DOCKETED	
Docket Number:	21-ESR-01
Project Title:	Energy System Reliability
TN #:	250181
Document Title:	Energy Storage Supply Chain
Description:	11 - CESA - Presentation
Filer:	Xieng Saephan
Organization:	California Energy Storage Alliance
Submitter Role:	Public Agency
Submission Date:	5/16/2023 5:02:30 PM
Docketed Date:	5/17/2023

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

CEC Reliability Workshop

Energy Storage Supply Chain

May 19, 2023

Sergio Duenas
Policy Manager

Our CESA Board Members

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

Our CESA Members

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

Categories of ES Supply Chain & Price Impacts

Potential risk over past few years

Different factors occur on different time scales

Battery tariffs*

BOS costs & availability

Lithium & other commodity prices

Shipping Congestion & Related Costs (e.g., oil)

Short-Term (2023/2024)

Mid-Term (2025/2026)

Long-Term (2027+)

Labor costs

Deferred deliverability allocation

Interconnection delays

Cost of capital

Transmission IFS & network upgrade construction delays

Sources of Relief on ES Price & Supply Chain Risks

Some relief in short term (IRA), but much can be done with longer lead-time actions - i.e., minimize just-in-time procurement where possible

Battery tariffs*

BOS costs & availability

Flexible & innovative contracting

Lithium & other commodity prices

Domestic critical materials & manufacturing facilities

Shipping Congestion &

Non-lithium ES procurement diversity

IRA tax credits

Mid-Term (2025/2026)

Short-Term (2023/2024)

Labor costs

Long-Term (2027+)

Streamlined & efficient interconnection & construction

Potential to mature & support

Deferred deliverability allocation

Domestic recycling & reuse

Interconnection delays

Cost of capital

Transmission IFS & networ

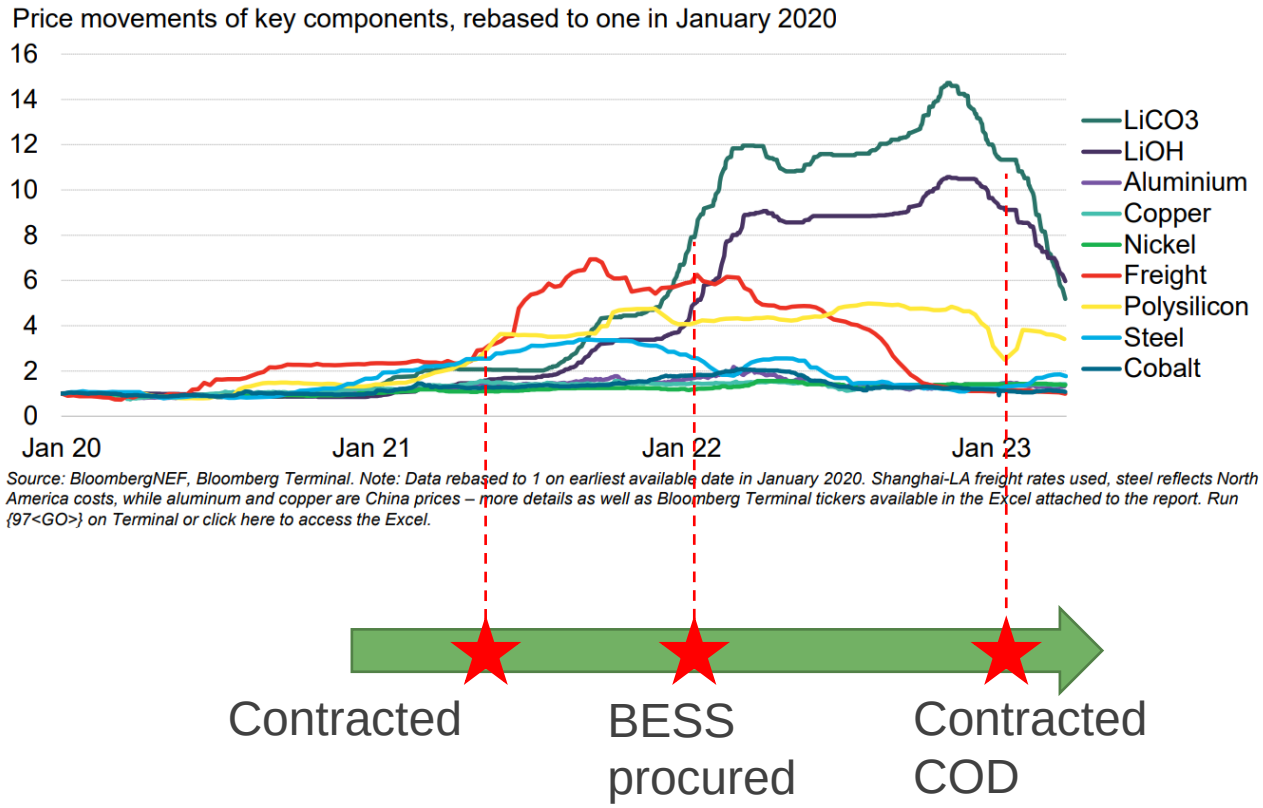
Proactive policy-driven transmission upgrades

Rising Commodity Prices

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

Inflation of commodity prices will be volatile to a degree, but it will likely persist:

- Rule of thumb: $1/kg increase in Lithium Carbonate ≈ $1/kWh increase in Li-Ion batteries
- Lithium is only component of full balance of system (BOS) – e.g., transformers
- Battery is typically procured and shipped ~ 1 year ahead of COD and after contracted with LSE



Price expectations set in contract did not reflect unprecedented inflation, commodity price increases, supply chain shortage, etc.

Foreign Manufacturing

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

Concentration of Li-ion raw material production is a vulnerability in the supply chain.

- Lithium-ion batteries are expected to be the dominant commercial technology (>95%) for short-term energy storage (less than 10 hours) for the next several years
- China produces more than 60% of the cobalt and lithium and 95% of the manganese refined materials
- China's dominance over US even more pronounced in subcomponent manufacturing

- Underdeveloped supply chains:
  - Lead-acid
  - Flow Batteries
  - Emerging Tech
  - LDES

Table ES-1 United States' and China's Existing and Future Shares of Global Subcomponent Capacity

	Current		Under Development	
	U.S.	China	U.S.	China
Cathode	0.70%	63%	0%	84%
Anode materials	0.60%	84%	0%	91%
Separator[3]	3%	66%	0%	76%
Electrolyte	7%	69%	2%	75%

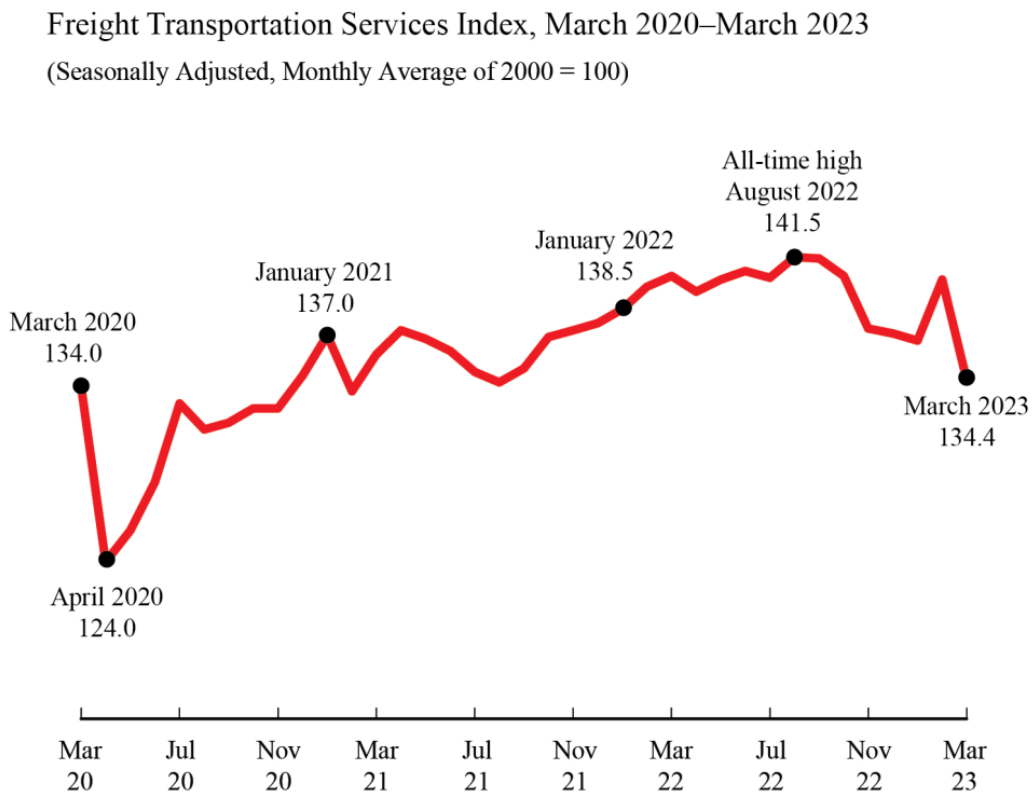
Source: (BloombergNEF, 2021)

Shipping

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

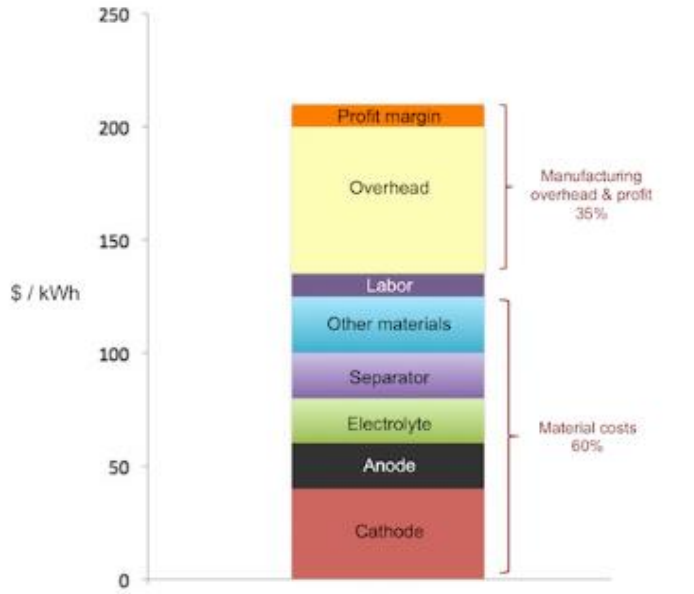
Since most battery manufacturing takes place in China, energy storage project costs were affected by the global shipping crisis

- The cost of shipping a 40-foot container, which cost just $1,300 before the pandemic, reached record highs above $11,000 in September 2021
- 2023 has seen freight rates slump to the lowest level since the first wave of the pandemic as shipping volumes have decreased (due to decreased spending on merchandise) and excess capacity has emerged



O&M Costs

- **Labor is a smaller portion of overall costs**
  - It does not scale linearly with MW capacity (costs are fixed and benefit from scale)



Cost components of a lithium-ion battery

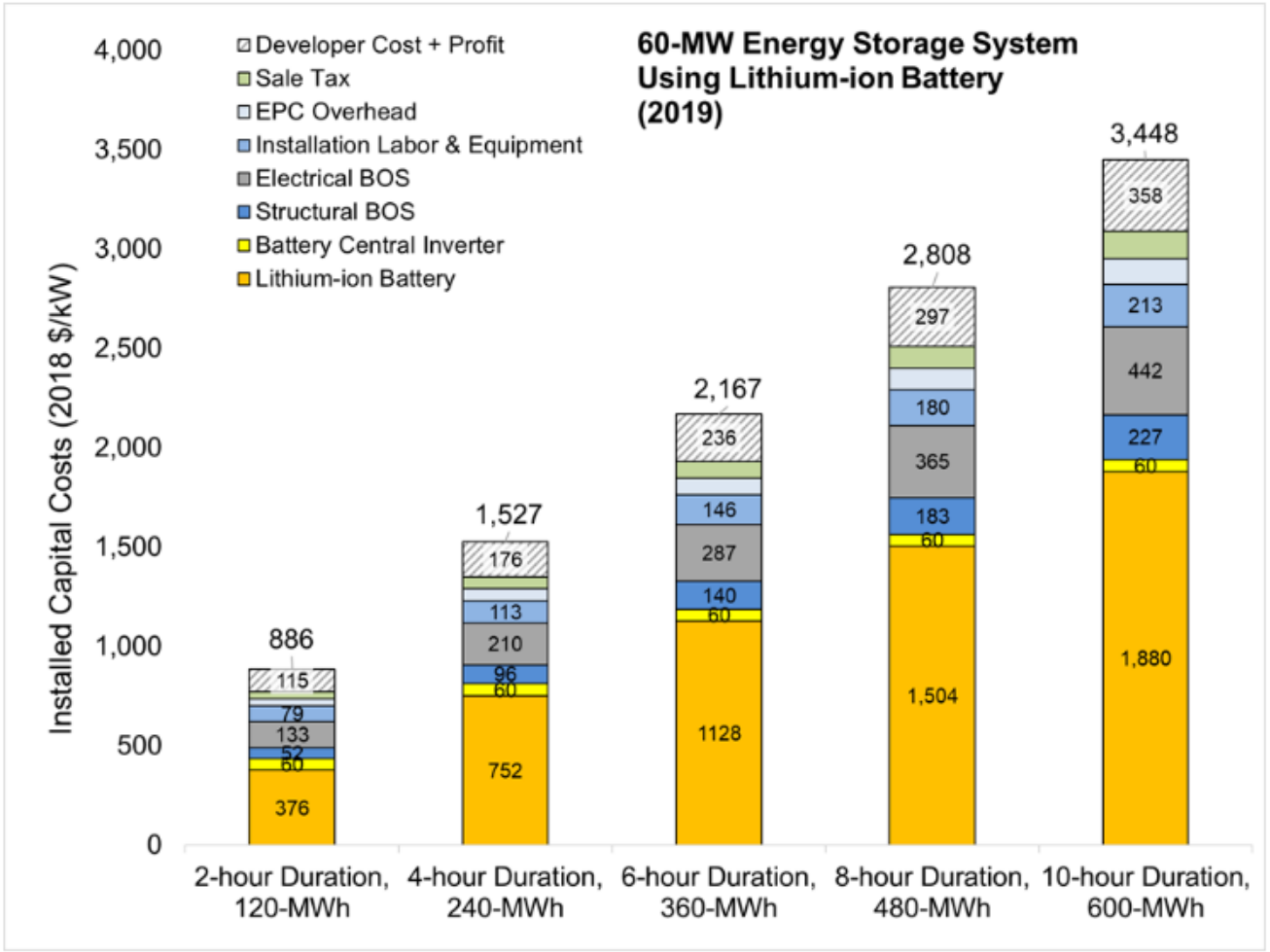


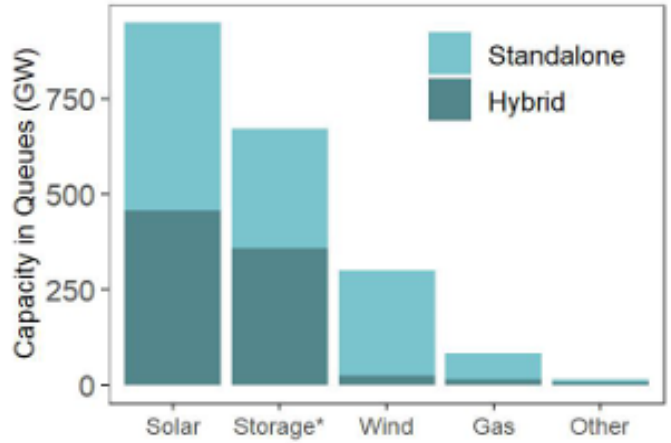
Figure 2. 2019 U.S. utility-scale LIB storage costs for durations of 2–10 hours (60 MW_{DC}) in $/kW

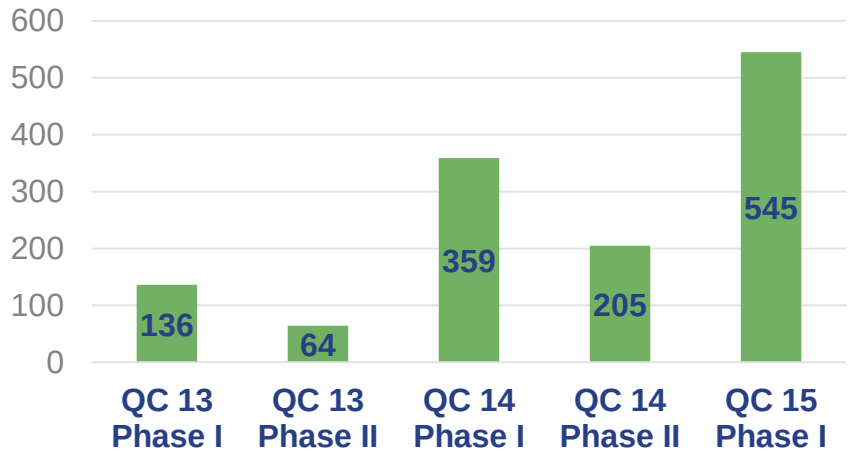
Interconnection Delays

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

- **US grid interconnection backlog jumped 40% in 2022, with wait times expected to grow as IRA spurs more renewables**
  - Over 10,000 projects representing 1,350 GW of generator capacity and 680 GW of storage actively seeking interconnection
- **CAISO: Significant volume of interconnection requests currently pending in its queue**
  - Mutiple projects in queue for several years now

Region	*n* (Active)
CAISO	495
ERCOT	902
ISO-NE	350
MISO	1,734
NYISO	459
PJM	3,042
SPP	571
Southeast (non-ISO)	830
West (non-ISO)	1,879





Short-Term Supply Chain Enhancements

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

- **Inflation Reduction Act (2022)**
  - Standalone energy storage assets are now eligible for the investment tax credit. ITC was increased to 30% under a ten-year fixed term for both standalone storage and solar-plus-storage facilities.
  - Developers can claim an additional 10% bonus credit for using project equipment that is manufactured in the U.S., and another 10% for assets that are located at decommissioned fossil fuel facilities in front-line communities.
- **Flexible & Innovative Contracting**
  - Have some flexibility on contract renegotiations to get critically needed near-/mid-term capacity online, recognizing timeline of when projects are contracted and batteries are procured
  - Develop some upfront indexed pricing mechanisms to pass through some commodity price volatility

Mid-Term Supply Chain Enhancements

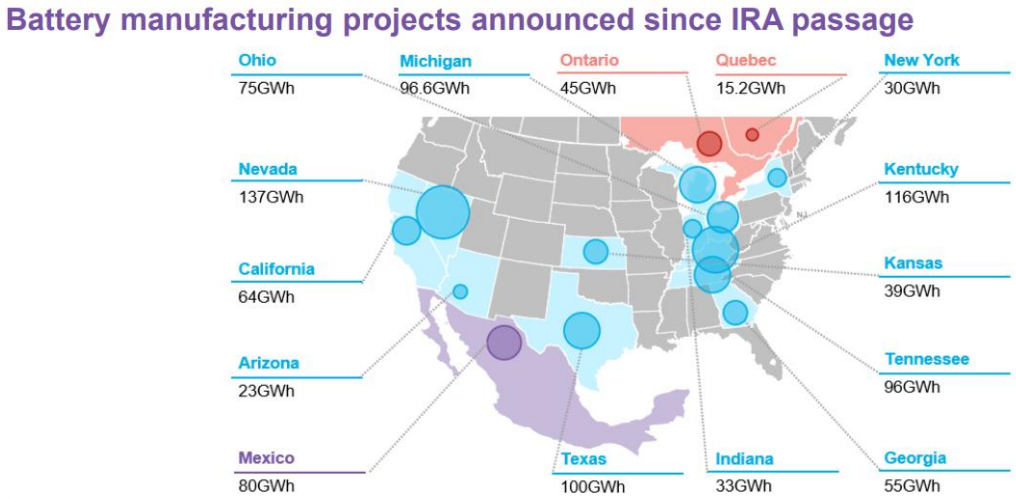
CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

- **CAISO Interconnection Process Enhancement (IPE) Initiative**
  - Focuses on improving the Generator Interconnection and Deliverability Allocation Procedures (GIDAP), as well as aligning resource planning, transmission planning, interconnection queuing and power procurement
- **Biden Administration: $10.5 billion to Grid Resilience and Innovation Partnerships (GRIP) Program and Additional $2.5 billion for Transmission Facilitation Program**
  - Funded by the President's Bipartisan Infrastructure Law, these programs together represent the largest single direct federal investment in critical transmission and distribution infrastructure

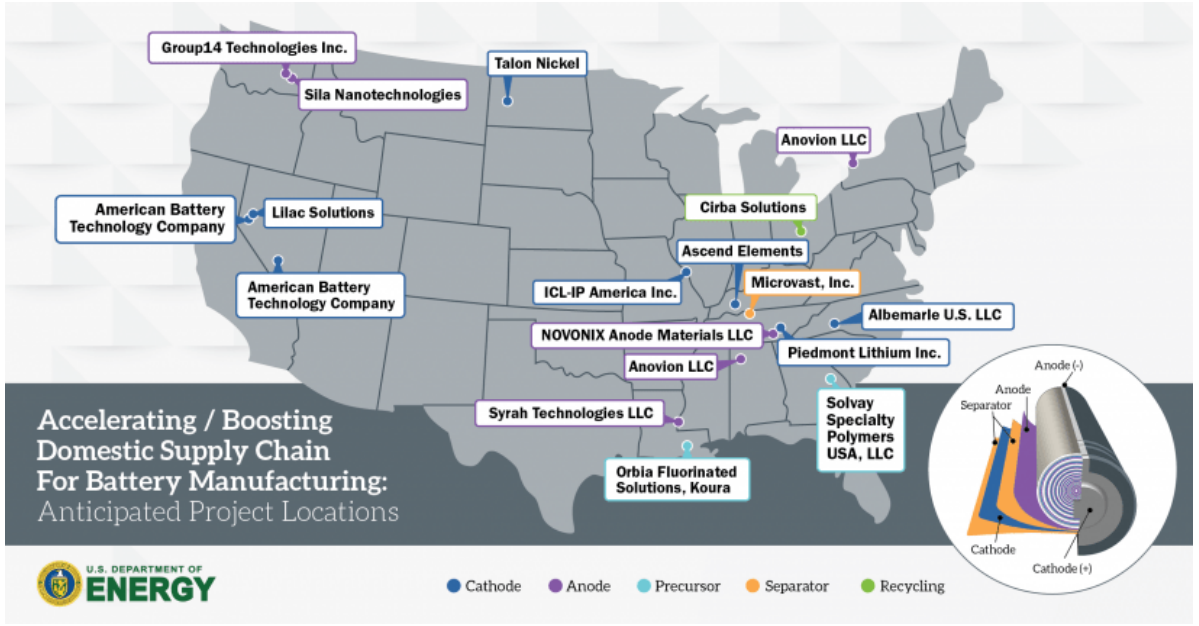
Long-Term Supply Chain Enhancements

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

- DOE is spearheading many initiatives and providing significant funds to enhance domestic and/or “near-shore” battery storage supply chain
- DOE is also working to diversify storage supply chain to other ES tech
- All the above are helped by IRA but are sources of long-term (~ post 2026) supply chain resiliency



Source: BloombergNEF. Note: Dates for fully commissioned plants correspond to the data when the last phase was commissioned. Bubble size corresponds total capacity commissioned, under construction and announced.



Questions?

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

For follow-up, please reach out to:

Sergio Duenas

sduenas@storagealliance.org

CALIFORNIA ENERGY STORAGE ALLIANCE