



Stationäre Batteriespeicher (BESS)

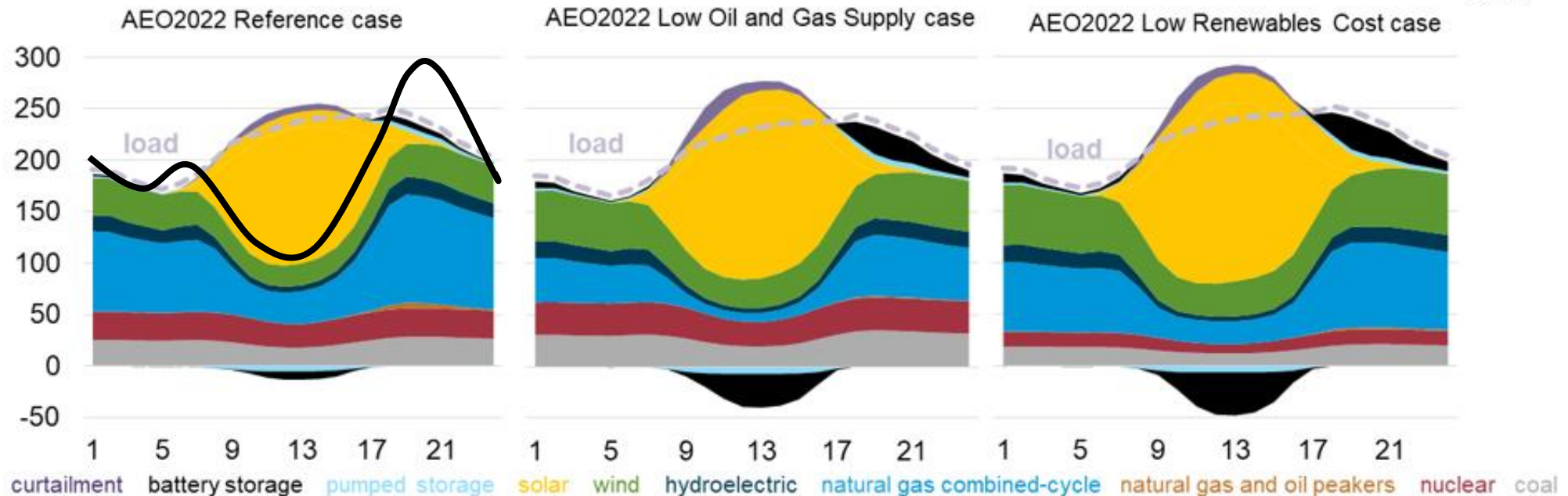
Überblick, Technologie und Ausblick – B³ Impuls 25.09.26

Dr. Dennis Hein
Innovation & Funding

Rolle von stationären Energiespeichern

Figure 1. Hourly U.S. electricity generation and load by fuel for select AEO2022 core cases, 2050

billion kilowatthours



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

Note: Negative generation represents charging of energy storage technologies such as pumped hydro and battery storage. Hourly dispatch estimates are illustrative and are developed to determine curtailment and storage operations; final dispatch estimates are developed separately and may differ from total utilization as this figure shows. Solar includes both utility-scale and end-use photovoltaic electricity generation.

Unternehmensstruktur VARTA AG



CEO – Michael Ostermann | CFO – Rolf Glessing | CTRO – Sebastian Rudow

Consumer Batteries



Micro Batteries & Lithium-Ion Small Cells

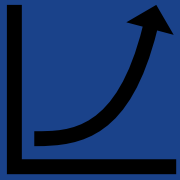


Energy Storage Systems & Power Pack Solutions



Cell Development | Communications | Controlling | Finance | Human Resources | Information Technology | International Business Development
Legal & Compliance | Marketing | Material Research & Pre-Development | Operations & Supply Chain | Project Management | Purchasing | Risk Management
Quality | Sustainability | System Development | Taxes | Technics | Treasury

Battery Energy Storage Systems



Übersicht & Markt

Warum sprechen aktuell alle von einem „Batterie-Tsunami“?



Technology Overview

Ist Lithium-Ionen bereits die ideale Speichertechnologie?



Smart Energy Systems

Können Batteriespeicher mehr als nur Energie speichern?

BESS Variations

Home Storage System

Energy [kWh] 10 bis 20
max. Power [kW] 5 bis 10



Commercial & Industrial Storage System

Energy [kWh] 72 bis 675
max. Power [kW] 36 bis 360



Utility Storage System

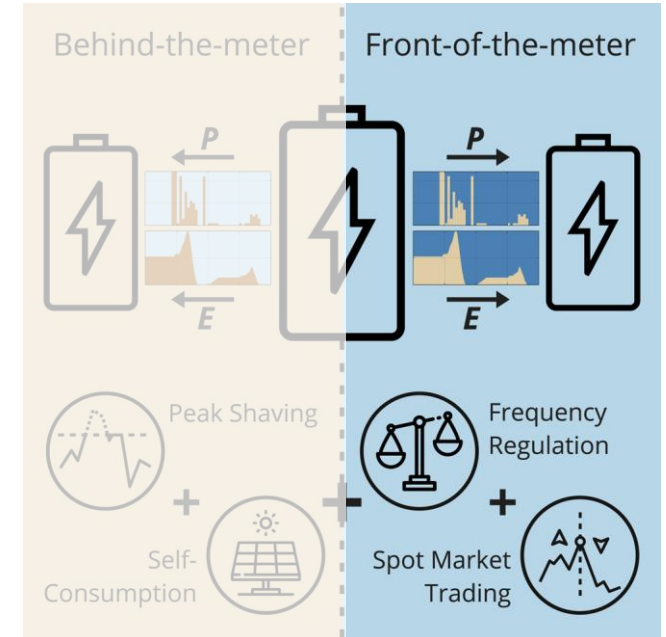
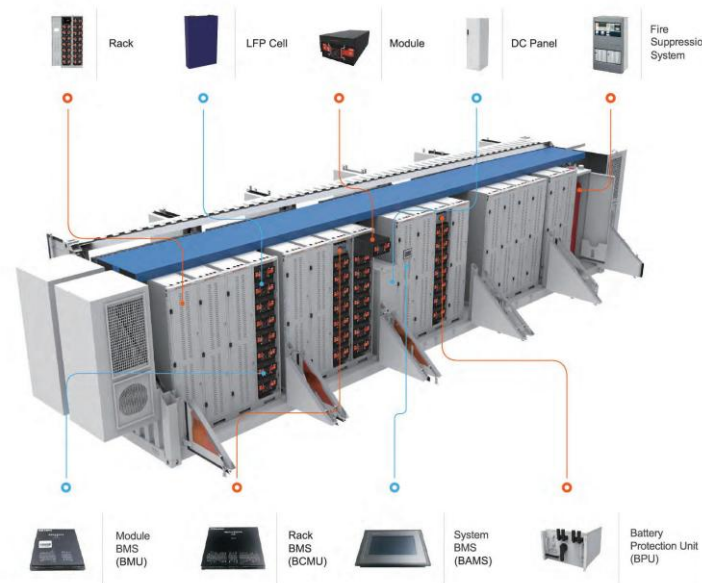
Energy [kWh] 800 – 12.000
max. Power [kW] 800 – 3.200



BESS – Container

Utility Storage System

Energy [kWh] 800 – 12.000
max. Power [kW] 800 – 3.200

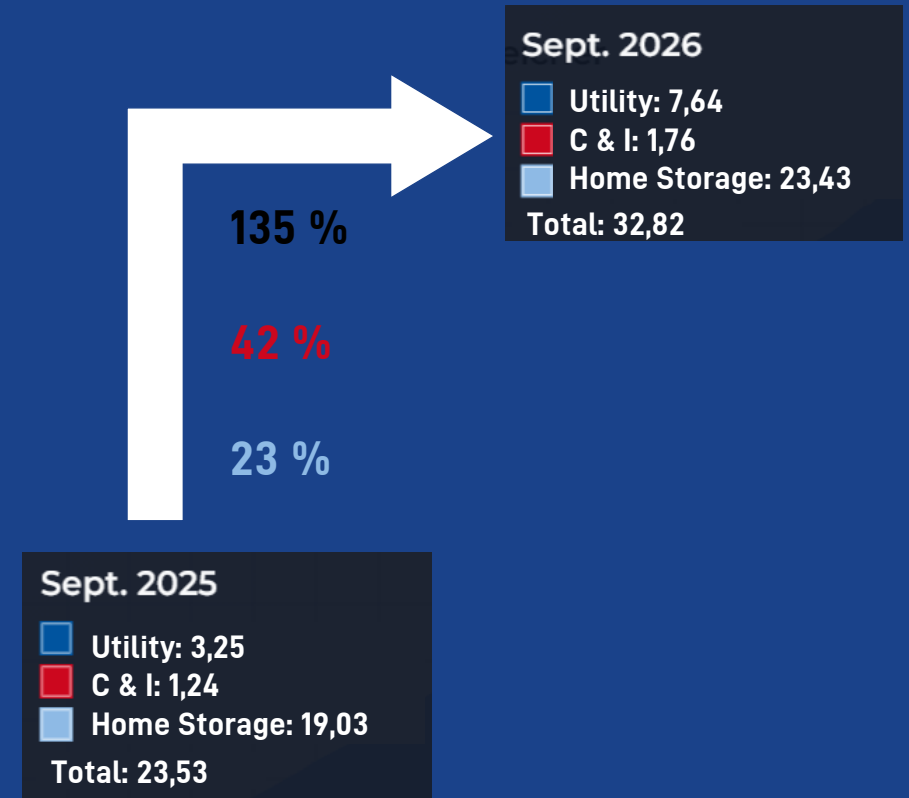
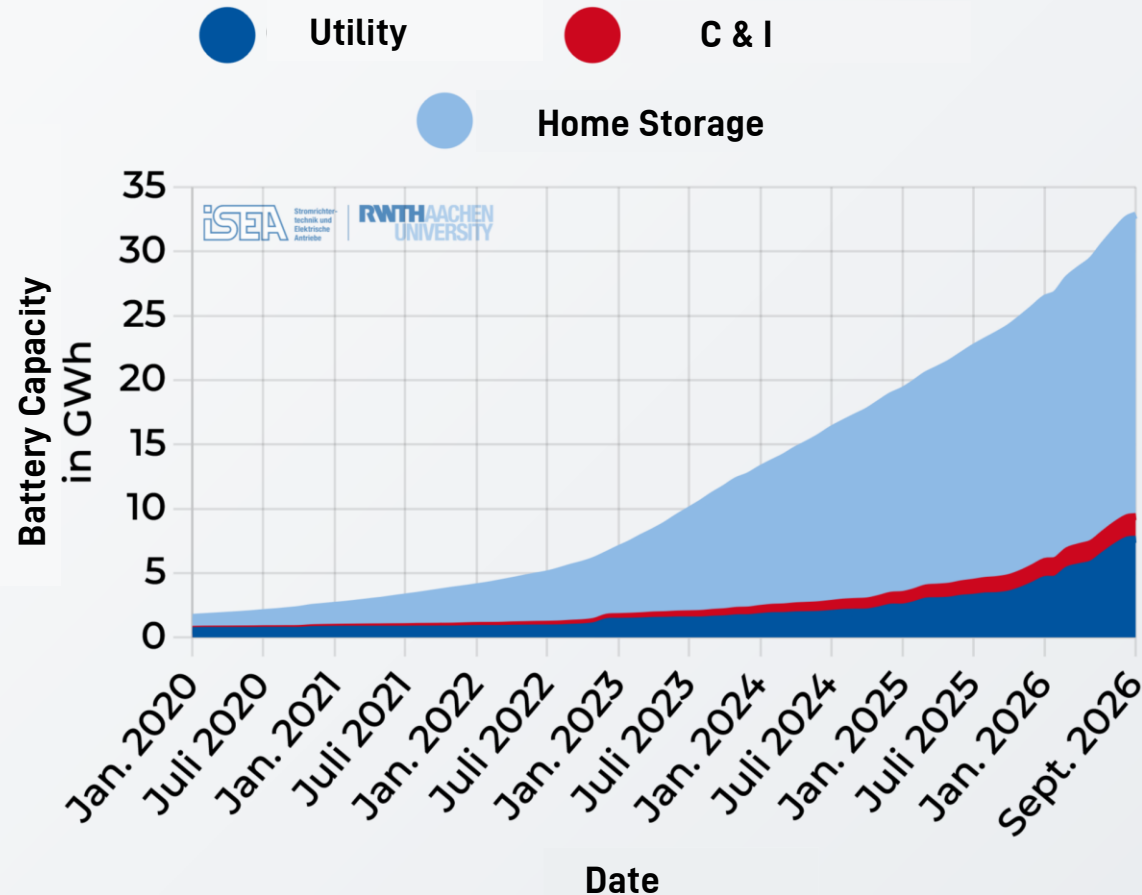


Markttreiber
ROI
Einschränkung



Arbitrage-Erlöse
Schnelle Amortisation
Genehmigung des Netzanschlusses

BESS Wachstum der letzten 12 Monate in Deutschland



BESS – Home Storage System

Home Storage System

Energy [kWh] 10 bis 20
max. Power [kW] 5 bis 10



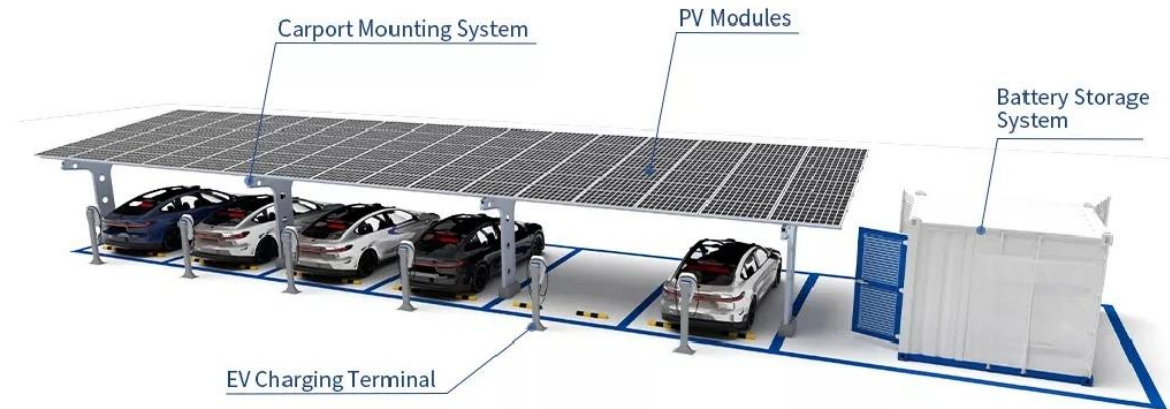
Aktuell →
Trending →
Hindernis →

Steigerung des Eigenverbrauchs von Solarstrom
Optimierung der Energieflüsse im Haushalt
Hohes Potenzial, jedoch komplexe Regulatorik

BESS – Commercial & Industrial Storage

Commercial & Industrial Storage System

Energy [kWh] 72 bis 675
max. Power [kW] 36 bis 360



SINO

Use Case
Nutzen
Einschränkung



Spitzenlast
Stabilisiert die Betriebskosten
Business Case meist noch limitiert

Technologie - BEV vs. BESS

BEV

Demand > 1.000 GWh/year

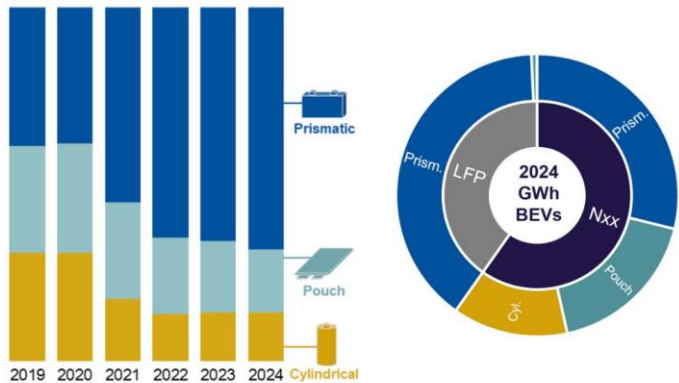
BESS

Demand ~ 250 GWh/year



BEV Market Trending Towards Large-Format Cells, Primarily Prismatic

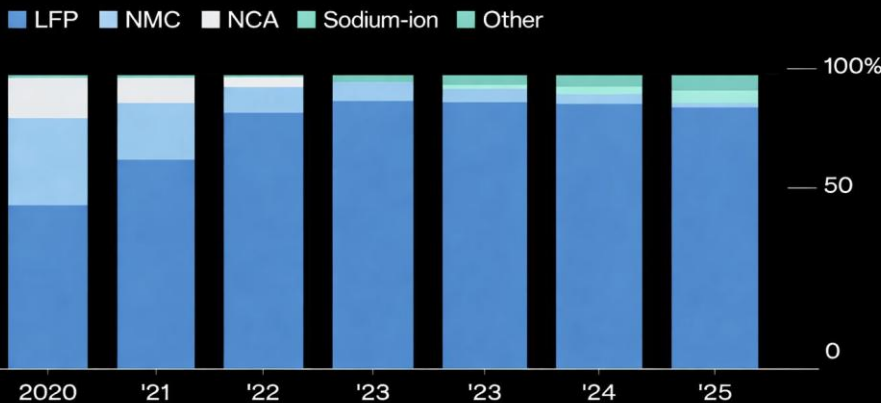
SHARE OF CELL FORMATS IN BEVs, % GWh BASIS



	NXX	LFP
Energy	++	+
Gewicht	++	+
„Power“	++	+
Cycles	+	++
Price	+	++

Lithium-Ion Batteries Dominate Energy Storage Market

Stationary storage technology mix outlook based on gigawatt-hours



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LFP – Die Preise sind so niedrig wie noch nie

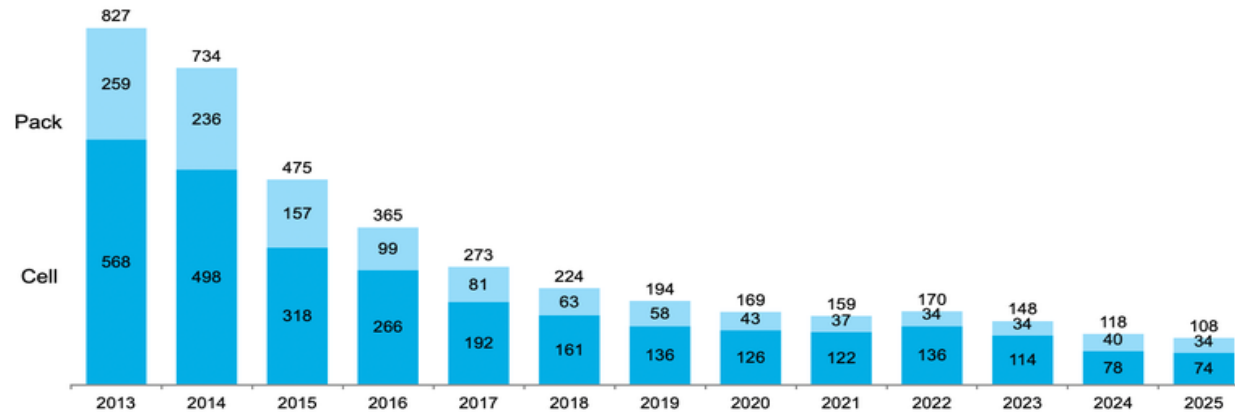


INDUSTRY Costs | 2025 Cell and Pack Prices

VF VOLTA FOUNDATION

Cell & Pack Global Average Selling Prices Fell in 2025, Despite Rising Raw Material Prices

REAL 2025 \$ PER KILOWATT-HOUR



BloombergNEF

Source: Data from BloombergNEF (Distinguished Partner). For more information, visit <https://about.bnef.com/contact-us>.
Note: Historical prices have been adjusted using June 2024 to June 2025 inflation rates based on US Consumer Price Index (CPI) index.

2025 KEY COMPONENT COSTS(\$/kWh)
(DC-BLOCK + PCS + MVT + EMS) [1]

Chart A: Chinese AC block system pricing - unadjusted

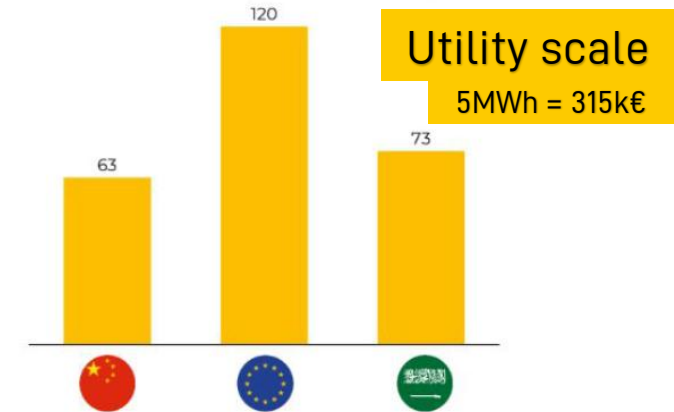
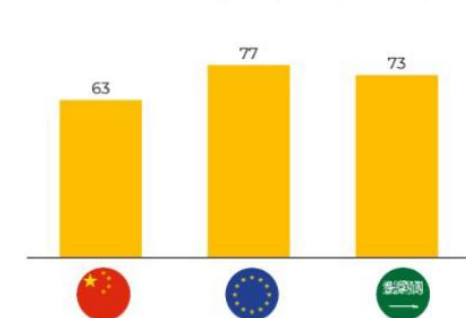


Chart B: Chinese AC block system pricing - 1GWh+ project sizing



Warum ist Natrium eine interessante Alternative?

- **Natrium-Ionen-Technologie** – Rohstoffvorteil

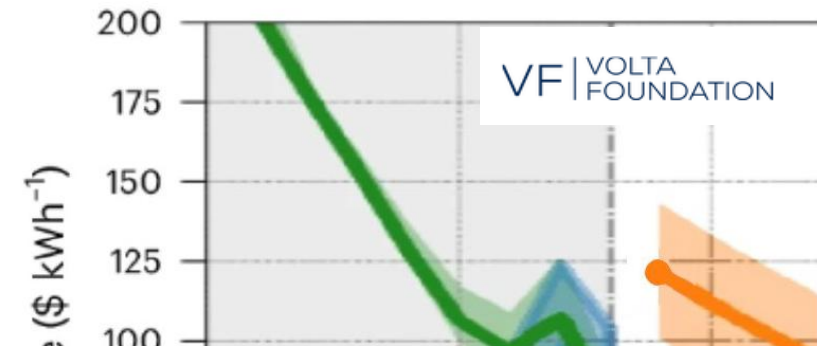
- Sweet Spot ESS:

- hohe Zyklenstabilität
- gute Leistung bei niedrigen Temperaturen
- Kosten

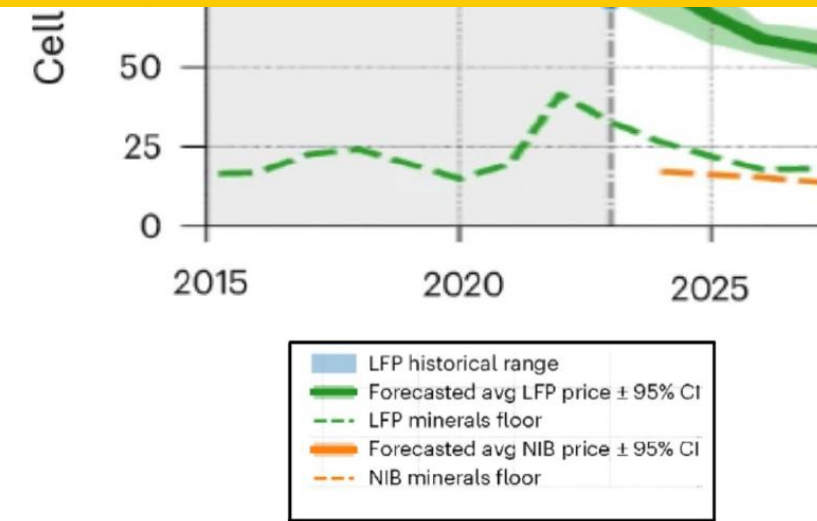
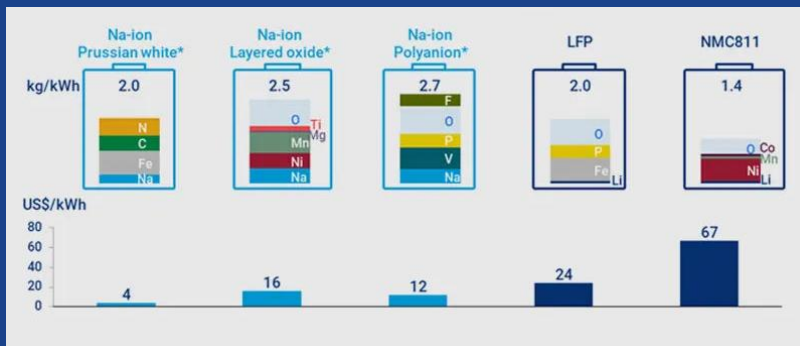


- **Schnelle Anpassung:** Nutzung bestehender Produktionsanlagen

COST HISTORY OF NIB RELATIVE TO LFP

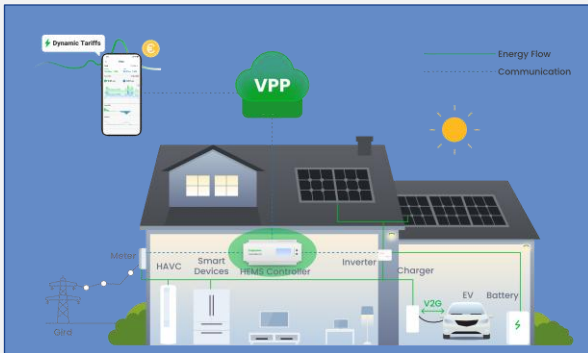


Natrium-Ionen-Batterien sind vielversprechend – derzeit LFP-Batterien wirtschaftlicher



Intelligente Energiesysteme

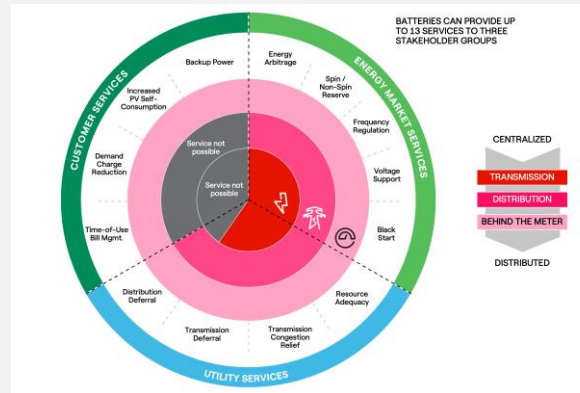
- 1. Schritt = **Eigenverbrauchsoptimierung [HEMS – PV/Batt/EV/HP]**
- Dynamische Tarife
→ **marktorientierter Betrieb**
- § 14a / dynamische Netzentgelte
→ **netzorientierter Betrieb**



Integration Front-the-Meter- & Behind-the-Meter-Lösungen

Multistacking

- **Multistacking**
 - **Eigenverbrauch**
 - **Spitzenlastabdeckung**
 - **Arbitrage**
 - **Frequenzregelung / Netzstabilität**
 - **Dynamische Tarife**



Kombination erhöht Wirtschaftlichkeit

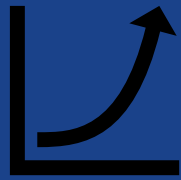
Bidirektionale Wallbox

- **EV = 80–100 kWh „mobile Hausbatterie“**
- **V2H / V2G / V2B: enormes Potenzial für Flexibilität**
- **Erforderlich: Standards, Regulierung, Preissignale**



Das bidirektionale Laden ist die neue Flexibilitätsquelle

Battery Energy Storage Systems



Übersicht & Markt

- Speicher werden zum Schlüssel der Energiewende
- Alle Speichersegmente wachsen dynamisch
- Flexibilität wird systemkritisch



Technology Overview

- LFP dominiert den Markt
- Natrium-Ionen gewinnt an Bedeutung
- Evolution statt Revolution



Smart Energy Systems

- Software schafft Mehrwert
- Multistacking steigert die Wirtschaftlichkeit
- Bidirektionales Laden erweitert die Flexibilität



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