

# WIRAB Monthly Meeting

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September 28, 2023



# Introductions

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# Outline



- **WIRAB Activities:**
  - Long Duration Energy Storage Recommendations to WECC
- **Upcoming WIRAB Meetings**

# Long Duration Energy Storage Modeling at WECC



**2022 Initiative:** Advise WECC on conduct a reliability assessment, identifying the services and capabilities that long-duration energy storage could provide to support ongoing system reliability in the Western Interconnection.



## What has been accomplished:

WECC completed a study on LDES in late 2022

WECC incorporated a LDES element into 2023 Study Program Studies

# WECC Results in LDES Study



## WECC's Recommendation:

- Modeling Improvements
- Seasonal Storage
- Extreme Natural Events

## 12-hr vs. 168-hr Storage Operation



# Today's Goals:



## WIRAB's Ongoing Contribution:

- Contracted with Strategen to develop recommendations for WECC and industry on ways to improve modeling of LDES in assessments



## Ask of WIRAB:

- Review recommendations to WECC
- Support WIRAB Staff and Strategen taking these comments to the WECC Reliability Assessment Committee (RAC)



# Incorporating Long-Duration Energy Storage into Reliability Planning and Modeling

September 2023



# About Me

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Sergio Dueñas  
Senior Manager

- + Expertise in policy analysis, energy economics, electric power systems, and comparative climate policy
- + Served as the Policy Manager to the California Energy Storage Alliance (CESA), an advocacy group representing over 100 companies in the energy storage ecosystem in regulatory proceedings and venues at the state and federal level
- + Co-author of *"Long Duration Energy Storage for California's Clean, Reliable Grid"*, a report prepared by Strategen for CESA that explores the need and opportunity for LDES utilizing a technology-neutral modeling approach and a capacity expansion model capable of multi-day optimization
- + BA with Honors in Political Science and International Relations from Centro de Investigacion y Docencia Economicas (CIDE) and Master's in Public Policy (MPP) from the Goldman School at the University of California, Berkeley
- + His capstone project *"Barriers and Opportunities for Long-Duration Energy Storage in California: An Analysis in the Context of SB 100"* was awarded the Smolensky Prize for Best Advanced Policy Analysis.

# Background

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- + Across the United States, including in the West, several states and utilities are pursuing strategies to achieve a 100% clean energy or zero-carbon grid.
- + Most efforts have concluded that currently available technologies (solar, wind, and battery energy storage) can decarbonize the grid by up to 90%, but the last 10% will require the adoption of new technologies.
  - + These technologies will need to provide clean, flexible capacity as well as the integration of renewable resources across longer time horizons.
- + This fundamental imperative is the motivation underlying the significant investment that private and public entities are making in understanding and deploying long-duration energy storage (LDES) technologies.

## Context and Purpose

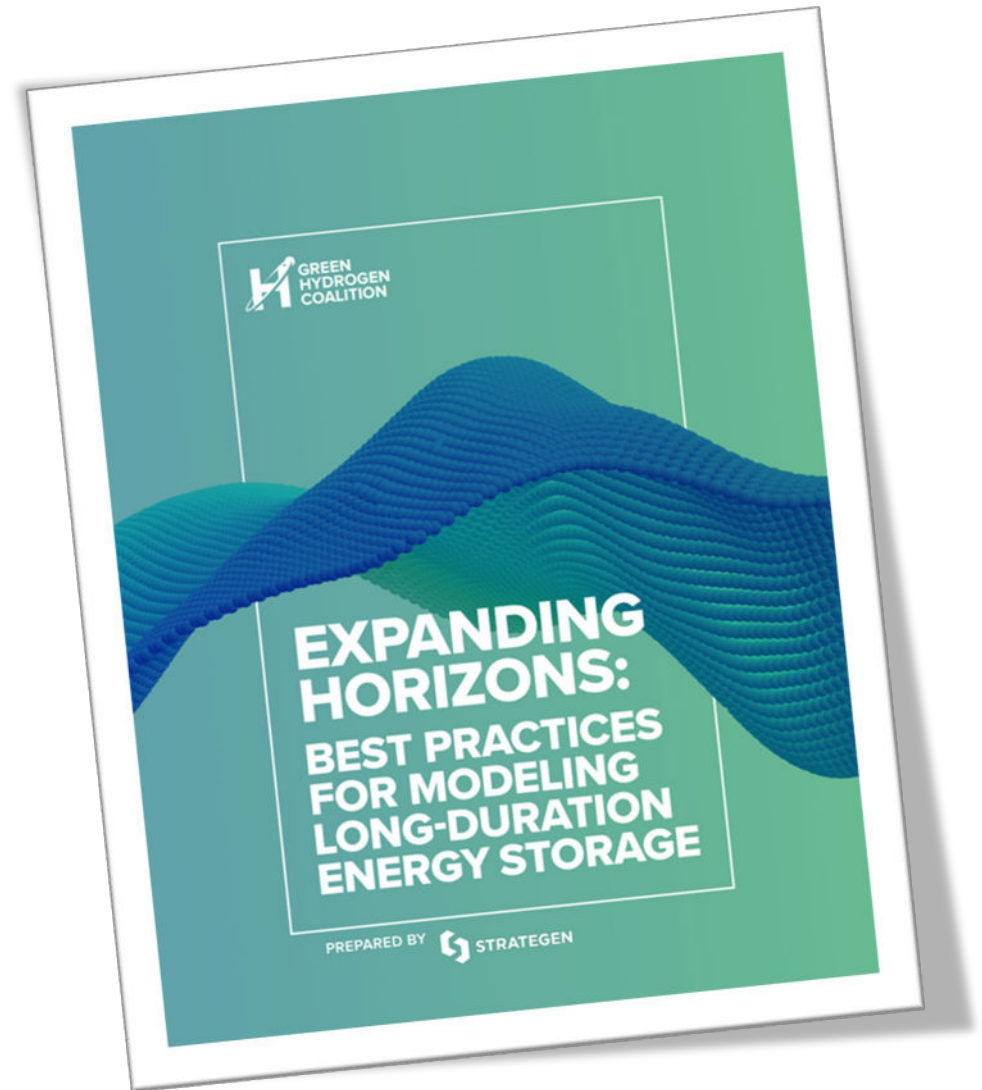
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- + For entities such as the Western Electricity Coordinating Council (WECC), understanding the type and magnitude of resources that will be needed to preserve reliability is a paramount endeavor.
- + Despite its relevance, integrating LDES into modeling and planning activities has been challenging due to the complexity and rapid evolution of the technological and regulatory landscapes, paired with the computational demands of accurately modeling the long dispatch horizons of LDES.
- + This whitepaper seeks to identify a specific set of recommendations regarding how to successfully incorporate LDES into future resource planning and reliability modeling.
- + These recommendations are intended to help the WECC and the broader power sector, as LDES modelers, to manage the challenges related to accurately and effectively incorporating LDES into planning and reliability modeling efforts.

## Purpose

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- + The recommendations contained herein are derived from best practices from LDES modeling practitioners and build upon the report prepared by Strategen Consulting for the Green Hydrogen Coalition (GHC), *“Expanding Horizons: Best Practices for Modeling Long-Duration Energy Storage”*.
- + These recommendations are intended to help WECC and the broader power sector, as LDES modelers, to manage the challenges related to accurately and effectively incorporating LDES into planning and reliability modeling efforts.

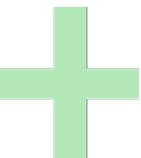


## Recommendation #1

From a reliability perspective, LDES modelers should align problem statements, research questions, inputs, assumptions, and analytical tools to identify the type, magnitude, and timing of future storage needs across the system, as well as their expected effects on the grid's reliability.

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- + The problem statement directs decisions about essential trade-offs
  - + Where is simplification a viable option?
  - + Where are higher levels of detail needed?
- + A future study on LDES should be focused on:
  - + The resource mix needed to preserve reliability while achieving decarbonization of upwards of 80% of the electricity served in the Western Interconnection;
  - + What different types of LDES could enable these goals and;
  - + How these different types of LDES can impact reliability.



## Recommendation #2

LDES modelers should utilize capacity expansion modeling to remedy planning oversights by using tools that consider dispatch horizons across multiple days and even years.

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- + Modeling LDES requires tools that can optimize resource build and dispatch across long balancing horizons.
  - + Traditional CEMs model time in 24-hour steps that are disconnected from each other, an architecture that cannot carry over the state-of-charge (SOC) of storage across days.
  - + Time step simplifications reduce model runtimes but overlook the value proposition of storage assets that can arbitrage energy for days or weeks at a time, profoundly impacting need identification and resource selection.
- + Future studies need to utilize models that consider multi-day or even multi-year balancing horizons to fully capture the value of resources with longer discharge durations



## Recommendation #3

LDES modelers should utilize production cost modeling to take into account the probabilistic nature of different risk factors and assess the reliability contribution of LDES.

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- + In parallel to CEM use, WECC should use production cost models (PCMs) to consider what external factors can affect a portfolio's resiliency and value.
  - + PCMs can evaluate the reliability of a portfolio across a range of scenarios:
    - + Evolving electricity prices
    - + Weather variability
    - + Outage variability, and
    - + Load fluctuations.
- + The use of PCMs is essential for the estimation of portfolio- and resource-specific effective load-carrying capabilities (ELCCs)
  - + While WECC need not determine ELCC values on a resource class basis, the use of PCMs would enable the estimation of the incremental reliability provided by portfolios that include LDES.

## Recommendation #4

LDES modelers should ensure that the modeling approach includes a diverse and representative set of candidate energy storage resources and technologies and appropriately captures their benefits and value streams, including capacity, energy, ancillary services, and resilience.

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- + A diverse representative portfolio of energy storage resources and technologies allows the model to capture their energy value and capacity contributions.
  - + Providing the model with options will allow it to make trade-offs across the range of storage solutions.
- + Emerging and mature technologies, and storage durations from 10- to 100-hour with round-trip efficiencies across the 30-85% range should be represented through either:
  - + The inclusion of specific technologies as candidate resources (i.e., technology classes such as gravity storage, thermal storage, iron-flow battery storage, etc.); or,
  - + The use of technology-neutral storage archetypes that could be representative of one or more technology classes (e.g., modeling storage options with different durations, price points, round-trip efficiencies, etc.).

## Recommendation #5

WECC should ensure that model findings and results identify no-regrets planning actions for WECC stakeholders, as well as actionable means to mitigate reliability risks to the bulk power system.

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- + Studies should focus on identifying directional insights that can inform no-regrets planning actions and strategies that enable the accurate identification of LDES needs and minimize reliability risks to the bulk power system.
- + These actions can include but are not limited to:
  - + Identifying modeling tools and features.
  - + Identifying a preferred approach to model the wide array of LDES options.
  - + Identifying key drivers and sensitivities behind the need for LDES.
  - + Identifying the timing of needs across the region to define the urgency of modeling improvements and the need for further coordination.

## Closing Thoughts

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- + WECC's unique position enables it to perform an overarching study that can inform and materially improve and align planning and reliability efforts regionwide.
- + Regional studies can initiate the pursuit of additional research tracks allowing for more future scenarios to be studied or identifying which storage configurations are worth further investigation.
- + A WECC study can set an example for best practices in LDES modeling and signal to utilities within their territory what methods, inputs, assumptions, and candidate resources should be considered in the pursuit of accurate long-term modeling, given the variance between modeling practices today.



Questions?





**STRATEGEN**



# Next Steps



Review recommendations



Send Comments via email by  
**October 13, 2023**

Available next week during CREPC-WIRAB to discuss



Finalize recommendations **October 20, 2023**



WECC Reliability Assessment Committee Meeting **October 25, 2023**

# Upcoming Meetings



## WIRAB Monthly Meeting

**November 2, 2023 at 11:00 AM MT**

## Fall 2023 Joint CREPC-WIRAB Meeting

**October 4-6, 2023 in Seattle, WA**

<https://westernenergyboard.org/>

# Thank You!

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