Batteriesysteme für die Energiewende

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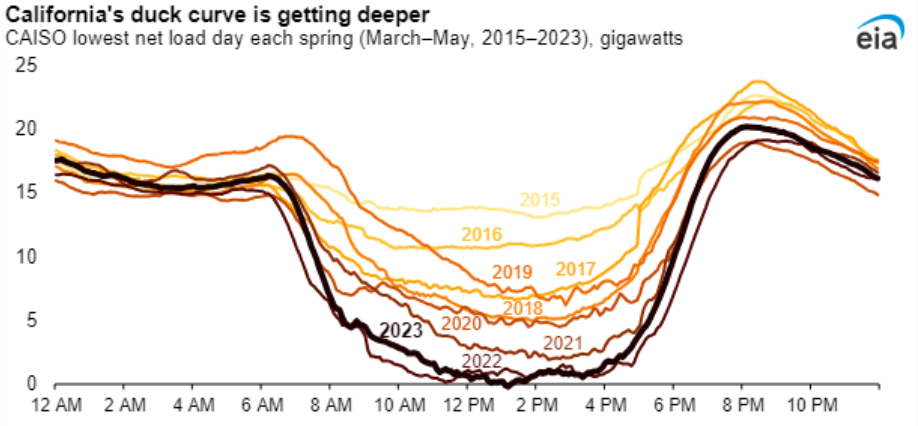
Empa

Materials Science and Technology

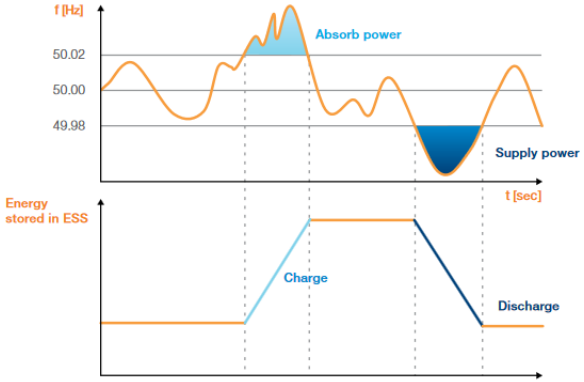
Image © Energy-Storage News

Stationäre Batteriespeicher

- Integration von erneuerbaren Energiequellen
- Netzstabilität



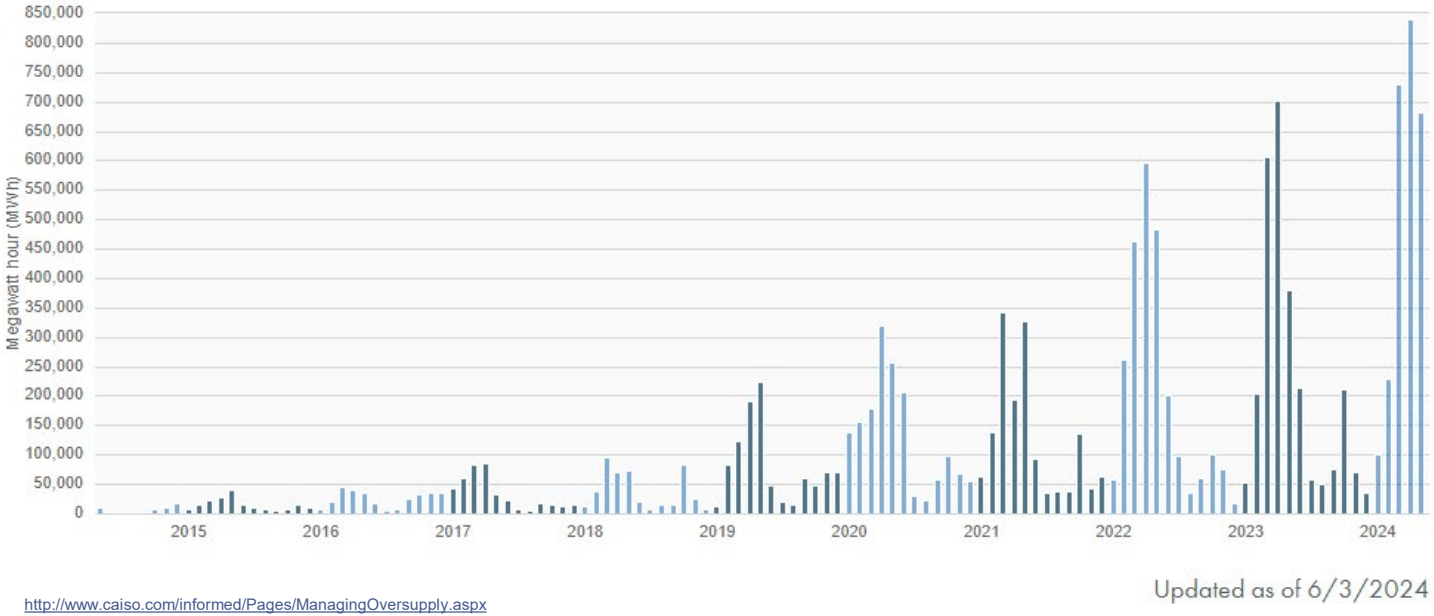
https://www.eia.gov/todayinenergy/detail.php?id=56880



https://library.e.abb.com/public/59a2be960fdb777a48257a680045c04a/ABB%20Energy%20Storage_Nov2012.pdf

Beispiel Kalifornien

- CAISO hat dieses Jahr bereits 3 TWh Wind- und Solarenergie abgeregelt
- Entspricht Energiebedarf von ca. 600’000 Schweizer Haushalten

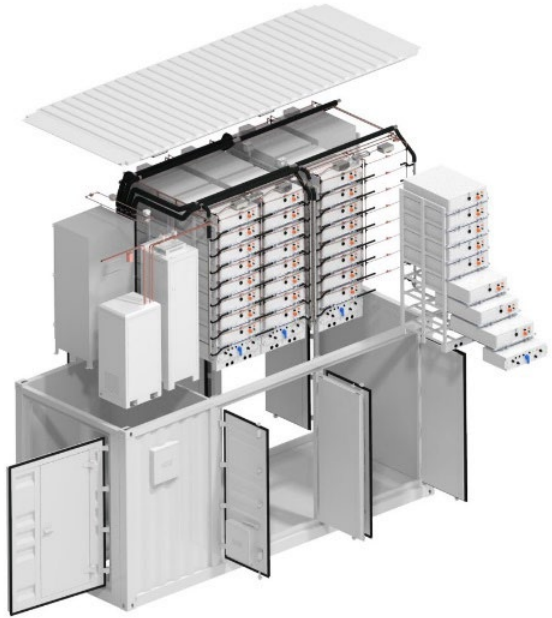


http://www.caiso.com/informed/Pages/ManagingOversupply.aspx

Lithium-Ionen Batterien

- Dominieren den Batteriemarkt
- Hohe Energiedichte, bis zu 8 MWh pro Container

- Brandgefahr
- Lebensdauer
- Recycling



https://cambridgerenewables.co.uk/megawatt-hour-container-bess/

California solar-plus-storage project with world's largest BESS fully online

By Cameron Murray

January 24, 2024

US & Canada, Americas | Grid Scale | Business

LinkedIn | Twitter | Reddit | Facebook | Email

The Edwards & Sanborn solar-plus-storage project in California is now fully online, with 875MWdc of solar PV and 3,287MWh of battery energy storage system (BESS) capacity, the world's largest.

Grösste Lithium-Ionen Batterie der Schweiz

- 28MW / 26MWh, Unterwerk Ingenbohl, Schwyz
- Viel «nicht-Batterie»

In the news

https://www.youtube.com/watch?v=gLmP0tPac34

Hecate Energy 2.4GWh California project rejected while San Diego votes against BESS moratorium

By Andy Colthorpe

October 3, 2024

https://www.energy-storage.news/hecate-energy-2-4gwh-california-project-rejected-while-san-diego-votes-against-bess-moratorium

Semi-truck carrying lithium-ion batteries overturns, sparks fire in San Pedro

By Tim Pulliam

Friday, September 27, 2024 4:11PM

Este artículo se ofrece en Español →

https://abc7.com/post/semi-truck-carrying-lithium-ion-batteries-overturns-sparks-fire-san-pedro/15360889/

Third battery fire at the same site in Germany

It's the third time in two months that a battery fire has broken out on the premises of Suncycle in Germany.

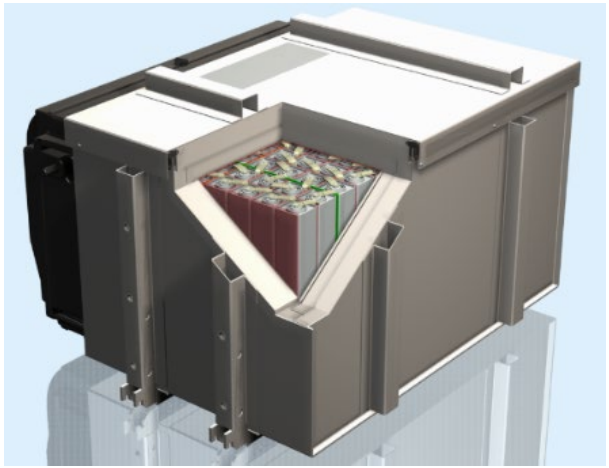
AUGUST 13, 2024 SANDRA ENKHARDT

ENERGY STORAGE | UTILITY SCALE STORAGE | GERMANY

https://www.pv-magazine.com/2024/08/13/third-battery-fire-at-the-same-site-in-germany/

Molten-salt Batterien

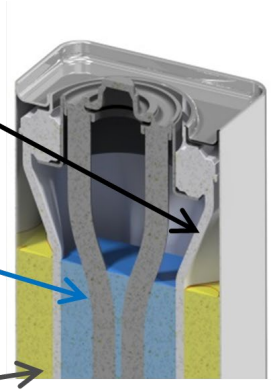
- Häufig vorkommende Materialien: Nickel und Kochsalz
- Betrieb bei knapp 300°C, 150 Wh/kg, 4000 Zyklen
- Ideal für stationäre Anwendung aber momentan sehr teuer



Ceramic Electrolyte:
(Na-β"-alumina)
$Na_{1.6}Li_{0.34}Al_{10.66}O_{17}$

Cathode:
(Ni, Fe, Zn and NaCl)

Anode:
(pure **molten Na***)
** generated upon charge*

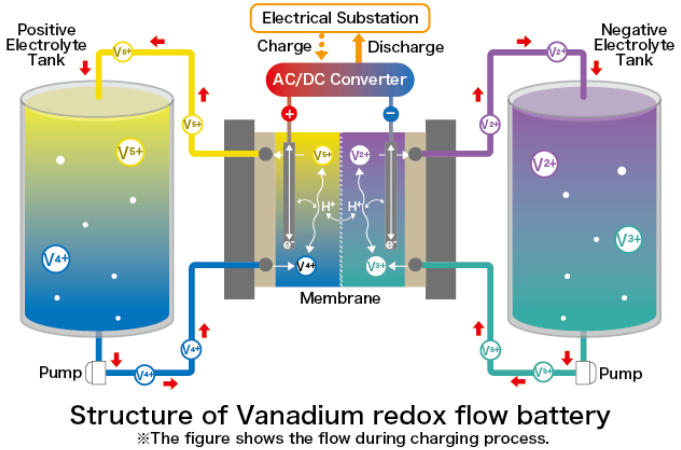


M. Heinz,et al. Electrochimica Acta,464, 2023, 142881

Redox Flow Batterien

- Energie- und Leistungskomponenten sind entkoppelt
- Tiefe Energiedichte
- Von Natur aus nicht brennbar
- Potentiell tiefste Kosten für Grossanlagen

https://english.cas.cn/newsroom/research_news/chem/202401/t20240115_655258.shtml



Structure of Vanadium redox flow battery
※The figure shows the flow during charging process.

https://www.lesys.jp/english/redox/

0.25 MW / 1 MWh

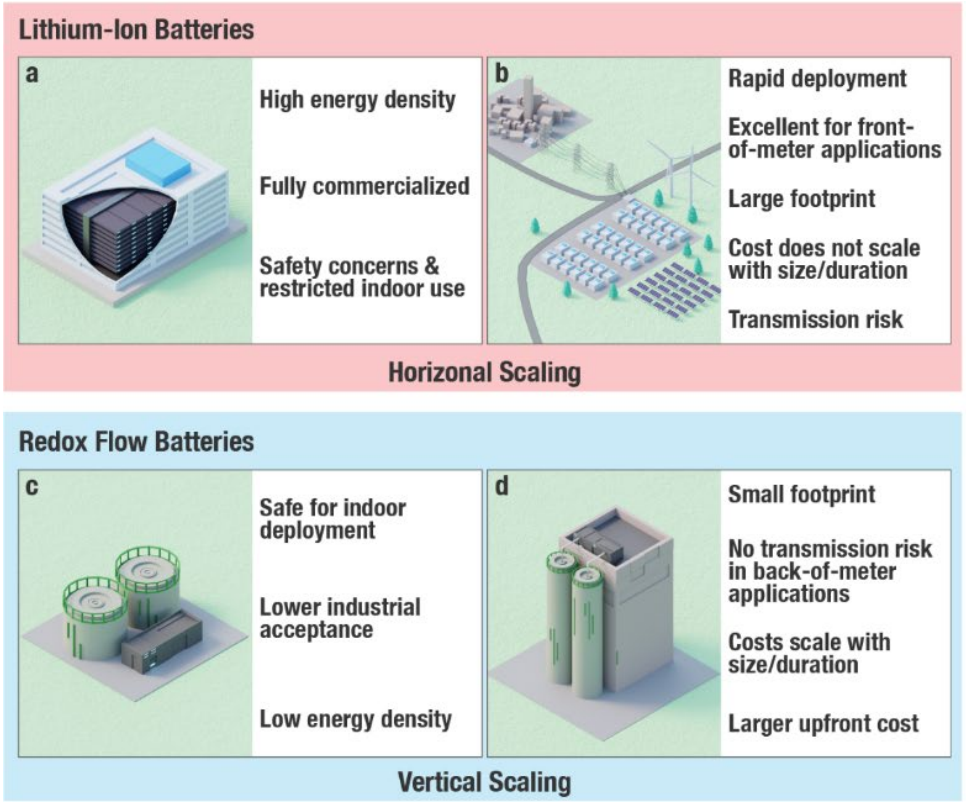
Grösste Flow Batterie der Welt

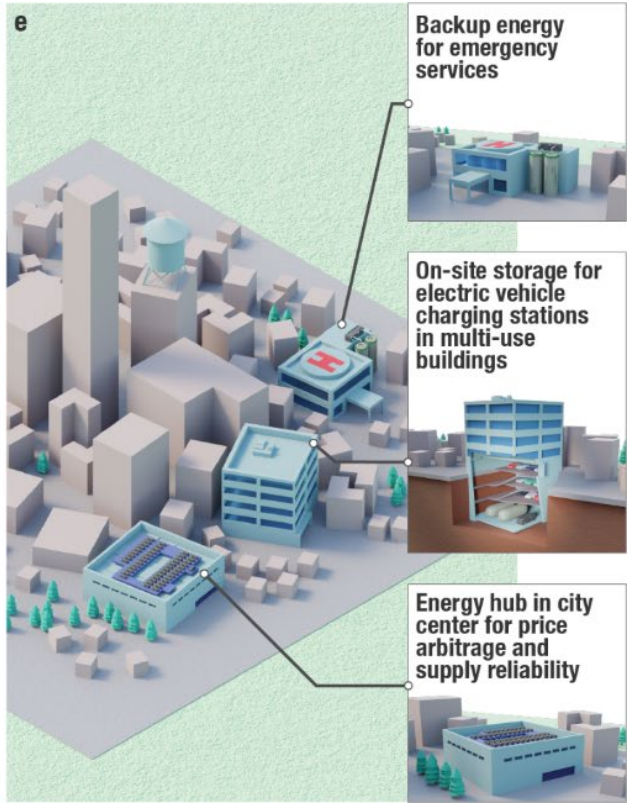



100 MW / 400 MWh
in Dalian, China

https://pubs.rsc.org/en/content/articlelanding/2023/ya/d3ya00208j

Sicherheit → Vertikale Skalierung





https://pubs.rsc.org/en/content/articlelanding/2023/ya/d3ya00208j

Fazit & Ausblick

- Mega-Batterien sind kritisch für Stromnetze der Zukunft
- Viele Technologien mit ihren jeweiligen Stärken und Schwächen
- Empa forscht an Batterien für die Elektromobilität sowie für stationäre Anwendungen

Acknowledgement

Laboratory Materials for Energy Conversion

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