



Sandia  
National  
Laboratories

# OPSI Annual Meeting Panel Discussion

## *How to Add Storage to the Grid More Quickly?*

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October 22, 2024



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# What I will be covering today.



1. **Key question:** “What Steps Can Be Taken to Add Storage to the Grid More Quickly?”
2. Market Challenges
3. Market Observations
4. Introducing the LDES National Consortium
5. Relevant Industry Recommendations



# Market challenges.



- PJM has acknowledged the risk of its capacity market failing to address regional needs as soon as 2030.
  - ❖ Impending resource adequacy shortfall of nearly 4 GW by 2029 unless new entries from resources like BESS accelerate.
  - ❖ The shortfall grows to over 8 GWs by 2034, despite over 105 GW of new entries.
  - ❖ Energy storage is a crucial flexible resource for future system balancing and ramping needs...but not if storage resources can't get built and built quickly.

# Market observations.



## 1. Energy storage classified as a generation asset in PJM.

- ❖ Risk lies in hindering the deployment of energy storage by not adequately compensating for its flexibility, and potentially causing issues with interconnection studies by treating storage like traditional generation sources.
- ❖ Different approaches have emerged (e.g., SPP classifies energy storage as a transmission-only asset + CAISO, where storage participates as Non-Generation Resources—either load or generation)
- ❖ Storage resource do not have a capacity market must run requirement.
- ❖ It appears that PJM's interconnection queue is primarily composed of limited-duration resources, so policies to increase incentives for LDES would likely be beneficial.

# Market observations.



## 2. There are opportunities to streamline Surplus Interconnection Service (“SIS”)

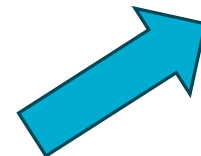
- ❖ SIS provides a simpler, expedited study process that occurs outside the conventional interconnection queue. Allows new generators that do not trigger transmission system upgrades to use an existing generator’s unused interconnection capability.
- ❖ PJM has placed restrictions on grid-charging BESS from utilizing the SIS option.
- ❖ Expedite the interconnection and commercial operation of projects in the queue that would address identified reliability issues (opportunity for LDES here).

# Market observations.



## 3. Disconnects between state policies and PJM rules

- ❖ Disconnect between state portfolio goals and limitations of the PJM interconnection queue.
- ❖ Questionable level of influence that state representatives have before PJM, when compared to other RTOs such as MISO and SPP.
- ❖ PJM's interconnection queue will continue to delay state renewable goals and other emission-reduction targets until FERC, PJM, and states work together.
- ❖ Opportunity to adopt best practices from other RTOs (e.g., standardize pro forma RMR requirements, consistent with mandatory requirements in most of the other RTOs).



RTO/ISO	Notice Period	Mandatory/ Voluntary
<b>PJM</b>	At Least 90 Days Before Deactivation Date	Voluntary
<b>CAISO</b>	At Least 90 Days Before Deactivation Date	Mandatory
<b>MISO</b>	At Least One Year Before Deactivation Date	Mandatory
<b>ISO-NE</b>	~ Four Years Before Deactivation Date	Mandatory with some opt-out capability
<b>NYISO</b>	At Least One Year Before Deactivation Date	Mandatory During Notice Period Voluntary After Notice Period Has Passed

# Market observations.



## 4. Concerns about resource adequacy assessment metrics

- ❖ LOLE assessment is based on one-day-in-10 years, and does not quantify the magnitude or duration of firm load loss.
- ❖ ELCC may not capture hourly data and pay resources based on actual availability rather than on assumed performance derived from a very limited data set of performance based on unrepresentative extreme historical weather
- ❖ ELCC may not fully capture the increasing heterogeneity of LDES technology characteristics, such as duration, roundtrip efficiency, and parasitic loss constraints, which do not make them exact substitutes.

# The National Consortium for the Advancement of LDES Technologies



The LDES National Consortium provides a forum through which stakeholders across the LDES ecosystem can convene to **identify barriers, determine potential synergies, and collaboratively develop and implement strategies necessary to achieve LDES technology commercialization** within the next decade.

## MAJOR DELIVERABLES OVER NEXT THREE YEARS:

- LDES Demonstrations & Deployments Tracking System
- LDES Technology Maturity Evaluation Framework
- Assessment of Utility Needs for LDES
- Geographical Readiness Assessments
- Evaluation of US Wholesale Markets
- Evaluation of US Retail Markets
- Full Set of Commercial Pathways Recommendations
- Networking and Community Outreach



### Lab Leadership

Lead by Sandia Labs partnering with ANL, INL, NREL, ORNL, & PNNL



### 180+ Teaming Partners

LDES National Consortium will be comprised of U.S. industry and community stakeholders, known as "Teaming Partners."



### Website

Community of Knowledge and Best Practices ensuring findings are easily accessible

**3 Years  
\$7M Federal  
Funds + Cost  
Share**

**16 Tiger  
Teams**  
Topical working groups to evaluate challenges.

## National Launch: January 2024



# Organizational Structure



## TIGER TEAMS

- Customer Adoption
- Demonstrations & Deployments
- Economics & Valuation
- Equity
- Grid Infrastructure
- Interconnection, Standards & Permitting
- Investor Confidence / Finance
- Market Planning
- Policy & Regulations
- Reliability & Resilience
- Safety & Grid Security
- Supply Chain & Manufacturing Efficiencies
- Technology Development, Evaluation & Testing
- Use Case Development
- Utility Resource Planning
- Workforce Development

***Tiger Teams will develop what ultimately will become the public stakeholder recommendations for these specific focus areas.***

- ❖ The recommendations address the commercialization challenges referenced by the DOE's 2023 Lift-off Report.
- ❖ The 11 challenges were assigned to the 16 Tiger Teams; most of the challenges now have 5-10 recommendations associated with them.
- ❖ Along with making the recommendations, we will be developing an implementation tracking system to track results. (Findings will be included in forthcoming assessment reports).

**DOE funded, Lab facilitated, and Industry driven!**

**As of October 2024, we now have ~200 Teaming Partners!**



# 11 Challenges—Pulled directly from the DOE's Lift-Off Report.



1. Cost of an LDES system needs to come down by 2030
2. LDES technologies must achieve 7-15% improvement in roundtrip efficiency to compete with Li-ion storage and hydrogen.
3. The specific needs related to LDES workforce training (i.e., skills and training) are presently not well defined.
4. A uniform approach toward developing resource adequacy compensation for LDES technologies does not exist, in either regulated markets (PUC evaluation) or competitive markets (ISO/RTO).
5. A comprehensive assessment of necessary supply chain improvements specific to LDES technologies does not presently exist.
6. There is presently a lack of resources regarding how to evaluate grid upgrades or expansions that will be necessary to accommodate both new variable renewable generation sites and LDES systems
7. Presently, there is no publicly available evaluation of LDES technologies against primary competitive factors.
8. LDES is not included in most utility grid firming plans.
9. LDES use cases require market changes at the wholesale level.
10. ISO and RTO markets will need to develop support mechanisms.
11. State-level policymaking specific to LDES has been very limited.

# LDES in Wholesale Markets.



- Across all RTOs/ISOs, to enable LDES in wholesale markets, significant changes are needed:

Market Design Modifications	Regulatory Reforms	Technological Advancements
<ul style="list-style-type: none"><li>○ Assign appropriate capacity credits to LDES based on long discharge duration, not just power rating, to accurately reflect value in grid reliability.</li><li>○ Implement pricing structures that incentivize charging during low-demand periods and discharging during peak demand, allowing LDES to capitalize on price arbitrage opportunities.</li><li>○ Develop new market products specifically for LDES, such as "energy capacity" markets that allow LDES technology developers to sell their ability to provide sustained power over extended periods.</li></ul>	<ul style="list-style-type: none"><li>○ Define LDES as a distinct asset class within the market, allowing for tailored regulations and market rules to optimize its participation.</li><li>○ Enable flexible dispatch of LDES to respond to grid needs, including the ability to charge and discharge at different times depending on market conditions.</li><li>○ Ensure LDES can fully participate in ancillary services markets, such as frequency regulation and voltage control, to maximize revenue streams.</li></ul>	<ul style="list-style-type: none"><li>○ Continued R&amp;D efforts are crucial to reduce the cost of LDES technologies, making them more competitive in the market.</li><li>○ Enhance the round-trip efficiency of LDES systems to maximize energy storage capacity and profitability.</li></ul>

# Additional Policy Reforms



- Conduct a comprehensive study of which support mechanisms already exist and which need to be developed in ISO/RTO markets for LDES, including LDES technologies under development.
- Conduct an examination of why “storage as transmission” tariffs have not been more successful in the RTOs in which they have been developed, to identify what storage can do and cannot do in respect to transmission applications.
- Conduct further analysis to determine how to capture the value of emissions and translate value into a compensation metric in wholesale markets, based on a presumption that carbon pricing as a fixed value may not send the right market signals or achieve intended impacts toward achieving LDES commercialization.
- Establish compensation mechanisms for LDES that are distinct from energy and capacity revenues.

**THANK YOU!**



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