Highlights of Energy Research 2021: Energy storage - key element to energy transition

Battery storage for the urban distribution network

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Tuesday, 23th November 2021

AUSTRIAN INSTITUTE OF TECHNOLOGY

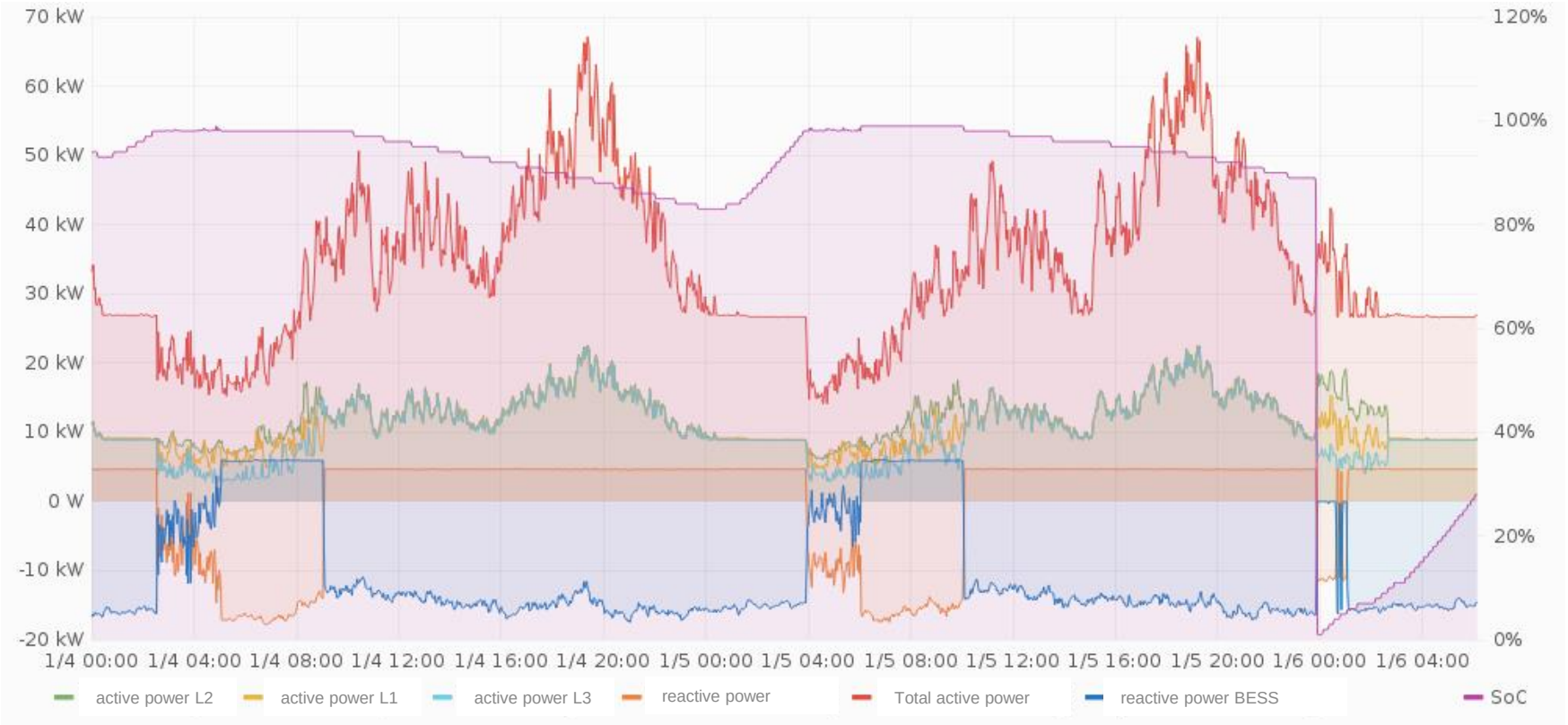
ASCR Aspern Smart City Research
WO ENERGIEZUKUNFT STATTFINDET

WIENER NETZE

EXPERIENCES LEARNT
PROCUREMENT AND ACCEPTANCE TESTING

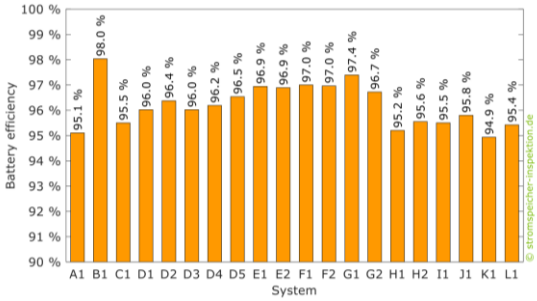
- **Technical System Specification**
  - Specifications concerning operational parameter, functions, safety aspects
  - Multiple applications from control reserve, peak shaving etc. available, partially individual implementation in the control system necessary
  - Possible misunderstandings between clients and supplier as not a unique terminology exists (e.g. energy capacity)
  - IEC 62933 first approach to harmonize terminology and provide planning and testing methods. Guideline for fire protection and risk assessment released in Germany.
- **Acceptance Testing**
  - Importance of acceptance testing (laboratory, factory, on-site testing) to validate data sheet values
  - Finding problems in an early phase of operation safes costs
  - Further development of standards and testing procedures for Utility Scale BESS required.

SIMULTANEOUS OPERATION OF THE SYSTEM

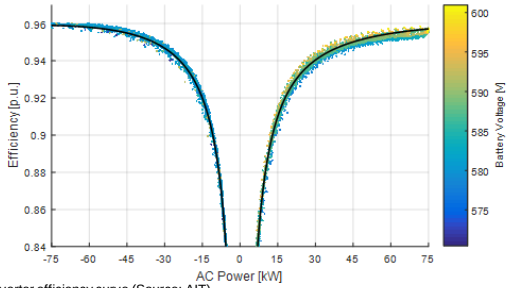


EFFICIENCY AND ENERGY CAPACITY

- **Roundtrip – Battery efficiency and Energy Capacity**
  - Full charge/discharge cycles at different power conditions
  - High Lithium-Ion efficiency of the battery up to 98 %
- **Inverter efficiency and standby consumption**
  - Peak Efficiency (up to 99 %) in datasheets is only the half truth, partial load efficiency is also important
  - Standby-consumption at no load condition
- **Roundtrip-System efficiency**
  - Full charge/discharge cycles at different power conditions
  - Includes system losses of the inverter an battery
  - Efficiency between 80 % (inefficienct system) and 94 % (very high inverter & battery efficiency efficiency) at nominal power



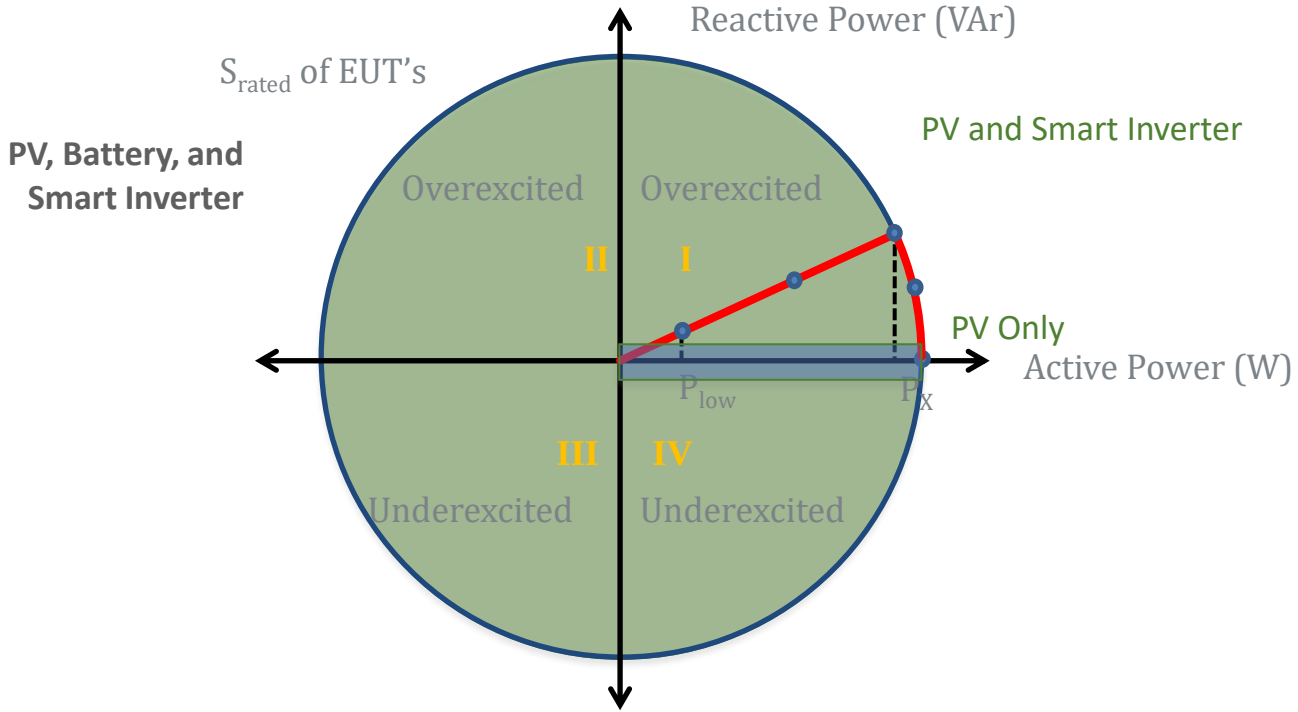
Battery efficiency of residential battery systems (Source: HTW-Berlin Storage Inspection 2021)



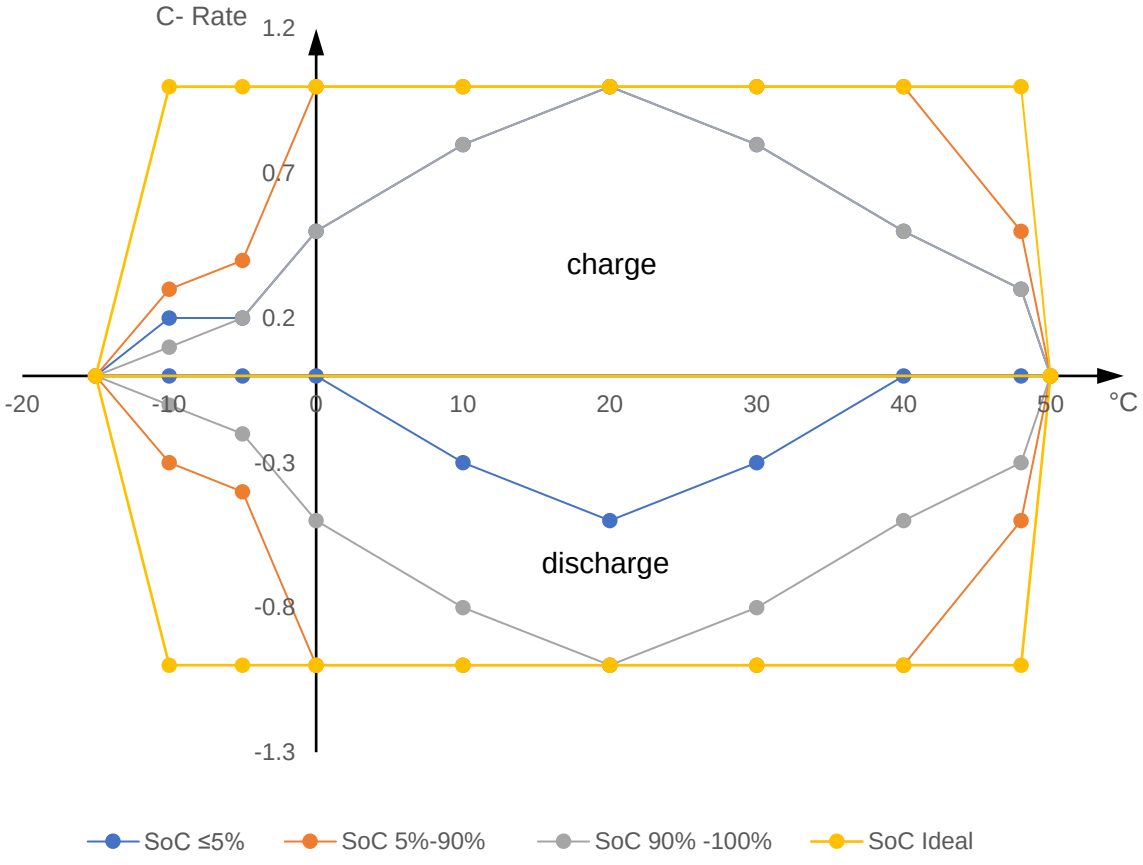
Inverter efficiency curve (Source: AIT)

ACTIVE / REACTIVE POWER (P-Q) CAPABILITY

- Advantage of BESS for grid support: Four-quadrant operation
- Basic functionality test – (Should be tested at different system states, SOC, voltage, temperature)



BESS Modes of Operation



ADVANTAGES OF BESS

- **increase of available grid capacity**
  - balanced load of lines
  - more customers / producers on the same common point of coupling
- **Quick and convenient** implementation on site
  - Relocatable
- **BESS are new active assets for DSOs**
  - ICT (e.g. Security, ICT Data connection)
  - new forms of maintenance (remote access for external technician,OEM)
  - troubleshooting (personal safety, IT- know-how)
    hybrid-engineer
- **experience shows,** the maximum power of BESS can‘t be applied at all time / depends on circumstances (e.g. SoC, temperature,…)
- **Measurements shows,** there is not ideal configuraton of the BESS in low voltage networks (DSOs)

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