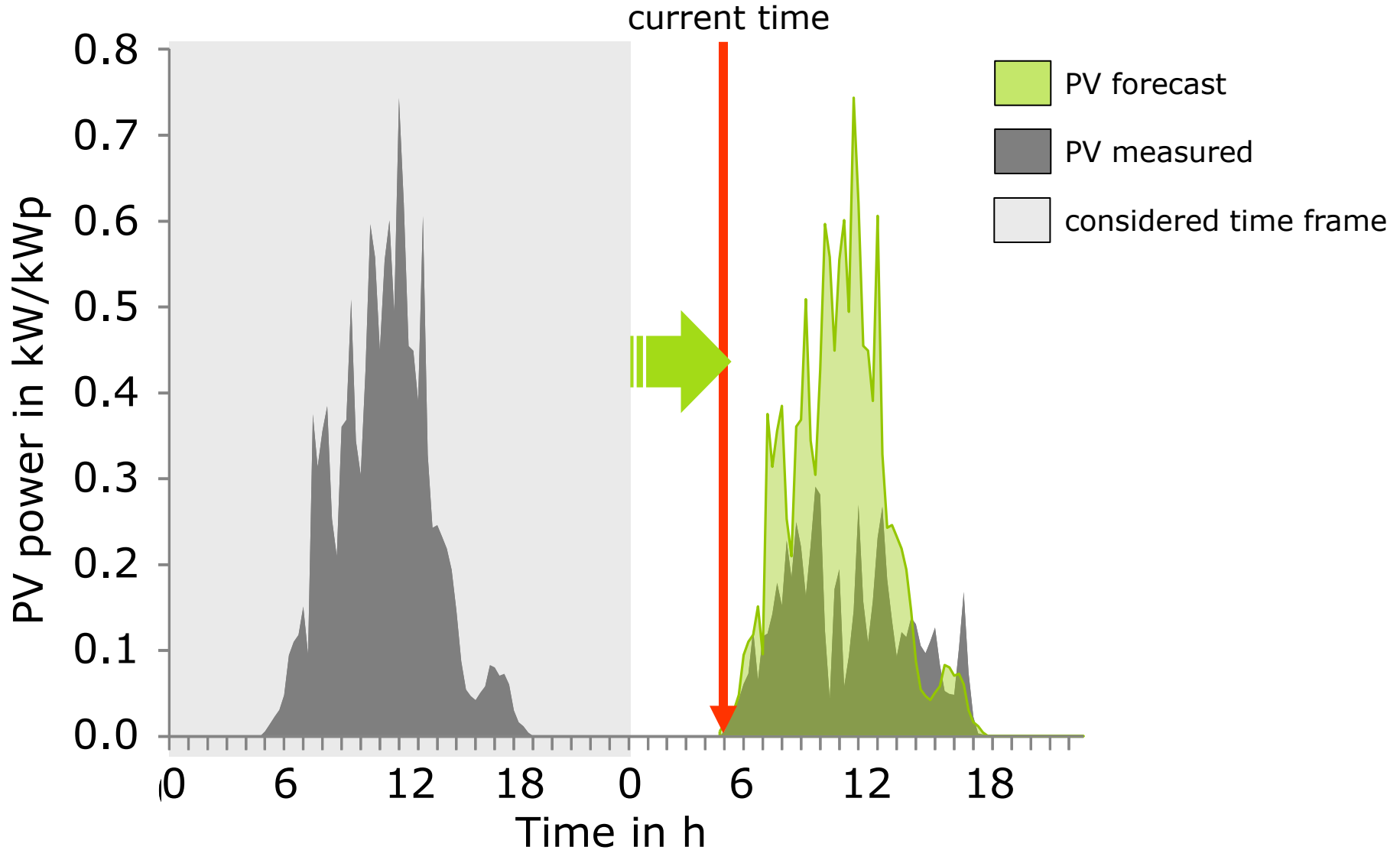
Impact of the PV operation in the low voltage grid



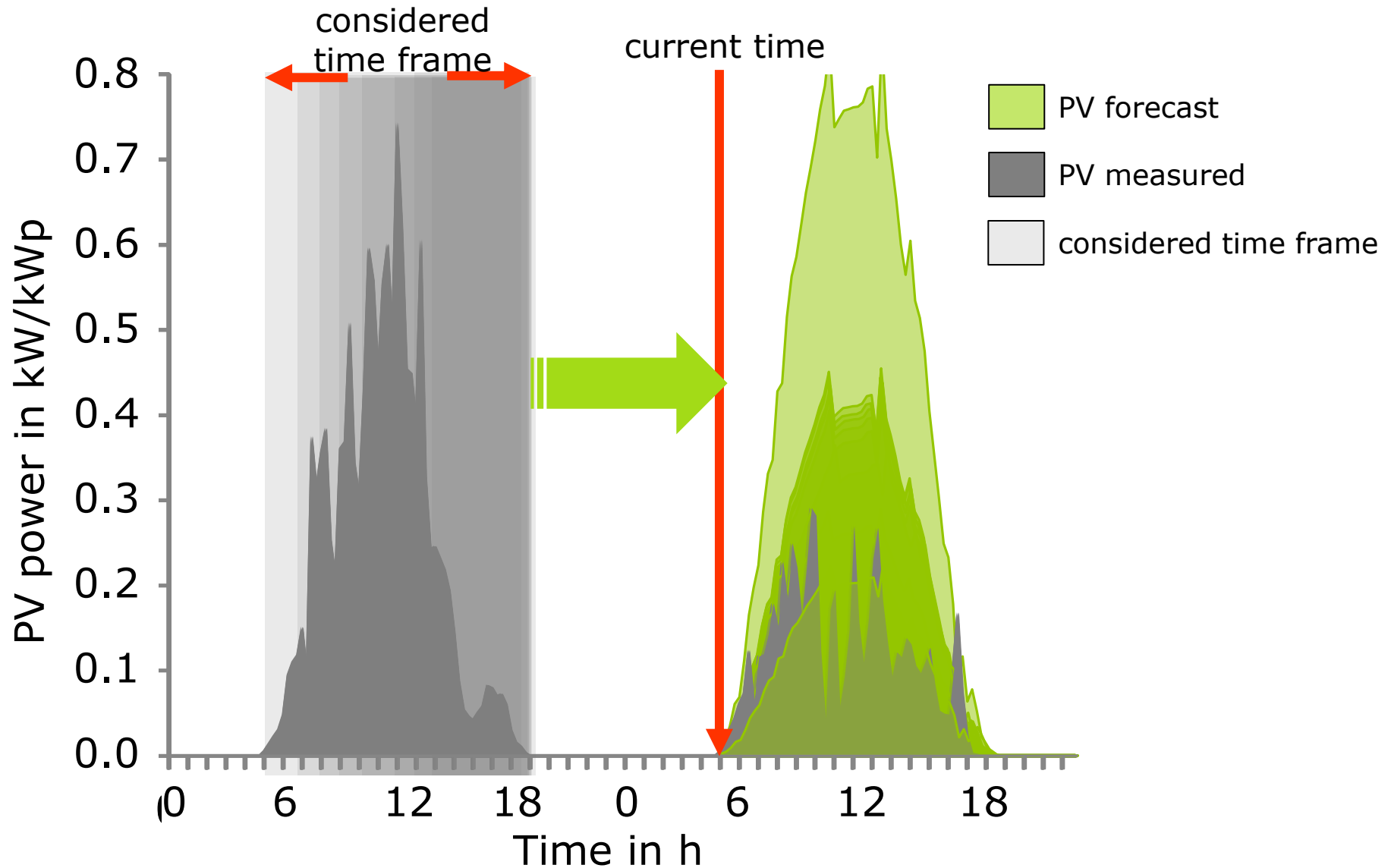
Implementation of forecast-based operation strategies



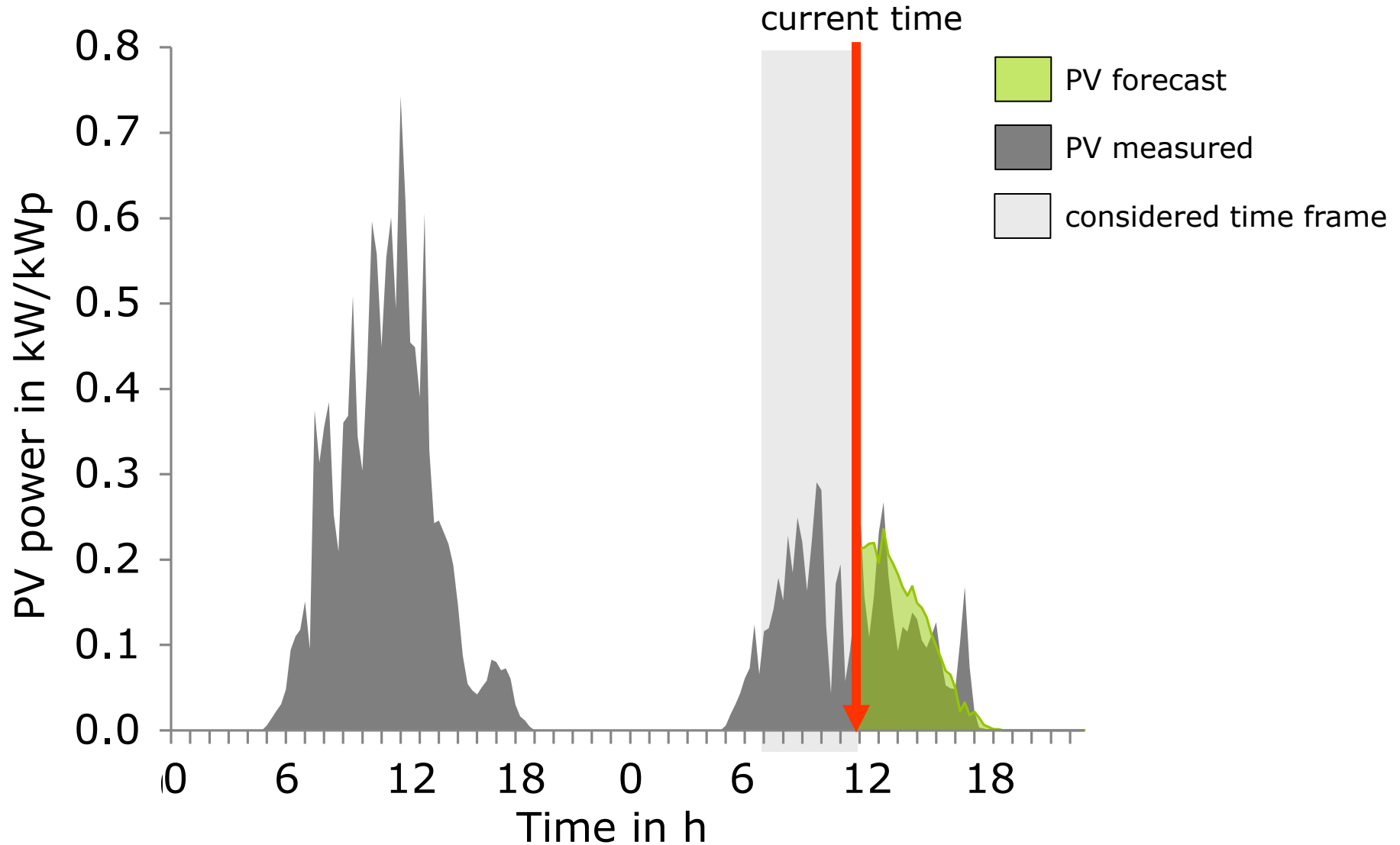
Approaches for autonomous PV forecast: persistence





Approaches for autonomous PV forecast: adaptive

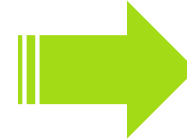


Approaches for autonomous PV forecast: adaptive

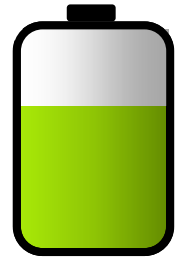




Impact of forecast errors

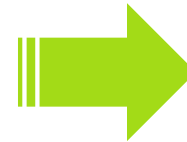
 Forecasted PV $>$  Measured PV



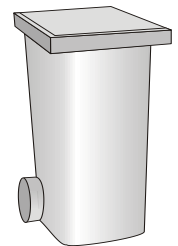
Grid supply



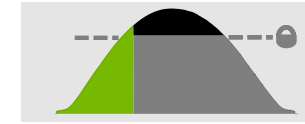
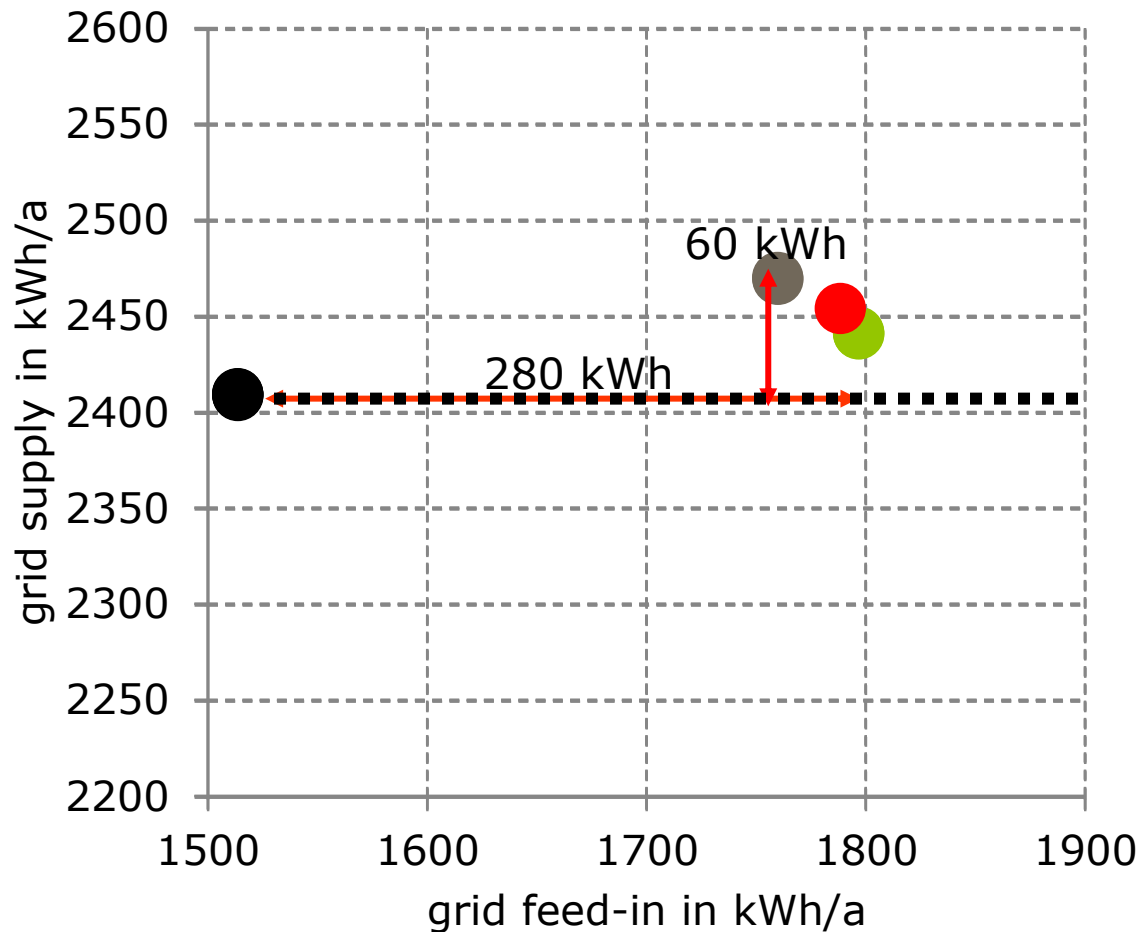
 Forecasted PV $<$  Measured PV



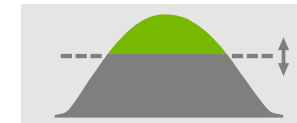
Grid feed-in



Energetic performance with different PV forecasts



● fixed feed-in limitation through curtailment

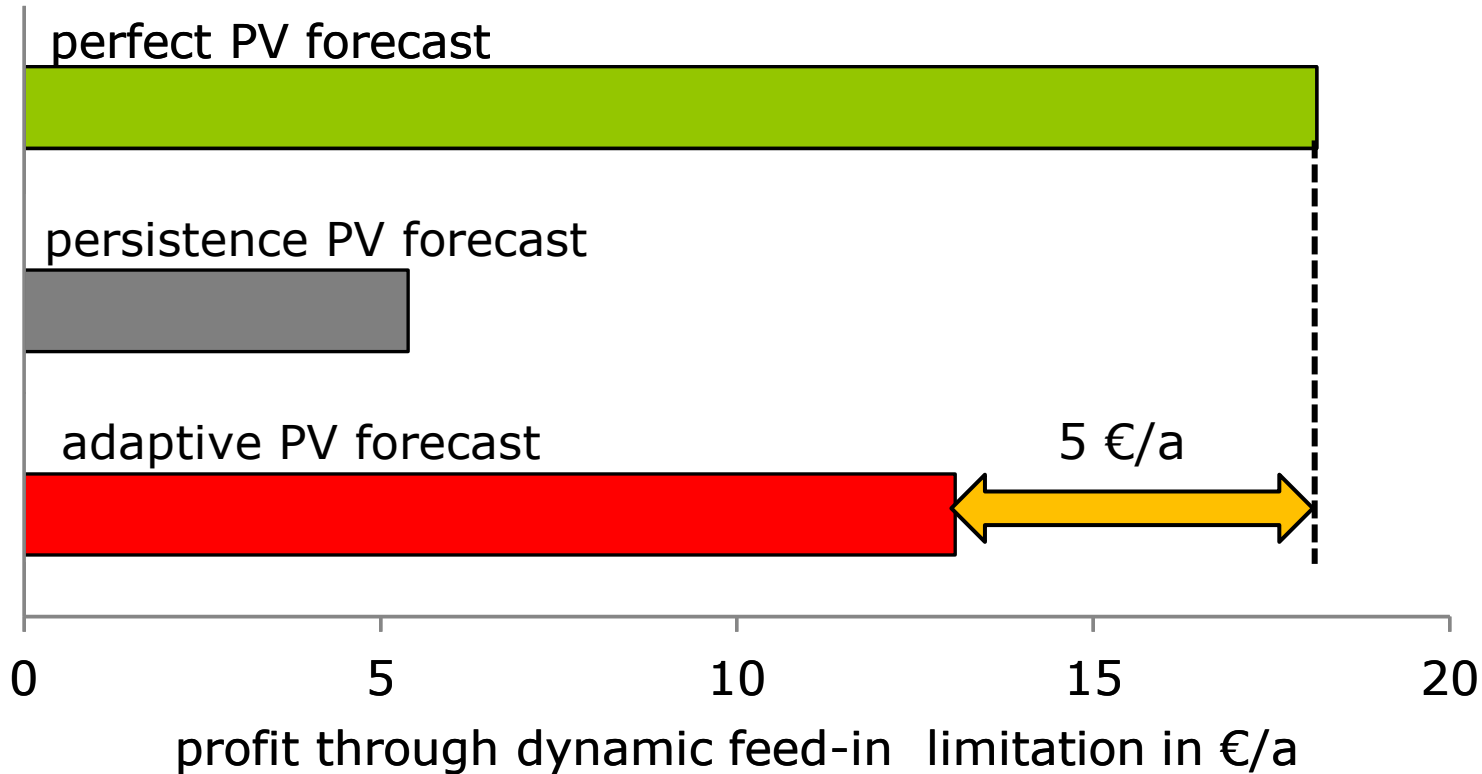
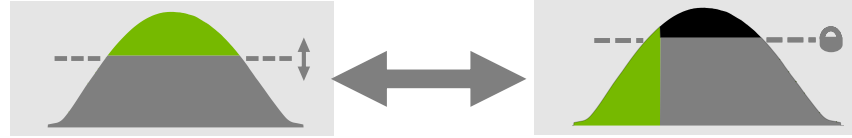


dynamic feed-in limitation with:

- perfect PV forecast
- persistence PV forecast
- adaptive PV forecast

Single family household: Load demand 5.3 MWh/a, PV system 5.3 kWp,
 Max. feed-in power 0.5 kW/kWp, battery capacity 5.3 kWh, persistence load forecast

Economic performance with different PV forecasts



Single family household: Load demand 5.3 MWh/a, PV system 5.3 kWp, maximum feed-in 0.5 kW/kWp, battery capacity 5.3 kWh, feed-in tariff 10 ct/kWh, retail el. price 30 ct/kWh persistence load forecast

Conclusions

- A lower **mandatory feed-in limit** is decisive for improved grid integration of PV battery systems.
- The benefit for the system's owner could be obtained by additional **feed-in** which **needs to be remunerated**.
- **For economic and technical reasons** PV battery systems should be operated with **dynamic feed-in limitation**.
- **Simple forecast** approaches are sufficient to **realize a peak shaving operation** of PV battery systems as basis for further PV expansion.