



LDES NATIONAL CONSORTIUM

ANNUAL WORKSHOP

Day 1 – Tuesday, September 10th, 2024

Time	ROOM NAME/NUMBER							
	Main Room	Auditorium	ROOM 305	ROOM 306	ROOM 307	ROOM 308	ROOM 309	Tour
7:30-8:00	BREAKFAST / CHECK IN		CLOSED SESSION: LEADERSHIP TEAM MTG.					
8:00-9:15	OPENING SESSION: <ul style="list-style-type: none"> Sandia and DOE-OCED Opening Remarks LDES National Consortium Update Keynote – Roland Berger 							
9:15-9:45	NETWORKING / TRANSITION BREAK							
9:45-10:45	SESSION 1							
		Utility Perspectives Panel	Geographical Assessment with RTOs: Addressing Regional Variances with Unique Approaches	Understanding the Cost and Value of Long Duration Energy Storage	Best Practices for Community Engagement for LDES Deployment			Tour Group A
10:45-11:00	NETWORKING / TRANSITION BREAK							
11:00-12:00	SESSION 2							
		The Role of LDES from Multiple Perspectives Panel	Public/Private Funding Scenarios	What does Safety and Grid Security Mean for LDES?	Pursuing Energy Equity Through LDES Policymaking	Measuring and Monetizing the Benefits of Long-Duration Energy Storage on Grid Reliability and Resilience		Tour Group B
12:00 – 1:00	LUNCH							
1:00 – 2:30	SESSION 3							
	Demonstration and Deployment Projects Review							
2:30-2:45	NETWORKING / TRANSITION BREAK							
2:45 – 3:45	SESSION 4 (2, 30-MINUTE ROTATIONS)							
	NETWORKING HOUR: DIALOGUE SESSIONS - USE CASE FOCUSED							
		Load Management services	Firming for PPA	Microgrid Resiliency	Utility Resource Planning	T&D Deferral	Energy Market Participation	Tour Group C
3:45-4:00	NETWORKING / TRANSITION BREAK							
4:00-5:00	SESSION 5							
	Technology Pitches – Defining the Future of LDES Technologies							
5:00-6:00	RECEPTION							

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LDES NATIONAL CONSORTIUM

ANNUAL WORKSHOP

Day 2 – Wednesday, September 11 th , 2024									
Time	ROOM NAME/NUMBER								
	Main Room	Auditorium	ROOM 305	ROOM 306	ROOM 307	ROOM 308	ROOM 309	Tour	
7:30-8:00	BREAKFAST / CHECK IN		CLOSED SESSION: LEADERSHIP TEAM MTG						
8:00-8:45	OPENING SESSION: <ul style="list-style-type: none"> Sandia and DOE-OTT Opening Remarks Keynote - NERC 								
8:45-9:45	SESSION 6 Alignment with DOE-OE LDES Initiatives								
9:45-10:00	NETWORKING / TRANSITION BREAK								
10:00 – 11:00	SESSION 7 Regulations & Standards Panel		Adoption Readiness Level (ARL) Workshop	Storage as Transmission / Grid Infrastructure	LDES Workforce: Looking Forward			Tour Group D	
11:00-11:15	NETWORKING / TRANSITION BREAK								
11:15-12:15	SESSION 8 TIGER TEAM MEETINGS								
		Technology Deployment, Evaluation, & Testing; Demonstrations & Deployments; Safety & Grid Security; Use Case Development	Supply Chain & Manufacturing Efficiencies; Workforce Development	Market Planning, Policy & Regulations; Interconnection, Standards, & Permitting; Utility Resource Planning	Economics & Valuation; Investor Confidence, & Financing	Customer Adoption; Equity	Grid Infrastructure; Reliability & Resilience	Tour Group E	
12:15 – 1:15	LUNCH								
1:15 – 2:15	SESSION 9 (2, 30-MINUTE ROTATIONS) NETWORKING HOUR: DIALOGUE SESSIONS – TECHNOLOGY FOCUSED								
		Mechanical	Thermal	Chemical	Electrochemical			Tour Group F	
2:15-2:30	NETWORKING / TRANSITION BREAK								
2:30 - 4:00	SESSION 10 CLOSING SESSION: <ul style="list-style-type: none"> Tiger Team Reports on Year 1 Recommendations Closing Session: What's Next for the Consortium 								

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DETAILED AGENDA

TUESDAY, SEPTEMBER 10

7:30AM – 8:00AM: Breakfast / Check In

8:00AM – 9:15AM: Opening Session

- **Welcome** (Will McNamara, Principal Investigator of the LDES National Consortium, Sandia National Laboratories)
- **Sponsor Opening Remarks** (Electrical Training Institute / IBEW / NECA)
- **Sandia Opening Remarks** (Ray Byrne, Energy Storage Program Manager, Sandia National Laboratories)
- **DOE Opening Remarks** (Emanuele Pecora, Liffoff Enabling Programs Manager, Department of Energy - Office of Clean Energy Demonstrations)
- **LDES National Consortium Update** (Will McNamara, LDES National Consortium Principal Investigator, Sandia National Laboratories)
- **Keynote, Opportunities for LDES Technologies: The Roland Berger Perspective** (Ben Lowe, Partner Energy & Utilities Regulated & Infrastructure, Roland Berger)
 - In this keynote presentation, Ben Lowe will discuss key drivers, use cases, and technologies for LDES and Roland Berger's perspective on the key challenges facing LDES players in seeking to accelerate the deployment and adoption of LDES technologies.

9:15AM – 9:45AM: Networking Break

9:45AM – 10:45AM: Session 1

- **PANEL Utility Perspectives Panel**

This session will focus on a discussion of the unique needs of utilities as they consider LDES development. Factors such as whether a utility is an IOU, municipal or co-op; whether or not the utility operates in a vertically integrated or restructured market; and the existence of enabling or restrictive policies all can have significant impacts. Representatives from LADWP and DTE Energy will share their perspectives, enabling an interactive discussion with session attendees.

 - *Moderator:* Jeremy Twitchell (Pacific Northwest National Laboratory)
 - *Panelists:* Matt Hone (LADWP), Nathan Bennett (DTE Energy)
- **WORKSHOP Geographical Assessment with RTOs: Addressing Regional Variances with Unique Approaches**

Different regions of the US have differing levels of readiness for LDES deployment due to grid conditions, policies and market constructs. The variances create unique challenges and opportunities for LDES commercialization that must be addressed with nuanced and tailored approaches and recommendations. This workshop will review the work plan that the LDES National Consortium is undertaking to conduct regional assessments of specific RTO markets and the expected outcomes.

 - *Moderators:* Will McNamara (Sandia National Laboratories)
 - *Presenters:* Mike Granowski (Roland Berger)

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- **PRESENTATION + DISCUSSION Understanding the Cost and Value of Long Duration Energy Storage**

This session will explore current estimates and projections of future LDES costs and will discuss ongoing research at DOE focused on identifying high-value research, development, and demonstration targets to reach a goal of 5 cents per kilowatt-hour levelized cost of storage by 2030. It will also review LDES modeling approaches used in investment planning, discuss relevant issues related to societal benefits and social equity, and evaluate commercialization pathways and approaches used to monetize services provided by LDES.

- *Moderator / Presenter:* Patrick Balducci (Argonne National Laboratory)
- *Presenters:* Gabe Murtaugh (LDES Council), H. J. Corsair (Oak Ridge National Laboratory), Eric Ruffel (CLP Engineering, LLC)

- **PRESENTATION + DISCUSSION Best Practices for Community Engagement for LDES Deployment**

In this session participants will explore best practices in community engagement for LDES projects through a variety of modes. First, the group will describe a hypothetical “case study” of community engagement and allow participants to offer a critical assessment on the approach taken in the case study. Next, the group will cover best practices in community engagement as identified by federal agencies as well as the literature. Finally, the group will outline the ideal process of community engagement, again referencing the “case study” from the beginning of the presentation.

- *Moderator/Presenter:* Torrey Lyons (Idaho National Laboratory)

10:45AM – 11:00AM: Networking Break

11:00AM – 12:00PM: Session 2

- **PANEL The Role of LDES from Multiple Perspectives Panel**

This panel will discuss the need of energy storage to support 100% clean energy future and the role of LDES from analyst, planner, end users, and developers. This panel will use LA100 as an example for path and lessons towards 100% clean energy.

- *Moderator:* Zhiwen Ma (National Renewable Energy Laboratory)
- *Panelists:* Caleb Dennis-Kiyasu (LADWP), Paul Denholm (NREL), Rachel Wilson (Form Energy), Joe Stekli (Galvanize Climate Solutions)

- **WORKSHOP Public/Private Funding Scenarios**

Learn about and help our collective understanding of the public/private funding and investment landscape for LDES companies, from those looking for seed funding, to first-of-a-kind projects, to deployments, and to manufacturing. The session will begin with an educational overview of the current state of private sector investment, investment types and strategy with a brief Q&A. Following the initial presentations, participants will help develop case studies and associated plan of action for generalized LDES companies who are seeking private investment at various stages of technology, company, and market development.

- *Moderator/Presenter:* Jeffrey Gifford (National Renewable Energy Laboratory)
- *Presenter:* Michael Sanders (Avicenne Energy)

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- **PRESENTATION + DISCUSSION What Does Safety and Grid Security Mean for LDES?**

This workshop will discuss the recommendations developed to address the safety and grid security challenges identified in the DOE LDES Lift-Off report. The discussion will focus on how the recommendation will potentially impact the workforce safety and security standards, training, technology, and procedures in preparation for the transition and integration of LDES technologies into the grid. Further, additional challenges and recommendations identified by the LDES Safety & Grid Security Tiger Team will be presented for discussion with the attendees of this session. Members of the safety, security, and manufacturing industries should attend this session to learn and share their insight on LDES Safety and Grid Security.

- *Moderator / Presenter:* Dan Ricci (Idaho National Laboratory)
- *Presenter:* Elias Greenbaum (GTA, Inc.)

- **PANEL Pursuing Energy Equity Through LDES Policymaking**

An interactive discussion of current “best practices” in state policymaking that seek to ensure that Energy Equity considerations are included in emerging energy storage / LDES policymaking will be the focus of this break-out session. This session will include panelists from Illinois and Michigan who will describe their states’ approaches toward Energy Equity through energy storage / LDES policymaking.

- *Moderators:* H. J. Corsair (Oak Ridge National Laboratory), Will McNamara (Sandia National Laboratories)
- *Presenters:* Emily McClure (DOE Clean Energy Innovator - Illinois Commerce Commission), Cathy Cole (Michigan Public Service Commission), Anurupa Roy (Oak Ridge National Laboratory)

- **PRESENTATION + DISCUSSION Measuring and Monetizing the Benefits of Long-Duration Energy Storage on Grid Reliability and Resilience**

There are a number of techniques and modeling approaches used to define the value of power reliability and grid resilience, all with certain benefits and significant shortcomings. While the need for enhanced reliability has become both a greater focal point and challenge for market operators and electricity service providers, the value of enhanced reliability and resilience and the means to compensate LDES to address this need remains an open question. This session will explore this question through presentations covering a range of topics and through follow-on panel discussions and audience Q&A. The session plans to include: the benefits and shortcomings of several reliability and resilience valuation approaches, LDES as a solution to the reliability/resilience challenge, grid modeling techniques and metrics used to evaluate reliability and resilience, and alternative compensation mechanisms for compensating LDES for reliability/resilience services.

- *Moderator/Presenter:* Patrick Balducci (Argonne National Laboratory)
- *Presenters:* Kimberly Johnston (NextGen Energy Partners), Gabe Murtaugh (LDES Council)

12:00PM – 1:00PM: Lunch

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1:00PM – 2:30PM: Session 3

- **SPECIAL EVENT Demonstration and Deployment Projects Review**

Demonstration projects play an integral role in the bankability and future investment of general infrastructure in the grid-supporting assets. With the need for LDES technologies increasing with growing intermittent renewable electricity generation, the typical end-users need to have a certain degree of guarantee on their investment on new infrastructure. Having substantial operational data from reasonable scale demonstration projects generally decrease the risk of novel technologies, by providing an enhanced learning experience.

- *Moderators:* Henk Laubscher (Sandia National Laboratories) / Dustin Highers (Chugach Electric)
- *Presenters:* Dan Petcovic (Lockheed Martin Energy), Timothy Held (Echogen), Mike Manwaring (Stantec), Eric Watson (Energy Dome)

2:30PM – 2:45PM: Networking Break

2:45PM – 3:45 PM: Session 4

- **SPECIAL EVENT Dialogue Sessions – Use Case Focused**

The Dialogue Session event will be networking-focused collaborative session in which participants will choose a room/use case that most aligns to their interests or expertise. Each room will spend 30 minutes discussing key questions regarding their assigned use case for LDES. After 30 minutes, participants will select a second room to attend. This format will allow for small and large group conversations around key challenges and opportunities for LDES across various use cases.

- Moderators:
 - *Firming PPAs:* Jeffery Gifford (National Renewable Energy Laboratory), Elias Greenbaum (GTA, Inc.)
 - *Microgrid Resilience:* Kannan Tinnium (Schneider Electric), Luke McLaughlin (Sandia National Laboratories)
 - *Load Management Services:* Vilayanur Viswanathan (Vish) (Pacific Northwest National Laboratory), Dan Petcovic (Lockheed Martin Corporation)
 - *Transmission & Distribution Deferral:* Patrick Balducci (Argonne National Laboratory), Joe Stekli (Galvanize Climate Solutions)
 - *Energy Market Participation:* Guangdong Zhu (National Renewable Energy Laboratory), Todd Levin (Argonne National Laboratory)
 - *Utility Resource Planning:* Paul Denholm (National Renewable Energy Laboratory), Rebecca Barney (National Renewable Energy Laboratory)

3:45PM – 4:00PM: Networking Break

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4:00PM – 5:00PM: Session 5

• **SPECIAL EVENT Technology Pitches – Defining the Future of LDES Technologies**

Step into a dynamic breakout session where leading innovators and thought leaders in LDES present their cutting-edge technologies and visions for the future. This session will focus on introducing new technologies, the organizations behind them, and the specific use cases they're designed to address. Participants will delve into key performance indicators (KPIs) beyond roundtrip efficiency, such as cost per capacity, reliability, and adaptability. Join us to explore areas of need and collaboration and discover how these technologies can be scaled to meet real-world demands. Whether you're a developer, investor, or policy influencer, this session is your opportunity to learn about the next wave of LDES solutions.

- *Moderator:* Luke McLaughlin (Sandia National Laboratories)
- *Presenters:* David Stapp (Peregrine Turbine Technologies), John Langhus (Photon Vault), William Taggart (Cavern Energy Storage), Brennan Gantner (SkipTech), Eren Engur (Malta Inc), Russ Weed (Clean Tech Strategies), Elias Greenbaum (GTA), Eugene Beh (Quino Energy)

5:00PM – 6:00PM: Reception

WEDNESDAY, SEPTEMBER 11

7:30AM – 8:00AM: Breakfast / Check In

8:00AM – 8:45AM: Opening Session

- **Welcome** (Will McNamara, Principal Investigator of the LDES National Consortium, Sandia National Laboratories)
- **Sandia Opening Remarks** (Mary Monson, Senior Manager, Technology Partnerships and Business Development)
- **DOE Opening Remarks** (Dr. Vanessa Chan, Chief Commercialization Officer for the Department of Energy and Director of the DOE's Office of Technology Transitions)
- **Keynote, LDES and the Future of the Grid: NERC's Perspective** (Howard Gugel, Vice President, Regulatory Oversight, NERC)
 - In this keynote presentation, Howard Gugel will share NERC's perspectives on the grid-transformation challenges facing LDES technologies, including the evolution of Critical Infrastructure Protection (CIP) Standards, maintaining grid security, and strengthening the agility of operational processes, all of which are critical considerations on the pathway to LDES commercialization.

8:45AM – 9:45AM: Session 6

• **PRESENTATION + DISCUSSION Alignment with DOE-OE LDES Initiatives**

In this keynote presentation, Dr. Erik Spoerke, Distinguished R&D Materials Scientist at the Department of Energy--Office of Electricity will discuss the LDES focused initiatives that are being funded through the DOE-OE and how they align with the objectives of the LDES National Consortium (and vice versa). DOE-OE funded initiatives focused on LDES include the Energy Storage Grand Challenge (ESGC), the Rapid Operational Validation Initiative (ROVI), the Long Duration Storage Shot, and the Storage Innovations 2030: Technology Liftoff funding opportunity announcement (FOA).

- *Presenter:* Erik Spoerke, Department of Energy – Office of Electricity

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9:45AM – 10:00AM: Networking Break

10:00AM – 11:00AM: Session 7

- **PANEL Regulations & Standards Panel**

In order to achieve wide commercialization, LDES technologies will need to ensure that they are compliant with national codes and standards (C&S). In fact, filling gaps in reliability C&S that may be unique to LDES technologies will be a critical factor in removing barriers impacting the wide commercial adoption of LDES technologies. This break-out session will provide an overview of the key C&S that are relevant to LDES deployment and include open discussions on activities at both IEEE and UL Solutions to ensure C&S related to storage remain updated, applicable to, and appropriate for LDES.

- *Moderators:* Will McNamara (Sandia National Laboratories)
- *Panelists:* Charlie Vartanian (IEEE), Chris Searles (CGS & Associates)

- **WORKSHOP Adoption Readiness Level Workshop**

This session will walk through the Adoption Readiness Level framework. To get to deployment, a technology must be completely de-risked, and ecosystem economics established so that every player in the value chain has a viable economic model. This means that managing a technology portfolio solely through the well-understood and widely used Technology Readiness Level (TRL) stage-gates is not enough. Often, commercialization fails not because of the technology's fundamentals, but because ecosystem economics have not been addressed or critical ecosystem players have not come onboard. Adoption Readiness Levels have been developed to compliment TRLs and describe adoption risks so that stakeholders have a tool that helps them drive towards wide scale adoption.

- *Moderator:* Kailey Fascitelli (Sandia National Laboratories)
- *Presenter:* Eshaan Agrawal (Department of Energy – Office of Technology Transitions)

- **PRESENTATION + DISCUSSION Storage as Transmission/Grid Infrastructure**

The techno-economic aspects of integrating energy storage with the electric grid is primarily two-fold. Hybridization of energy storage with non-dispatchable and intermittent renewable energy sources can ensure more efficient utilization of the interconnected grid infrastructure. On the other hand, the energy storage, itself can occasionally bear the burden of grid infrastructure – ensuring greater reliability in the long run. This session will have two presentations and follow on discussion to cover such aspects, including techno-economic considerations and use cases.

- *Moderator/Presenter:* Venkat Durvasulu (Idaho National Laboratory)
- *Presenter:* Jeremy Twitchell (Pacific Northwest National Laboratory)

- **PRESENTATION + DISCUSSION LDES Workforce: Looking Forward**

A panel of speakers will discuss workforce in long-duration energy storage, including past studies that have been done and links between LDES and other energy-related fields. These short presentations will be followed by Q&A. The session is designed for businesses anywhere in the supply chain who see challenges in attracting the skills they need.

- *Moderator:* H. J. Corsair (Oak Ridge National Laboratory)
- *Panelists:* Yue Ke (Argonne National Laboratory), Bernie Kotliar (NECA-IBEW LMCC), Matthew Garcia (CEMG Consulting & Research)

11:00AM – 11:15AM: Networking Break

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11:15AM – 12:15PM: Session 8

• **SPECIAL EVENT Tiger Team Meetings**

September's Tiger Team meetings will be held live at the LDES National Consortium Workshop! During these meetings, crossovers will be created by grouping Tiger Teams to discuss overlap between teams, findings of the workshop, and plan for activities in year 2 of the consortium.

○ *Moderators:*

- *Technology Deployment, Evaluation, & Testing, Demonstrations & Deployments, Safety & Grid Security, Use Case Development:* Luke McLaughlin (Sandia National Laboratories), Henk Laubscher (Sandia National Laboratories), Dan Ricci (Idaho National Laboratory), and Zhiwen Ma (National Renewable Energy Laboratory)
- *Supply Chain & Manufacturing Efficiencies, Workforce Development:* H.J. Corsair (Oak Ridge National Laboratory) and Charles Snyder (East Penn Manufacturing Co.)
- *Market Planning, Policy & Regulations, Interconnection, Standards, & Permitting, Utility Resource Planning:* Todd Levin (Argonne National Laboratory), Jeremy Twitchell (Pacific Northwest National Laboratory), and Will McNamara (Sandia National Laboratories)
- *Economics & Valuation, Investor Confidence, & Financing:* Patrick Balducci (Argonne National Laboratory), Jeffrey Gifford (National Renewable Energy Laboratory)
- *Customer Adoption, Equity:* Rebecca Barney (National Renewable Energy Laboratory), Guangdong Zhu (National Renewable Energy Laboratory), Anurupa Roy (Oak Ridge National Laboratory)
- *Grid Infrastructure, Reliability & Resilience:* Venkat Durvasulu (Idaho National Laboratory), Kimberly Johnston (NextGen Energy Partners)

12:15PM – 1:15PM: Networking Break

1:15PM – 2:15PM: Session 9

• **SPECIAL EVENT Dialogue Sessions – Technology Focused**

The Dialogue Session event will be networking-focused collaborative session where participants will choose a room/technology that most aligns to their interests or expertise. Each room will spend 30 minutes discussing key questions regarding their assigned technology for LDES. After 30 minutes, participants will convene for a group discussion. This format will allow for small and large group conversations around key challenges and opportunities for LDES across various technology types.

○ *Moderators:*

- *Mechanical:* Zhiwen Ma (National Renewable Energy Laboratory)
- *Thermal:* Luke McLaughlin (Sandia National Laboratories)
- *Chemical:* Henk Laubscher (Sandia National Laboratories)
- *Electrochemical:* Vilayanur Viswanathan (Vish) (Pacific Northwest National Laboratories)

2:15PM – 2:30PM: Networking Break

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2:30PM – 4:00PM: Session 10

- **PRESENTATION Closing Session**
 - **Tiger Team Reports on Year 1 Recommendations:**
 - Customer Adoption: Zhiwen Ma (National Renewable Energy Laboratory)
 - Use Case Development: Zhiwen Ma (National Renewable Energy Laboratory)
 - Demonstrations & Deployments: Henk Laubscher (Sandia National Laboratories)
 - Economics & Valuation: Patrick Balducci (Argonne National Laboratory)
 - Reliability & Resilience: Patrick Balducci (Argonne National Laboratory)
 - Grid Infrastructure: Venkat Durvasulu (Idaho National Laboratory)
 - Market Planning: Venkat Durvasulu (Idaho National Laboratory)
 - Interconnection, Standards, & Permitting: Jeremy Twitchell (Pacific Northwest National Laboratory)
 - Utility Resource Planning: Jeremy Twitchell (Pacific Northwest National Laboratory)
 - Investor Confidence & Financing: Jeffery Gifford (National Renewable Energy Laboratory)
 - Safety & Grid Security: Dan Ricci (Idaho National Laboratory)
 - Supply Chain & Manufacturing Efficiencies: Charles Snyder (East Penn Manufacturing Co.)
 - Technology Development, Evaluation & Testing: Luke McLaughlin (Sandia National Laboratories)
 - Equity: H. J. Corsair (Oak Ridge National Laboratory)
 - Workforce Development: H. J. Corsair (Oak Ridge National Laboratory)
 - Policy & Regulations: Will McNamara (Sandia National Laboratories)
 - **What's Next for the Consortium?** (Will McNamara, Principal Investigator of the LDES National Consortium, Sandia National Laboratories)



This project is funded by the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (BIL), as part of the DOE Technology Commercialization Fund (TCF), administered by the Office of Technology Transitions in collaboration with the Office of Clean Energy Demonstrations.



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