Stationary Energy Storage Systems Enabling Transportation Electrification

Tom Simchak

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Energy Storage Association

NAESCO National Association of Energy Service Companies

The Energy Storage Association

- The U.S. Energy Storage Association (ESA) is the national trade association dedicated to energy storage, working toward a more resilient, efficient, sustainable and affordable electricity grid – as is uniquely enabled by energy storage.
- ESA's mission is to accelerate the widespread use of competitive and reliable energy storage systems in the United States.

ESA Represents a Diverse Membership

- With more than 170 members, ESA represents a diverse group of companies, including independent power producers, electric utilities, energy service companies, financiers, insurers, law firms, installers, manufacturers, component suppliers and integrators involved in deploying energy storage systems around the globe.
- Federal, regional, & state policy engagement.

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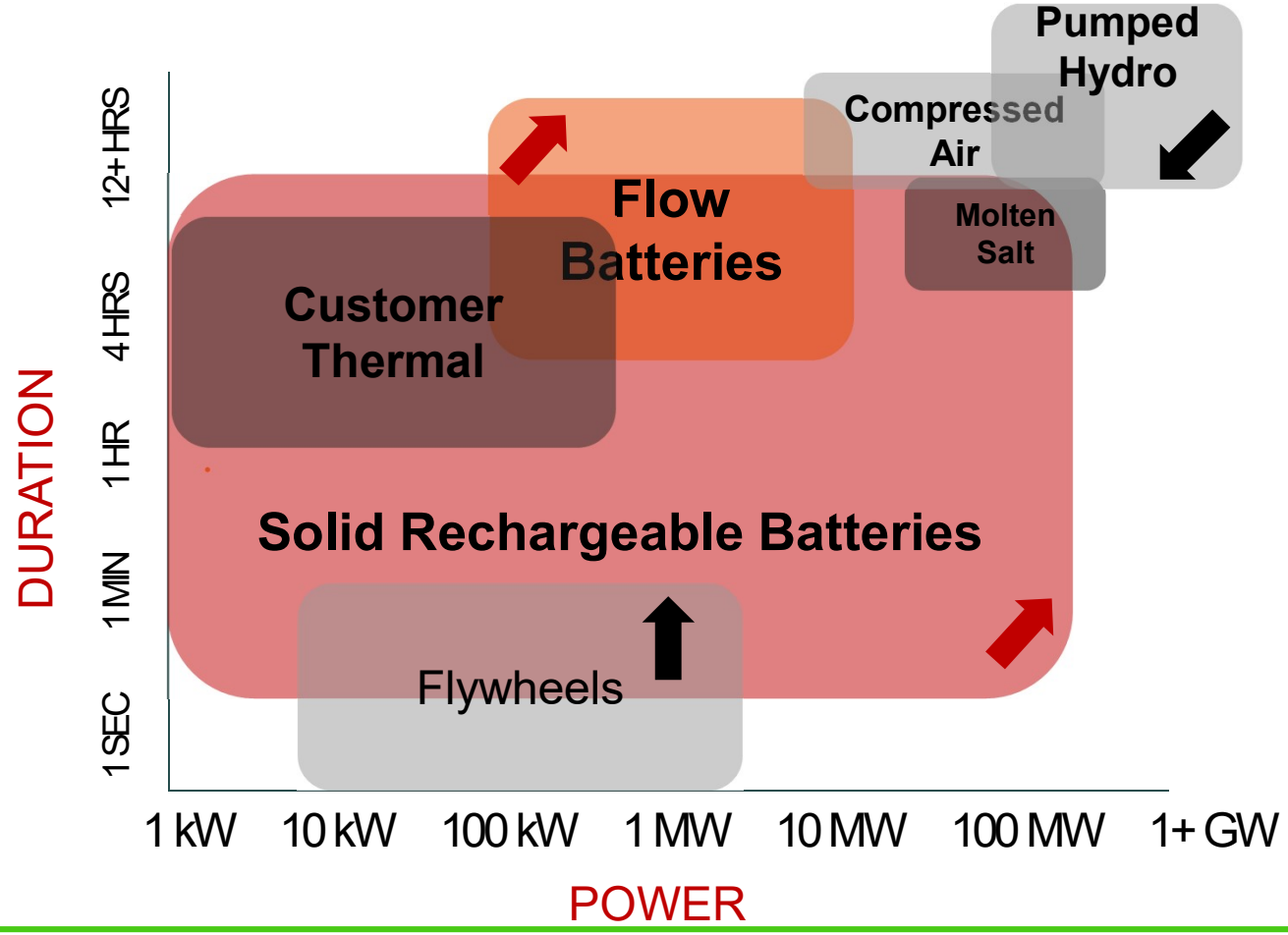
Energy Storage: Diverse Technologies, Expanding Capabilities



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Energy Storage = Flexibility

Supplies precise amount of electricity exactly when (and where) it is most needed, regardless of when it was generated

Valuable Applications

- Energy storage fits in everywhere on the grid, from a home system to a 400MWh facility, there are numerous different applications that storage can be used for
- It's not just about 'sunshine at night'
- Storage is systemic value, impacting every facet of supply, transmission and consumption
- A single system can provide multiple values to grid/owner

Flexibility Addresses Uncertainty for Reliability and Resilience

Short-term uncertainty
Seconds/Minutes/ Hours

RELIABILITY

Maintaining power quality

Frequency regulation

Load-following

Ramping

Spinning reserve

Curtailment avoidance

Congestion mitigation

RESIDENCE

Frequency response

Microgrid islanding

Backup power

Longer-term uncertainty
Days/Months/ Seasons

RELIABILITY

Resource adequacy

Transmission & distribution upgrade replacement

Operation independent of environmental restrictions

RESIDENCE

Black start service

Microgrid islanding

Emergency capacity for lost infrastructure

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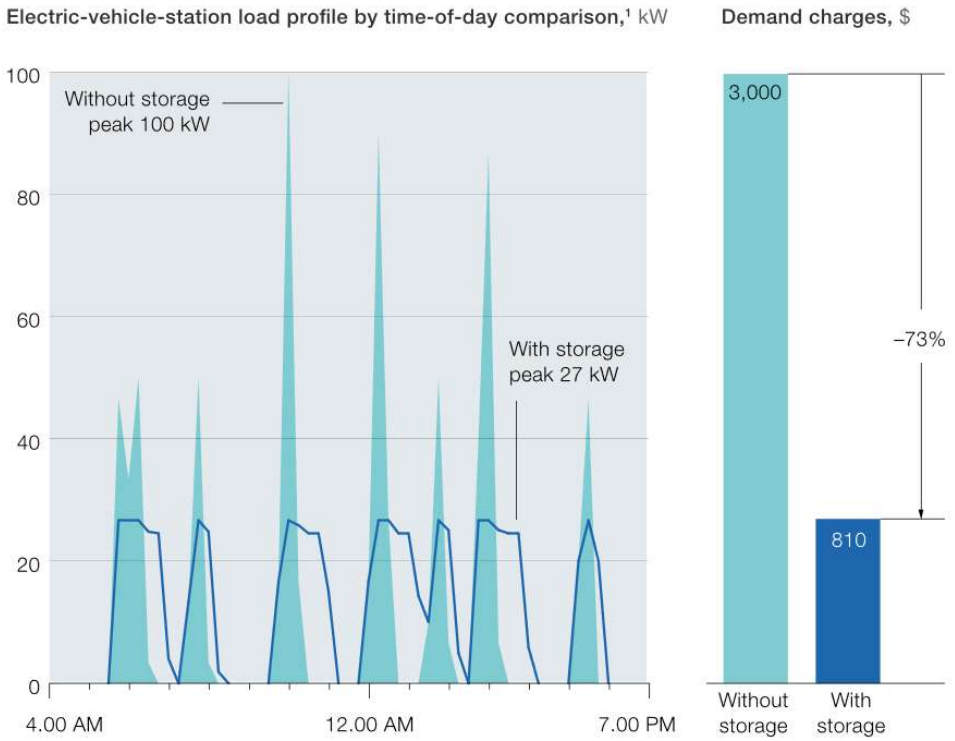
Mitigating Distribution Grid Impacts for EV Fast Charging

EVgo 30 kW / 50 kWh 2nd life batteries for DC-fast charging application at UCSD



[1]This assumes (i) the station has four direct-current fast-charging 50 kW chargers; (ii) 11 charging sessions occur during the time period profiled (4 AM to 6 PM); (iii) there is at least one instance where two cars charge simultaneously; (iv) the demand charge rate is $30 per kW; and (v) the battery-storage system is 150 kWh and can discharge at up to 75 kW.

McKinsey&Company

Mitigating Distribution Grid Impacts for EV Fast Charging

What happens when six electric semi trucks driving in a convoy pull in to a rural truck stop and all plug in to 350 kW fast chargers at the same time?

Mitigating Distribution Grid Impacts for EV Fast Charging

What happens when six electric semi trucks driving in a convoy pull in to a rural truck stop and all plug in to 350 kW fast chargers at the same time?

Stationary energy storage coupled with the charging station can be a solution.

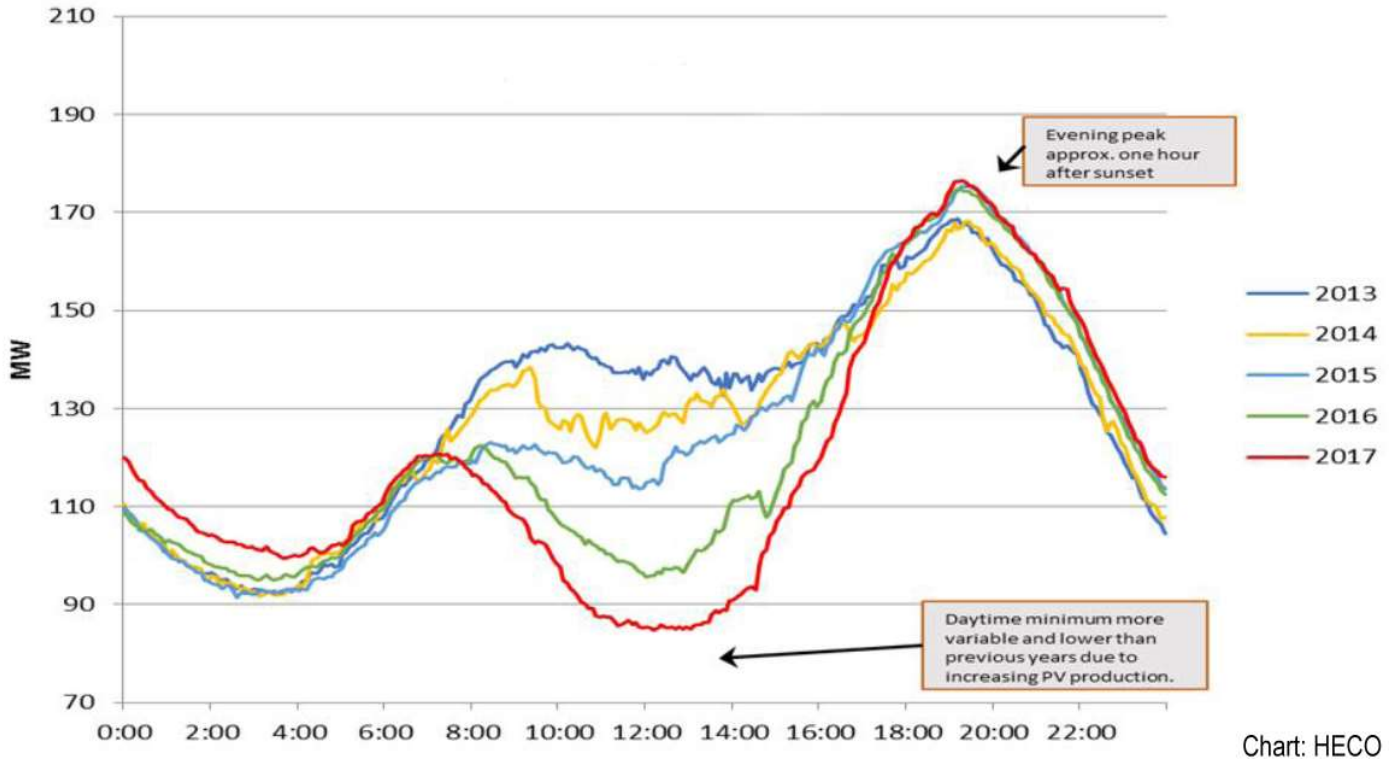
- Ramping
- Distribution grid capacity & congestion
- Demand charges

- Power quality
- Spot market generation prices
- etc…

…Not Just for Fast Charging, Not Just for Heavy Duty Vehicles

- When the whole cul de sac in your Bay Area neighborhood plugs in a Tesla Model 3 at once…
- Idaho National Lab researching better management of EVs on the grid – and security

We've all seen the duck curve…



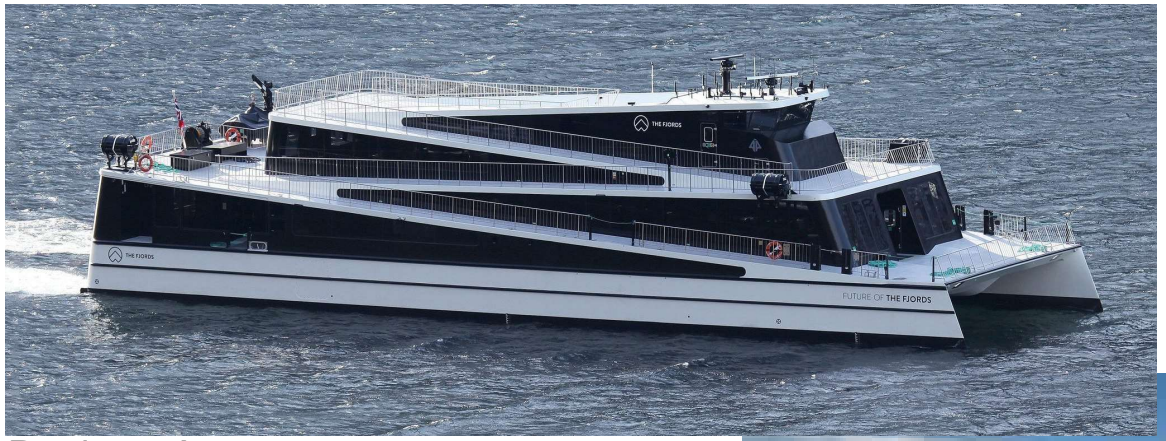
Storage shifts energy in time as transmission shifts it in space.

Others Who'll Demand Robust Charging Infrastructure

- Car dealerships
  - Everyone wants a test drive Saturday morning
- Office parking garages
  - Everyone arrives at 8:55
- Shopping malls
- Stadiums
- And more…

Wired

Future Fleet EVs?



Brødrene Aa

Wright Electric

Other Opportunities

- True 100% renewable charging with storage
  - More benefit if you have no feed-in tariff
- Mobile EV charging to meet demands at certain times and places
  - E.g. festivals or serving delivery trucks at a construction site

Siemens Gamesa

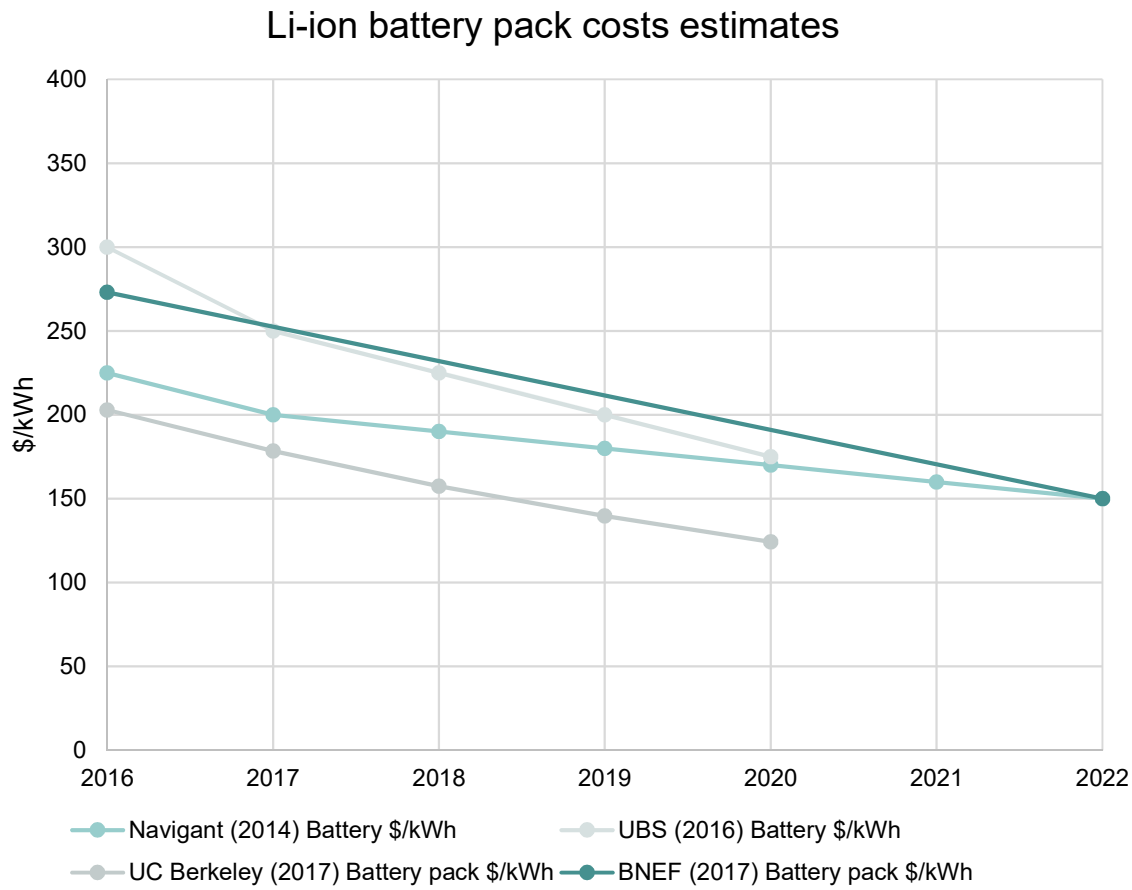
Open Questions

- If this makes EV chargers more expensive up front, how long are you waiting for use (mainly EV deployment) to increase to pay back the investment (chicken & egg)?
  - If usage is low, the revenue to recoup the demand charge is spread out among fewer customers.
  - Easier for fleet owners.

Open Questions

- Is the savings enough to justify the capital cost of an energy storage system?
  - Increasingly so as costs come down and charging station use goes up, but that balance point will vary. If a level 3 charger = an extra $1000 / mo demand charge, a $50,000 battery has a 4 year payback – is that ok?
  - Are there other value streams that the energy storage system could take advantage of? E.g. grid ancillary services while it wasn't being used for EV charging.

Battery Costs Continue to Decline



Growing Numbers of EVs on the Grid:

It's Complicated.

But entirely manageable and stationary energy storage is an important part of making it work.

Call for Posters and Registration are open for The ESA Storage Exchange!

Key Features Include

- Peer-to-peer education
- Exchange of real world solutions
- Expert technical study
- Objective-minded learning
- Intimate, non-sales pressure environment

Visit energystorage-events.org

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Thanks!

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