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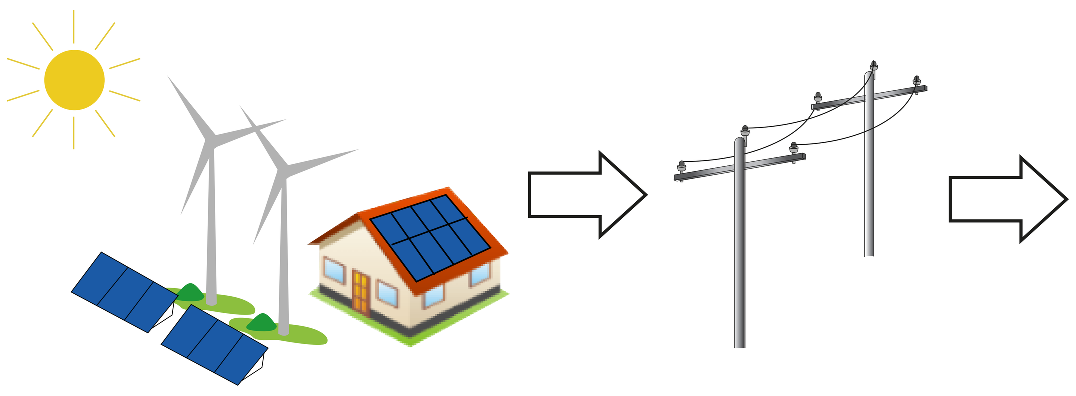
The positive contribution of decentralized battery storage systems for a stable supply of power

Franz Bauer M.Eng., Prof. Dr.-Ing. Michael Sterner, Fabian Eckert M.Sc., Martin Thema M.Sc.

FENES FORSCHUNGSSTELLE FÜR ENERGIENETZE UND ENERGIESPEICHER

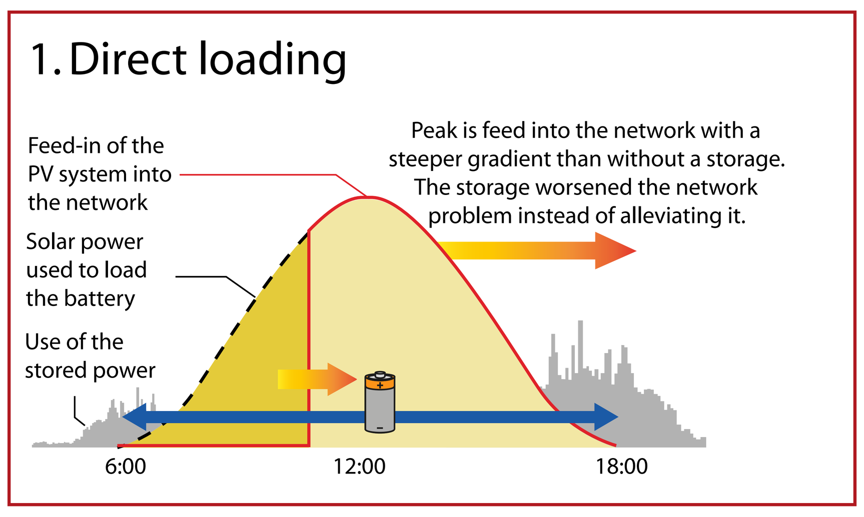
OTH OSTBAYERISCHE TECHNISCHE HOCHSCHULE REGENSBURG

Why should Battery storgae systems operate network supportive?

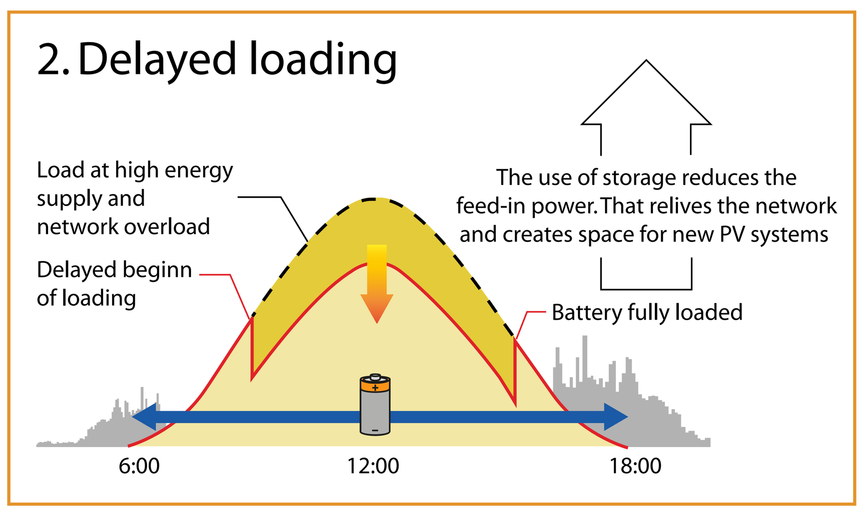


Problems with voltage stability
To less short-circuit power
Assymmetrical load
High feed-in peaks by PV

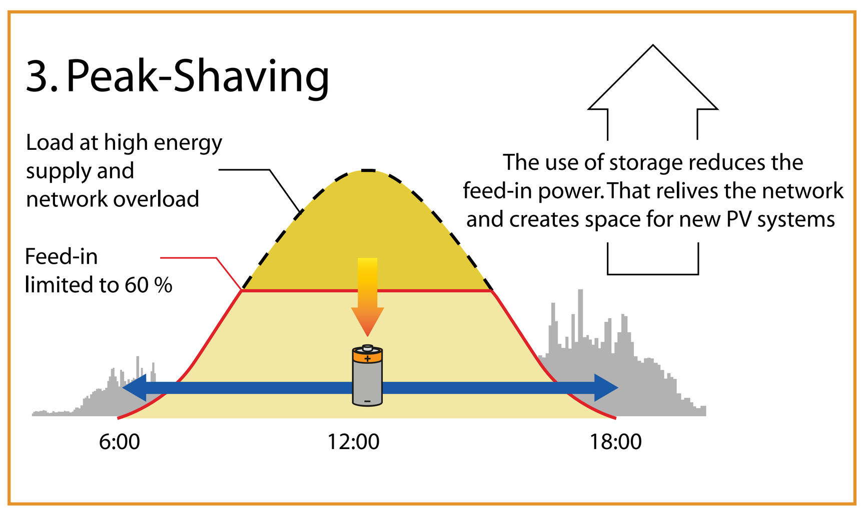
The four different types of loading a battery storage system with a PV system



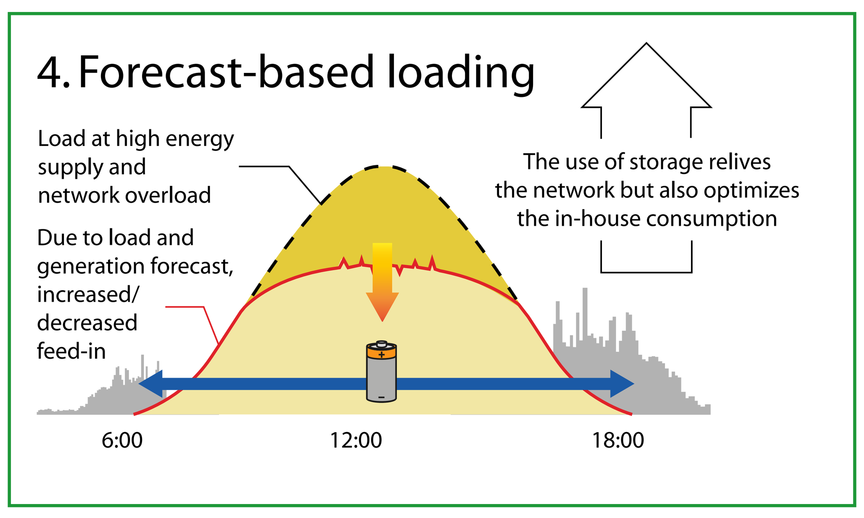
Optimize in-house consumption



Network supportive

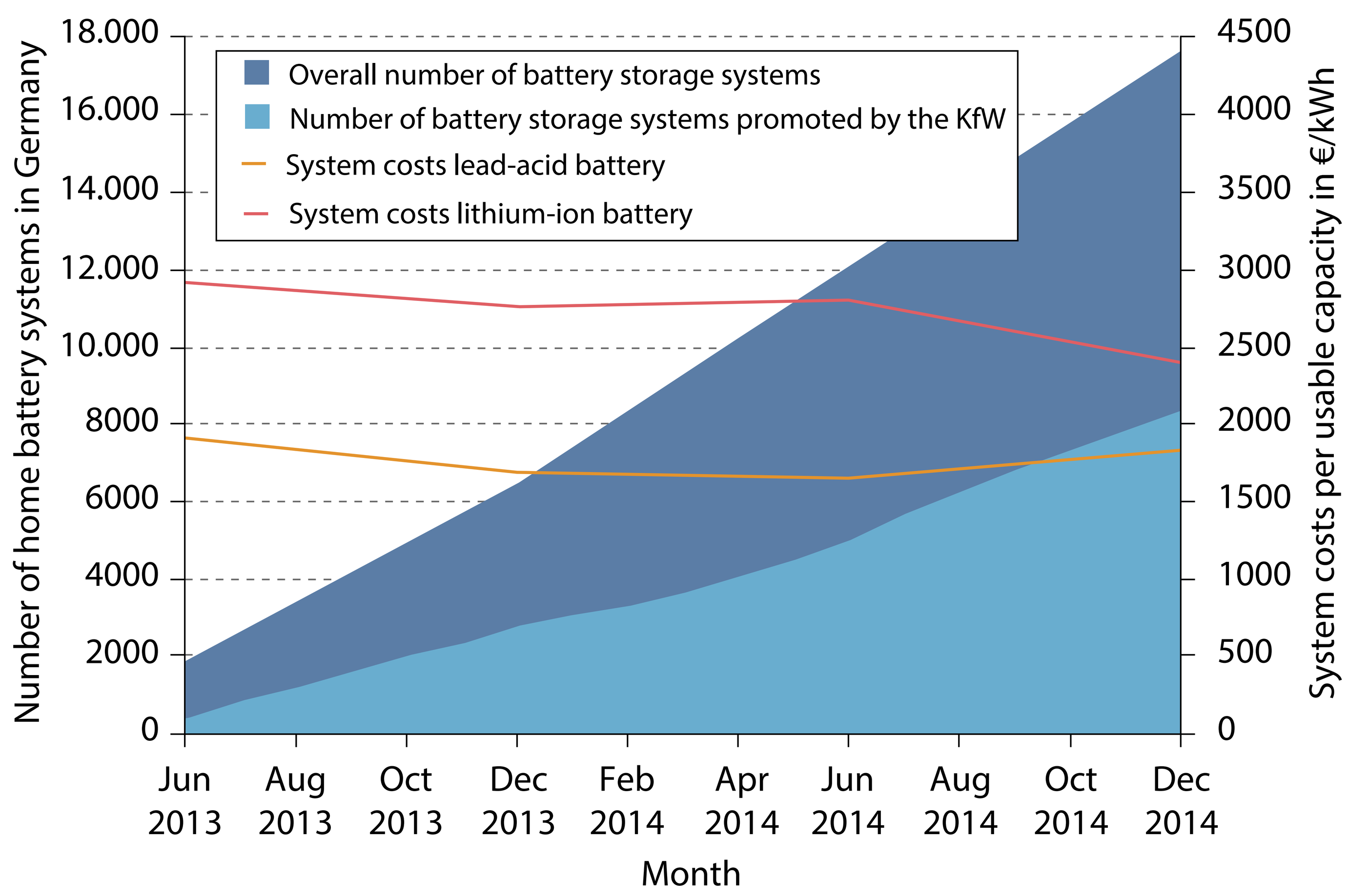


Network supportive



Optimize in-house consumption and network supportive

Prize trends in the battery sector and development of the number of home battery systems



System costs of lithium-ion-batteries continously decrease because:
- electromobility
- new materials

Cost reduction of 30 % between 2009 and 2012, Cell price in 2020 about 200 €/kWh

Number of battery systems increase because:
- KfW support
- optimization of the in-house consumption
- difference in pricing between EEG-feed-in renumeration and power supply price

Possible applications for battery storage systems to integrate renewable energy and provide network supportive services

Possible applications of battery storage systems				Lead acid battery	Nickel battery	Lithium battery	Sodium battery	Redox-flow battery
System services	Secure of supply and rebuilding	Contribution to secure the supply of power (especially reduction & protection of peak load inter alia reduction of must-run capacities)						
System services	Secure of supply and rebuilding	Uninterruptible power supply						
System services	Secure of supply and rebuilding	Ability to do a black start						
System services	Voltage stability and -quality	Supply of reactive power (static voltage stability)						
System services	Voltage stability and -quality	Supply of short-circuit power (dynamic voltage stability, fault-ride-through)						
System services	Frequency stability by active power control – tran-sient	Spinning reserve (immediate frequency stabilization)						
System services	Frequency stability by active power control – Control- and reserve power	Primary control power (pos. and neg. coupled)						
System services	Frequency stability by active power control – Control- and reserve power	Secondary control power	Neg.					
System services	Frequency stability by active power control – Control- and reserve power	Secondary control power	Pos.					
System services	Frequency stability by active power control – Control- and reserve power	Tertiary control power (minute range)	Neg.					
System services	Frequency stability by active power control – Control- and reserve power	Tertiary control power (minute range)	Pos.					
System services	Frequency stability by active power control – Control- and reserve power	Long term reserve (wind - or permanent reserve)						
System services	Operational manage-ment	Ramping (high rates of power change)						
System services	Operational manage-ment	Network congestion management (redispatch, partly used for voltage stability)						
Generation balance		Future markets (stock market and off market OTC trade)						
Generation balance		Spot markets (stock market and off market OTC trade)						

Technically feasible and economically useful
Technically feasible, check economic efficiency
Economically not feasible

To use batteries for network supportive aims, it is necessary to establish clearly defined regulaty frameworks

Adapt technical regulations
- Create standardized interfaces for central control
- Expand technical regulations (decentrally self controlled systems)

Define legal frameworks
- Define storage as an independent fourth element
- Establish storage as network operating equipment
- Adapt tax frameworks to system supportivness
- Avoid double burden

Promote communication
- Expose the importance of system supportiness
- Show the opportunities of a network supporting storage use
- Synergies for households and DSOs

Open new and old markets
- Open control power market and develop prequalification conditions that are open for all storage technologies
- Enable and pay additional ancillery services from decentral storage systems

Design system supportive subsidies
- Link fundings to system supportivness
- Continue research and development

Sources

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