



*National Association of
State Energy Officials*

NASEO Webinar: Scaling Storage: Long-Duration, Distributed, and Utility-Scale Deployment Pathways

October 5, 2026



Welcome and Zoom Reminders

Agenda

- Welcome and Introduction
- Remarks and Perspectives from Utah
 - Tim Kowalchik, Research Director, Utah Office of Energy Development
- Panel Discussion: Scaling Energy Storage across the Distributed, Long-Duration, and Utility-Scale Sectors
 - Alex Ince-Cushman, Chief Executive Officer, Branch Energy
 - Gabe Murtaugh, Director of Regulatory Affairs, Hydrostor
 - Eric Stoutenburg, Chief Development Officer, Eolian
- Moderated Discussion and Audience Q&A

Updates and Resources

- Long-Duration Energy Storage Updates and Resources
 - Edison Electric Institute is now leading the National Consortium for the Advancement of Long Duration Energy Storage Technologies (Learn more and sign up for updates [here](#))
 - [Long-Duration Energy Storage Landscape Assessment](#), Sandia
 - [Long-Duration Energy Storage Tool](#), Sandia
- [2026 NASEO Annual Meeting](#) in Boulder, CO: October 27-30
 - Maximizing Flexible Distributed Energy Resources and Grid Storage
 - Salt of the Earth: The Sodium-Ion Battery Breakthrough
 - Powering Safety in the Lithium-Ion Era

Scaling Storage:

Long-Duration, Distributed, and Utility-Scale Deployment Pathways

Oct 5, 2026 | NASEO Webinar

Tim Kowalchik
Research Director, Emerging Technology Strategist



**Energy
Development**

Energy Storage

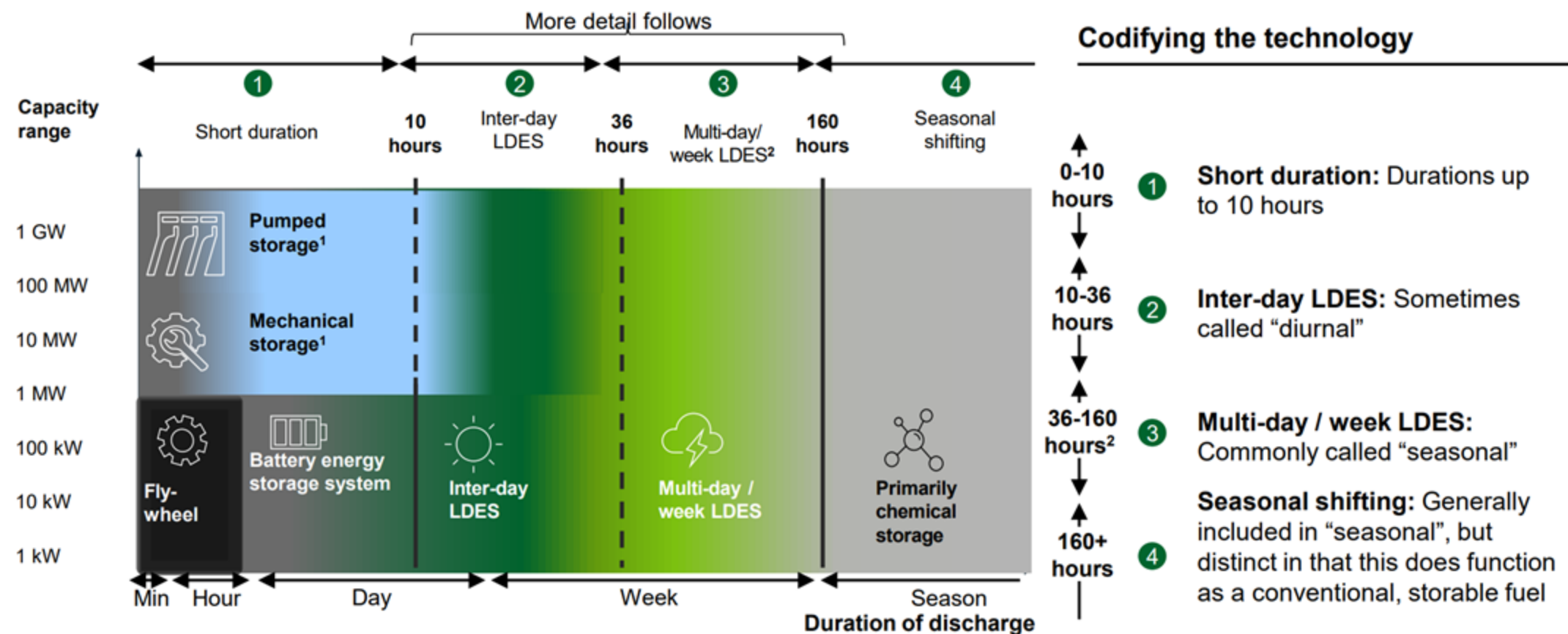


Figure 4: LDES technologies can be used for inter-day and multi-day use cases at a variety of scales. Technologies and market use cases may span across duration categories (e.g., technology's duration may encompass both multi-day LDES and seasonal shifting). ¹Pumped storage hydropower and mechanical storage can operate effectively as both short-duration and inter-day LDES systems; ²LDES systems with 36+ hours of duration are considered multi-day / week LDES as they can discharge to cover 2+ full days of peak demand (e.g., 8am to 8pm).

Shifting Landscape

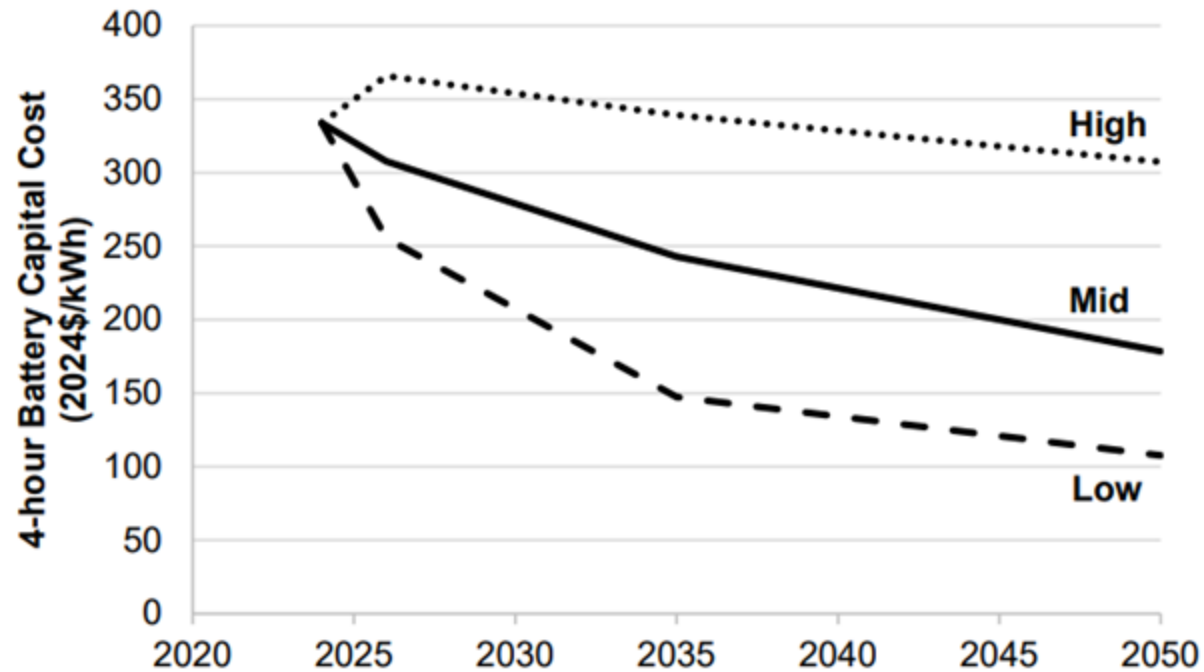
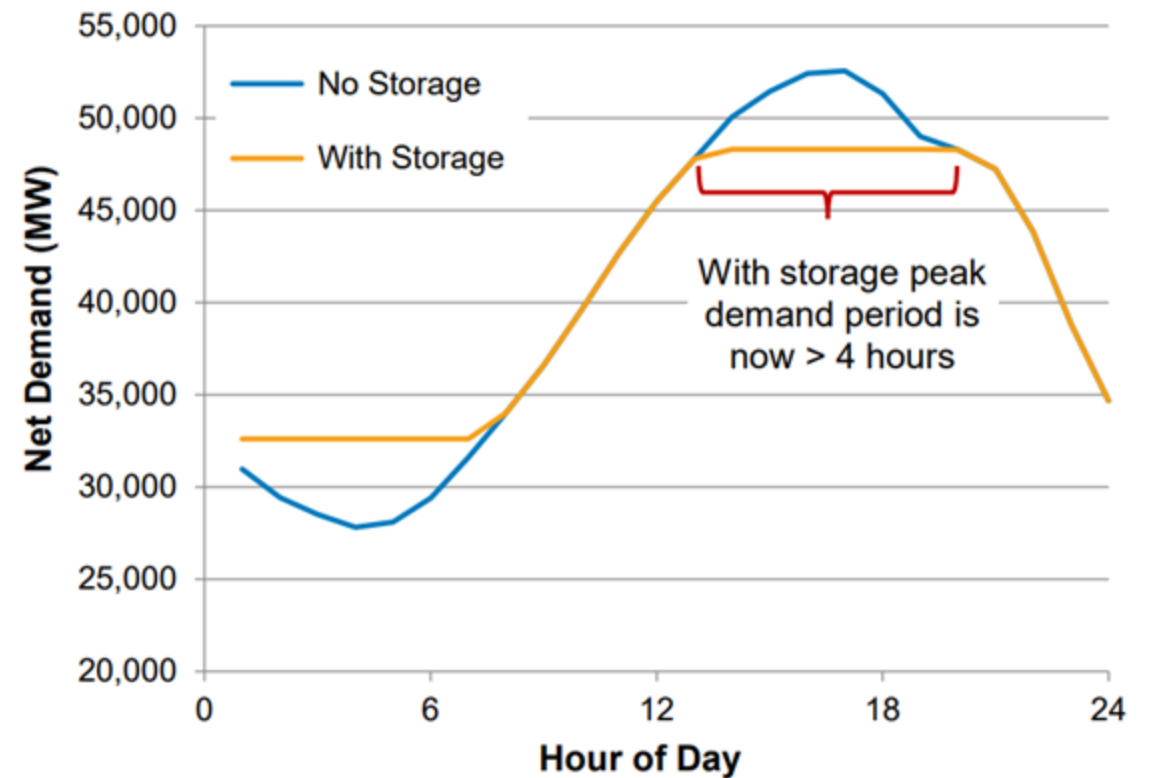


Figure ES-2. Battery cost projections for 4-hour lithium-ion systems.

<https://www.osti.gov/servlets/purl/2583471>



<https://docs.nlr.gov/docs/fy23osti/85878.pdf>



NASEO Scaling Storage Webinar

Gabe Murtaugh
Director of Regulatory Policy, Western US
October 5, 2026

A-CAES is a Flexible Storage Solution



Proven Technology

Our systems use proven OEM equipment, including air compressors, turbo expanders, generators, and heat exchangers



8-24+ Hours of Storage

A-CAES is the best positioned, commercially viable LDES solution for intraday applications



Flexible Siting

Purpose-built hard rock caverns allow for flexible project siting – facilities can be built anywhere there is hard rock, not salt caverns, typically 30-50% of landmass



Low-cost, Large Scale

A utility-scale LDES solution available today providing 200-500+ MWs of storage



Emission-free Operation

Allows renewable resources to be integrated onto the grid without sacrificing reliability



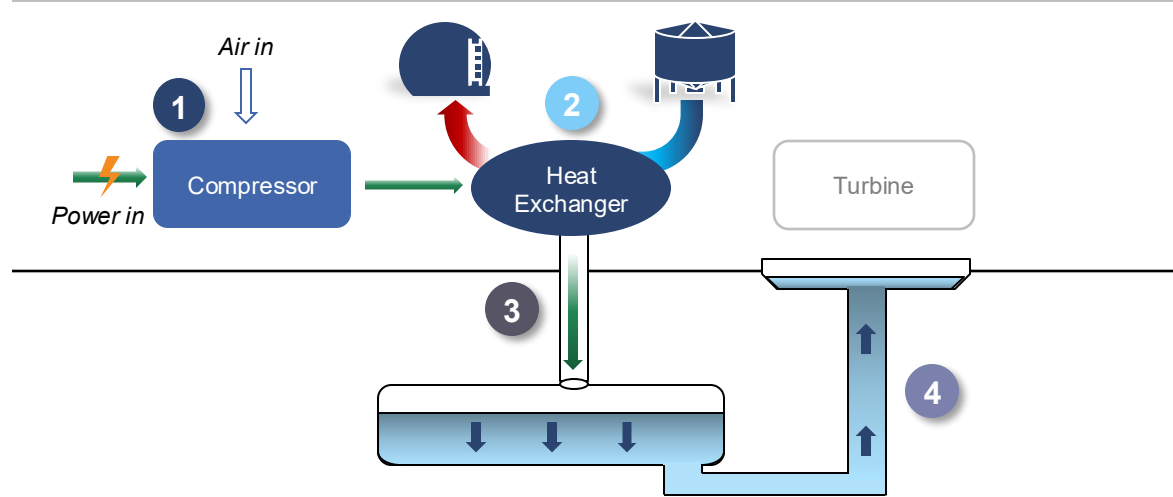
50+ Year Asset Lifetime

No efficiency degradation and low O&M



A-CAES is a Utility-Scale LDES Solution, Leveraging Proven Processes and Commercially Available Equipment

CHARGING



1

Compression

Off-peak electricity powers compressor, which pumps ambient air into the system at high pressure

2

Adiabatic Heat Storage

Heat generated during compression is extracted from the hot air and stored in the thermal storage tanks

3

Air Storage

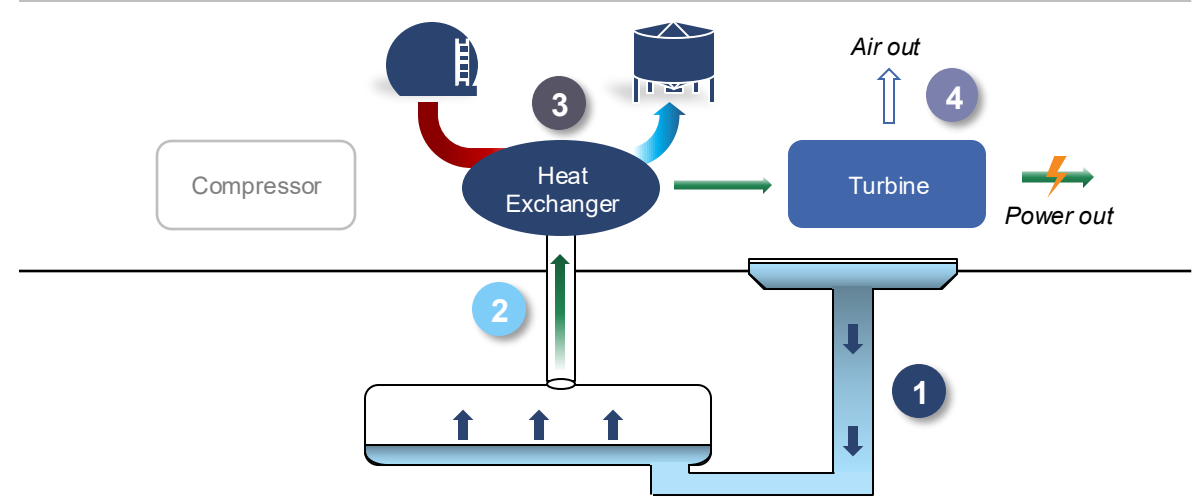
The cooled compressed air is pumped down an air shaft into a water-filled, purpose-built rock cavern

4

Hydrostatic Compensation

Compressed air displaces water from the cavern, up the shaft, and into the surface reservoir; the weight of the water keeps the pressure constant

DISCHARGING



1

Hydrostatic Compensation

When electricity is required, water in the reservoir is allowed to flow back into the cavern

2

Air Storage

Water flooding into the cavern pushes the compressed air back to the surface

3

Heat Redeployment

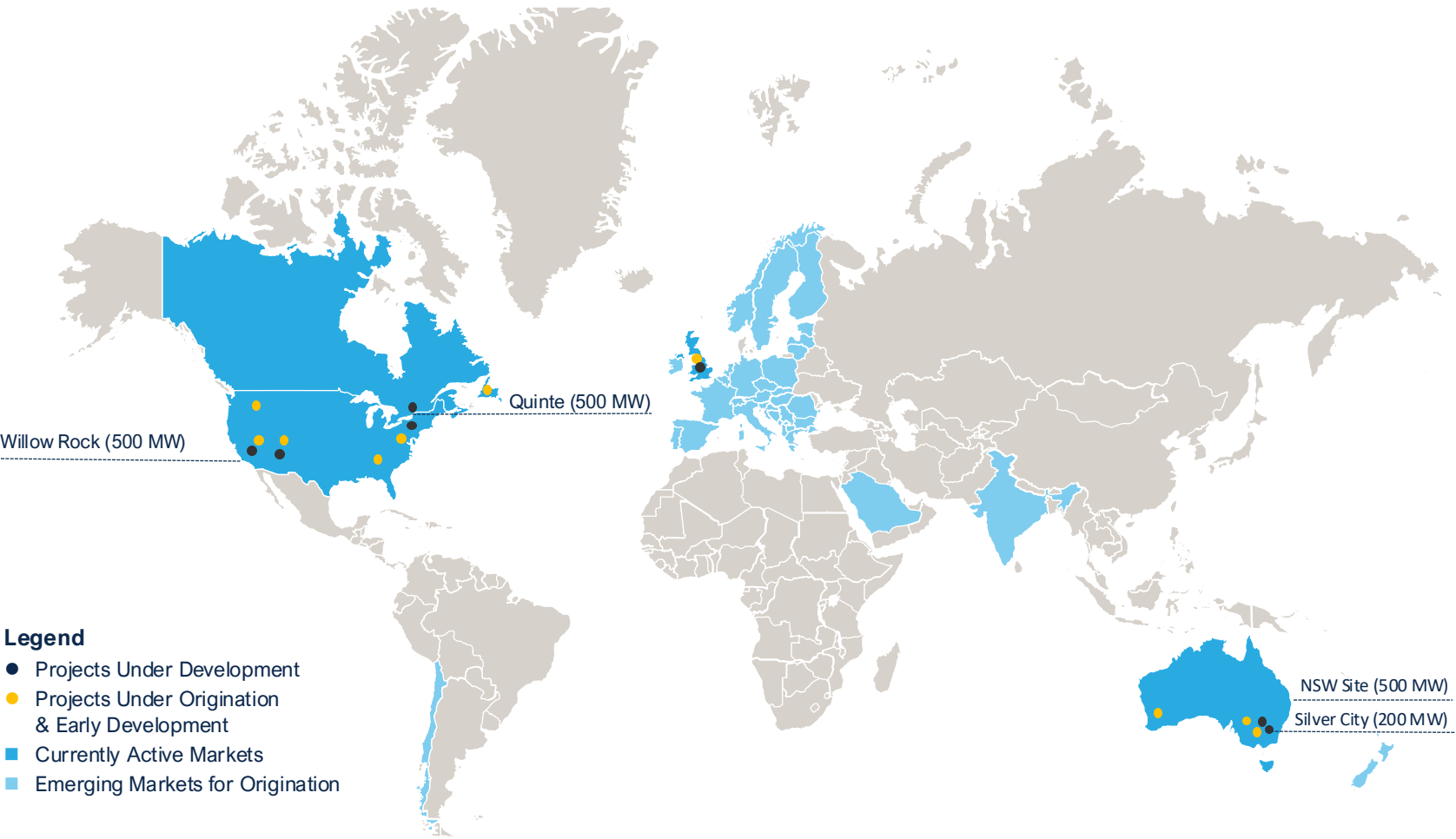
Heat from the thermal storage is re-injected into the compressed air stream to offset the cooling effect from expansion

4

Generation

The heated, compressed air is used to spin a turbine to generate power back into the grid

An Active and Growing 7,000 MW Project Pipeline



North America

- Willow Rock ESC (Site, LGIA, Offtake Contract)
- Quinte ESC (1 Project: Site Secured, IA In Progress)
- New York (2 Projects: 3 Sites Secured, 1 IA Submitted)
- Arizona (2 Projects: 1 Site Secured)
- California (2 Projects: 2 Site Secured, 2 IA Submitted)
- Nevada (2 Projects, 2 Site Secured, 2 IA In Progress)
- Pacific Northwest (Screening Complete)
- Virginia (High level geology screen complete, site control & modeling in-progress)
- Southeast (Screening Complete)
- Eastern Canada (Screening Underway)

Australia

- Silver City ESC (Site Secured, Offtake Contract)
- NSW (Site Secured, MOU Underway)
- Victoria (2 Projects; Screening Complete, Site Exclusives)
- South Australia (1 Project, Govt Submittal for Site Contract)
- Western Australia (1 Project; Site Identified)

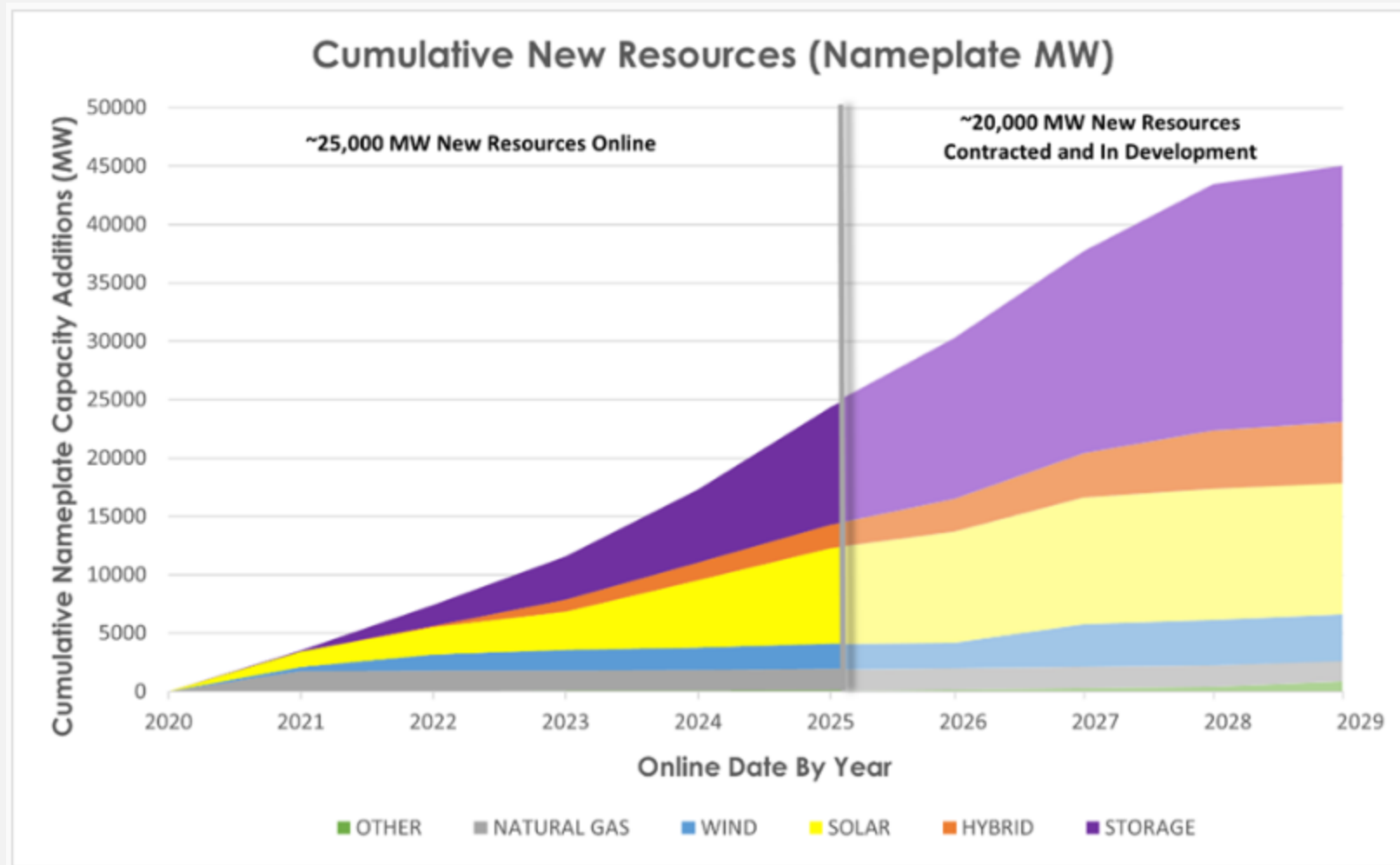
Other Countries

- United Kingdom (Screening Complete, 2 IA submitted)

Storage is not ubiquitous, and but there is some initial grid scale deployment of LDES

- The reality is that there is still relatively little new storage resources on US electric grids today
 - There is legacy pumped hydro
- There are clear “market” drivers for short-duration storage
 - We see a significant amount of storage built in California (14+ GW), Texas (12+ GW), and Arizona (5 GW)
 - The Texas market does not have a resource adequacy construct, but the energy market revenues and ancillary service market revenues are sufficient to make storage profitable
 - This is driving procurement of shorter duration resources
 - California has **deep decarbonization goals** combined with procurement mandates from the state, and a resource adequacy market that utilities must comply with
- Nearly all of the new storage capacity on all of the systems is lithium-ion technology

California's decarbonization goals (carbon neutral electric generation by 2045) is driving procurements of wind, solar and storage resources



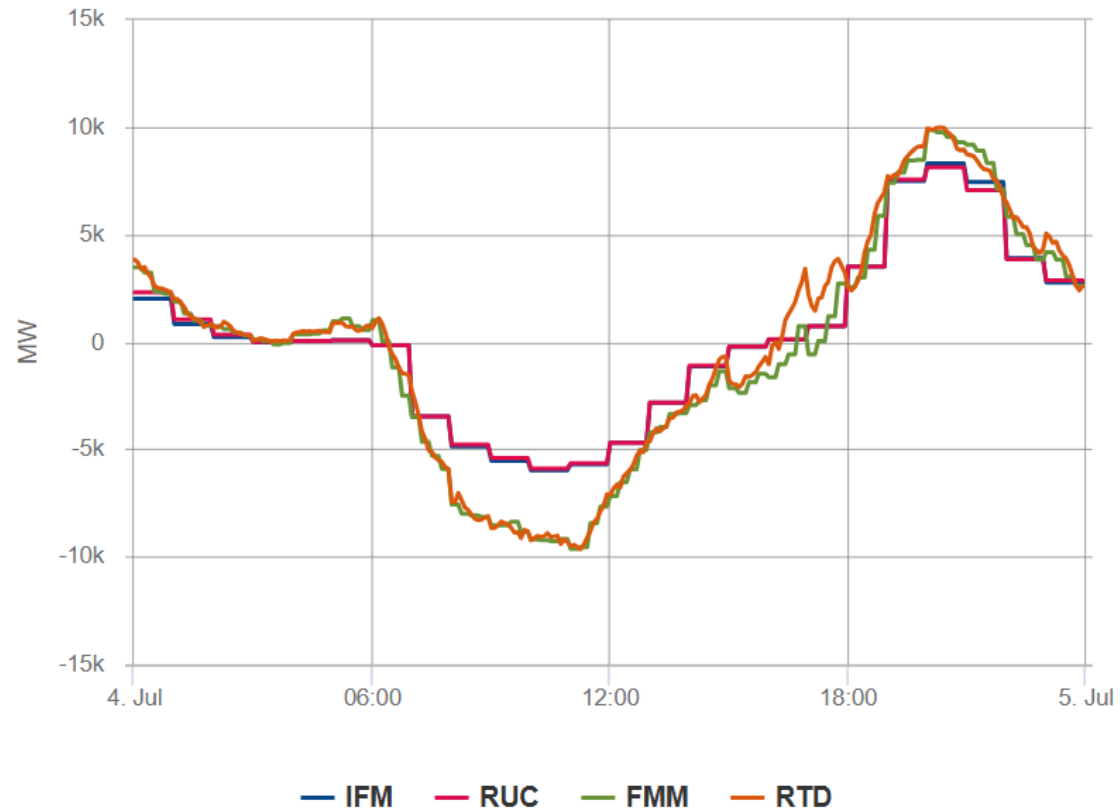
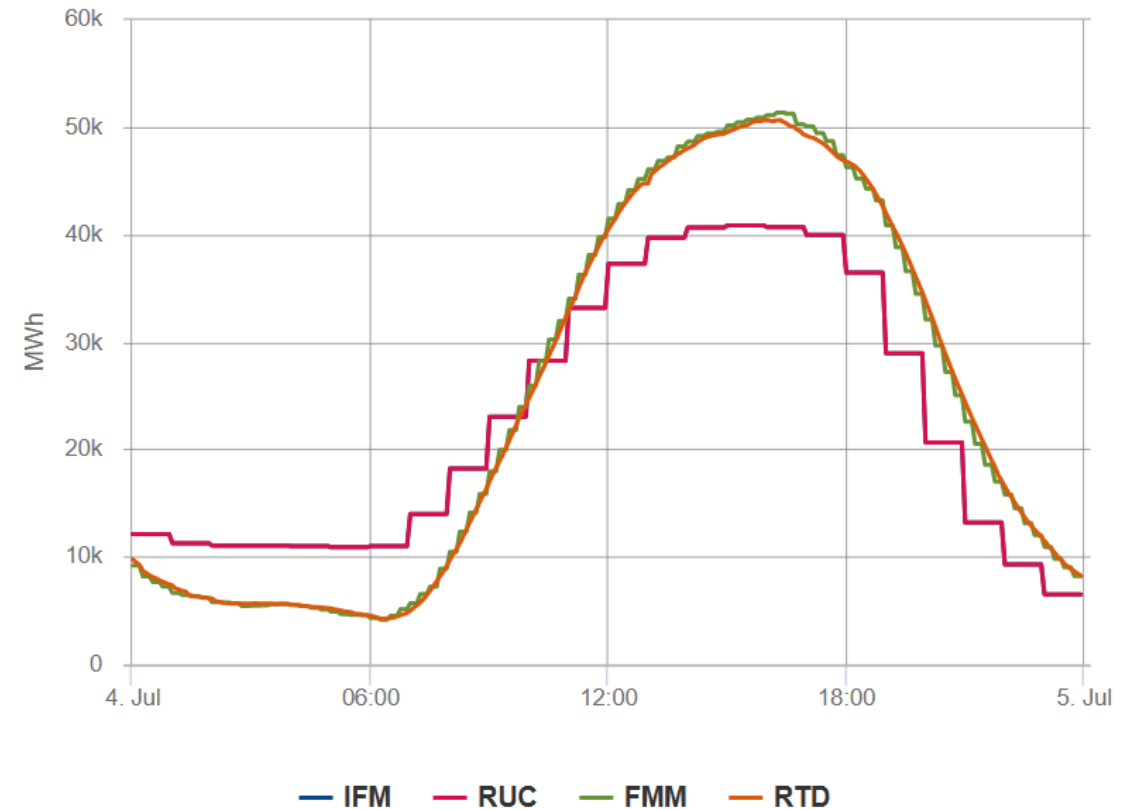
Long duration storage resources are coming to a market near you soon!

- California develops resource portfolios based on production cost and resource expansion modeling
- This modeling is calling for more than 11 GW of LDES, set to be on the system by summer 2031 and more by 2036
- This is required to keep the state on track for decarbonization goals, including carbon neutral electricity generation by 2045

Table 6. New Resources Included in 2026-272 TPP Proposed Base Case (in GW)

Resource Type	2031	2036	2041	2045
Natural Gas	-	-	-	-
Geothermal	1.2	3.4	3.4	3.4
Enhanced Geothermal	-	1.7	1.7	1.7
Biomass	-	-	-	-
In-State Wind	2.0	2.6	4.8	7.7
Out-of-State Wind	5.5	7.0	17.0	19.0
Offshore Wind	-	2.9	4.5	4.5
Solar	35.9	47.5	53.7	68.5
Li-ion Battery (4-hr)	6.8	6.8	6.8	6.8
Li-ion Battery (8-hr)	10.0	13.2	13.2	18.6
Location-Constrained Storage (12-hr)	1.6	5.4	5.4	5.4
Generic LDES (12-hr)	-	-	-	-
Generic LDES (24-hr)	-	0.5	0.5	0.5

California develops a daily energy report showing how storage resources are scheduled in the day-ahead and real-time energy markets

Total Energy Awards ⓘ**Total State of Charge** ⓘ

The patterns for storage dispatch tell us a lot a lot about how storage resources are participating in the markets

- The dispatch patterns for the storage resources resembles the familiar “duck curve” charging during the middle part of the day and discharging in the evening
 - Prices (and ultimately net load) are driving these patterns
- The reports also show that storage resources are providing a significant amount of capacity that the ISO is procuring for (sometimes all) **ancillary services**
- The principles of organized energy market design incentivize resources to bid full capacity at costs reflective of actual marginal operating costs into the day-ahead market
 - Real-time markets compensate based on *imbalance energy*, and only serve to improve financial outcomes (settlements) from day-ahead schedules
 - Higher prices in the real-time market result in larger energy schedules and lower prices in the real-time market result in reduced schedules

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Utility-scale Energy Storage

Eolian

October 5, 2026



Madero – 200 MW / 500 MWh

Mission, Texas – operated merchant



Padua – 400 MW / 1.9 GWh

San Antonio, Texas – utility contracted



Seaside – 200 MW / 800 MWh

Portland, Oregon – utility owned



Storage – Affordability and Reliability

- Price spikes fell 40%, “as additional ESR [energy storage] capacity improved ERCOT’s capability to manage the system’s ramp needs.” ERCOT IMM
- Ancillary service costs fell 60% in 2025, lowest since 2020
- Record demand without record prices in 2026
 - ERCOT all-time peak of 91,308MW
 - Battery discharge record of 11,980MW
- Average operating reserves rose 128% from 2021 to 2025
- Batteries met 9% of the 76GW peak demand for Winter Storm Fern



Storage – It is Not Easy

- Market rules needed to evolve for full deployment of storage
- Capacity value for storage is...?
- Cyclical investment character of storage



Where does storage go next?

- Expands significantly into other markets
- Meeting AI data center demand including NERC large load interconnection standards
- Could Storage As a Transmission Asset (SATA) be resurrected along with Grid Enhancing Technologies?
- Storage's role in mitigating different futures



Challenges for Energy Storage

- Permitting and comingled opposition to data centers
- Integration into new markets
- State approaches to approval of regulated utility rate recovery
- Executive Order 14421 and FCC Inverter Ban





Thank you!

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