ALASKA ENERGY STORAGE WORKSHOP
JANUARY 12, 2021

JCESR | JOINT CENTER FOR ENERGY STORAGE RESEARCH

CURRENT BATTERY TECHNOLOGY TRENDS

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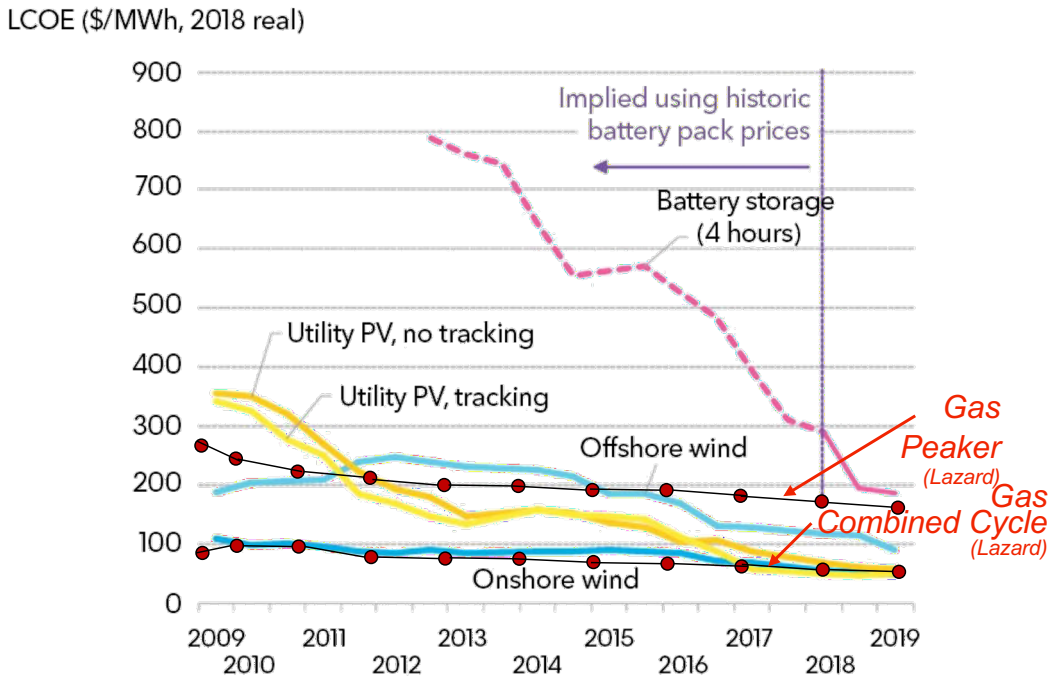
RENEWABLES + STORAGE MAKING ECONOMIC SENSE



Source: BloombergNEF. Note: The global benmark is a country weighed-average using the latest annual capacity additions. The storage LCOE is reflective of a utility-scale Li-ion battery storage system running at a daily cycle and includes charging costs assumed to be 60% of whole sale base power price in each country.

Storage alone is competitive with gas peaker plants.

What ”storage” is selling?

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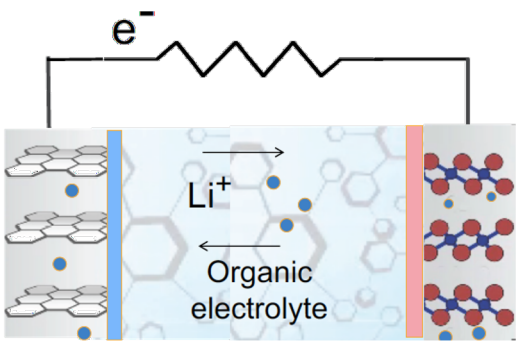
LITHIUM-ION BATTERIES

Revolutionary batteries serving transportation and the grid



BATTERY UNIVERSITY

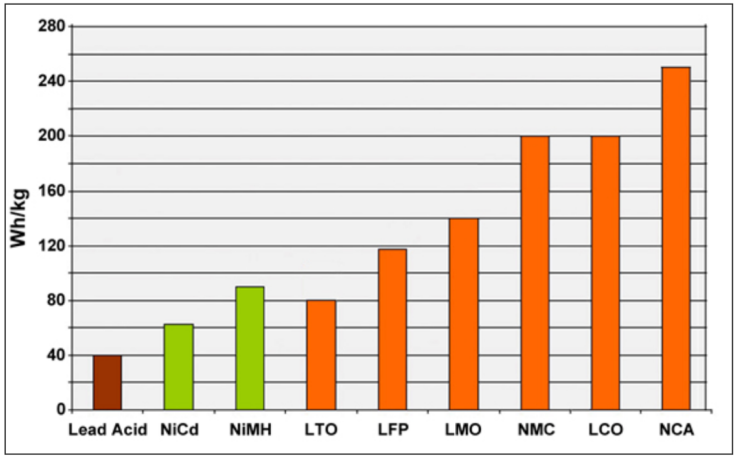


Figure 15: Typical specific energy of lead-, nickel- and lithium-based batteries.
NCA enjoys the highest specific energy; however, manganese and phosphate are superior in terms of specific power and thermal stability. Li-titanate has the best life span.
Courtesy of Cadex

Last updated: 2020-12-03

LIBs are not one thing. Understanding the chemistries can help in purchasing and operations.

LIBs are still getting better bit by bit.

Grid is benefiting from transportation battery enthusiasm.

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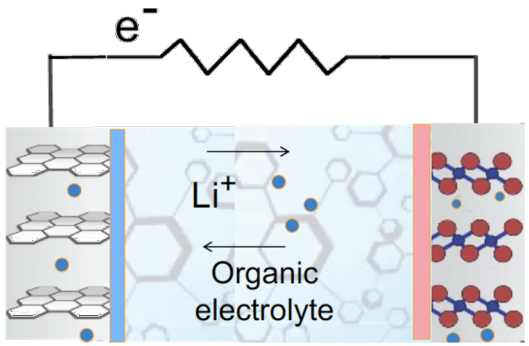
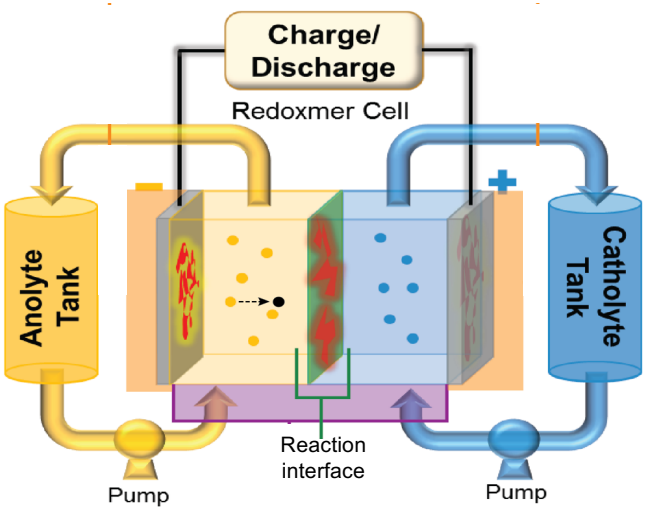
LIB COMPETITOR: FLOW CELLS

Commercially available and subject of research to make cheaper, safer, longer lasting





Power restricted by Li^+ transport rate in electrodes and electrolyte

Energy restricted by Li^+ storage capacity of electrodes

Power limited by area of reaction interface between anolyte and catholyte

Energy limited by volume of anolyte and catholyte tanks

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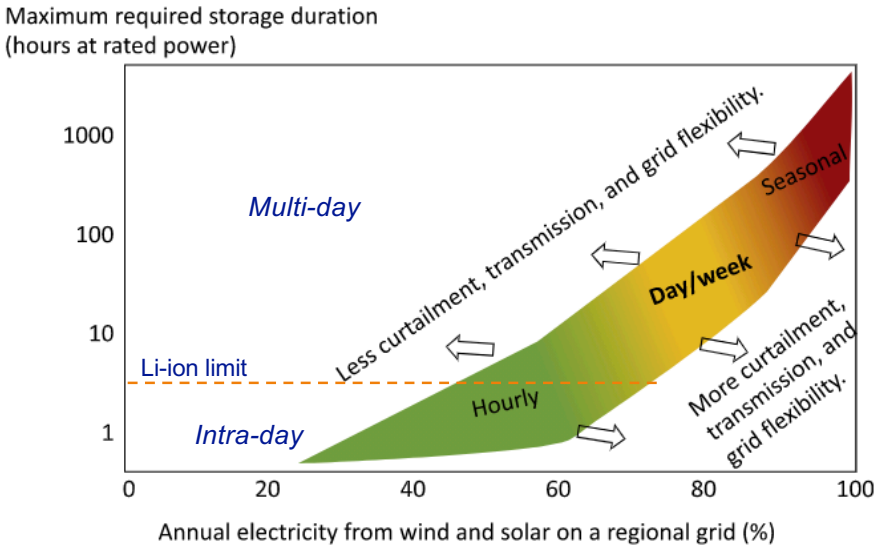
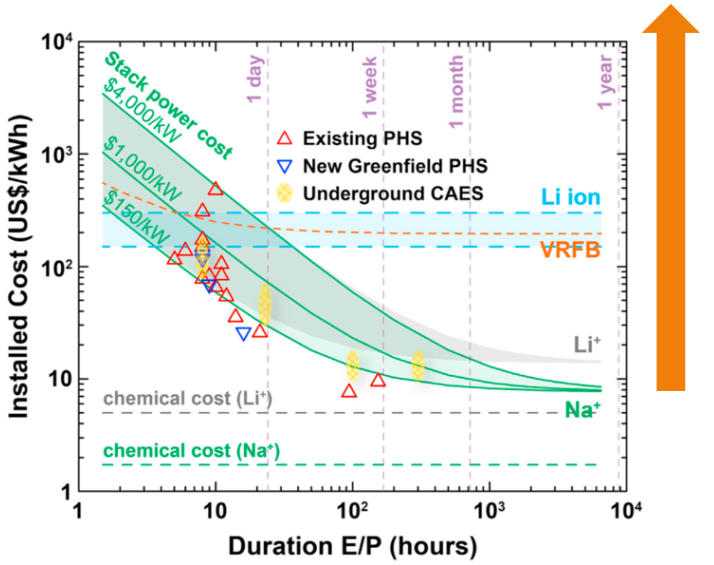
INCREASING RENEWABLES CALLS FOR LONGER DURATION STORAGE

Here LIBs meet more competition (some non-electrochemical)



Albertus et al., *Joule*, 4, 1 (2020)



Li et al., *Joule*, 1(2), 306 (2017)

MORE INFORMATION

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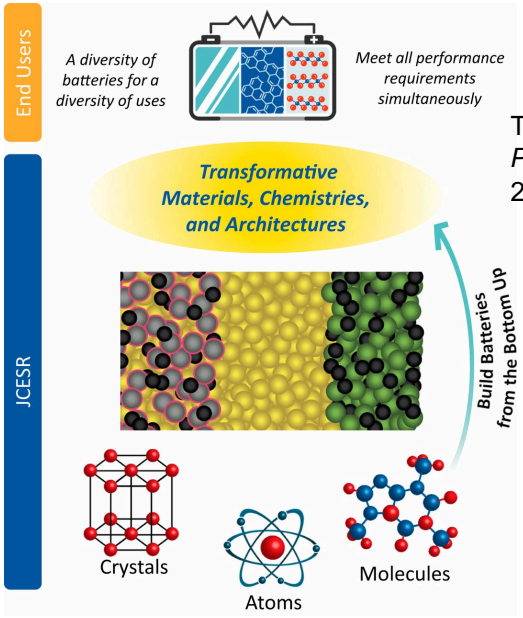
www.jcesr.org

Argonne NATIONAL LABORATORY

ANL works across the battery value chain

ACCESS (Argonne Collaborative Center for Energy Storage Science)

Energy storage emerging: A perspective from the Joint Center for Energy Storage Research



Trahey, et al, *PNAS,* 117(23), 2020, 12550.

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