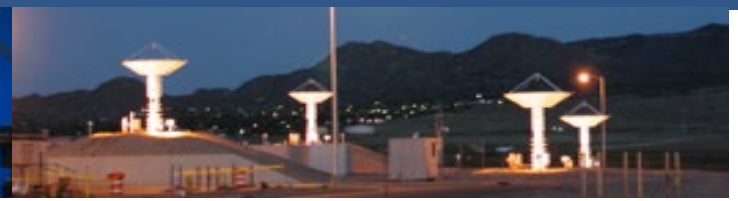
Energy Storage Peer Review—Regulatory, Policy, Equity Session





Energy Storage Policy & Outreach Accomplishments 2022

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Sandia National Laboratories

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Topics I will cover in this presentation.

- Key accomplishments of 8811 Policy & Outreach group

    1. Published white papers on Energy Equity and Long-Duration Energy Storage policy issues
    2. Continued engagement with state regulatory commissions
    3. Regulatory “Best Practices” initiative with CESA.
    4. Collaboration on Behind the Meter (BTM) rate design analysis
    5. Expanding policy analysis for tribal communities

Policy analysis of energy equity.

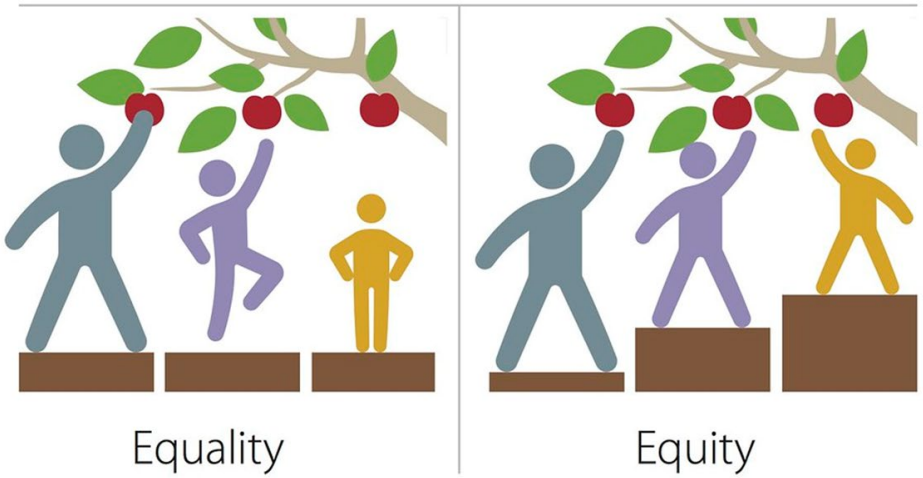
A disparity that needs to be addressed:

- Marginalized (aka disadvantaged, aka low-income) communities remain virtually unrepresented in the energy planning and decision-making processes that drive energy production, distribution, and regulation
  - For example, commission proceedings that determine what utility investments are allowed in the utility's rate base and how those costs are recovered from different classes of customers).

- At the same time, these communities bear an inequitable proportion of the negative impacts of disparities in racial and economic energy burden and environmental injustices related to fossil fuel-based energy production and climate change.

Defining energy equity.

- Rarely heard even a few years ago, references to EE now seem to be everywhere, including throughout the energy industry.
- EE means that levels of energy required by individuals and families is equally available to all, regardless of race, geography, social standing, or economic position.
- Put another way: Energy equity refers to the fair distribution of the benefits and burdens of energy production and consumption.



Fair distribution of benefits and costs

EE initiatives can be developed in different ways.

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- In the context of state electric utility regulation, equity can be a goal, tool, or metric.
  - ***As a goal:*** The primary goal of electricity affordability programs, disconnection moratoriums, and rate discounts is to advance equity.
  - ***As a tool:*** Public participation to ensure that the unique needs of underserved communities are well understood is a critical equity tool.
  - ***As a metric:*** Appropriate metrics are needed to rack and evaluate results of policies, regulations, and programs intended to deliver equitable outcomes.

Key findings from analytical research and white paper.

- "Seeking Energy Equity Through Energy Storage" white paper co-authored by myself and several Sandia colleagues + Dr. Imre Gyuk, our sponsor at the DOE-OE.
- Paper was published in *The Electricity Journal* in February 2022.
- Key findings:
  1. Fifty million households, or about 40 percent of the U.S. total households, fall into the category of "underserved populations,"
  2. Other relevant data points include the fact that low-income households spend three-times more of their income on energy costs than more affluent households.
  3. Underserved communities often incur an array of burdens from electricity generation that are unique to their communities.

Polluting generation facilities (e.g. peakers) are often located in the least affluent neighborhoods

Outages tend to be more frequent in low-income areas and take longer to resolve.

Resiliency and sustainability measures (e.g., BTM storage) tend to be installed in more affluent areas.

Electrification (e.g. vehicles) benefits affluent customers, but costs are born by all.

Policy analysis of Long-Duration Energy Storage.

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- Published white paper in the Materials Research Society. Analytical findings included:
  - There is an absence of LDES policies in every state / region in the U.S. (California is the exception).
  - While there is optimism surrounding LDES' future, there is still little consensus about where and how it can be used, and its value to the grid.
  - Policymakers can fill this gap by:
    - ✓ Defining fundamental LDES market components;
    - ✓ Creating a commodity market for LDES;
    - ✓ Creating valuation policies by defining MUAs & setting price values for specific LDES services; and
    - ✓ Setting policies that reduce risk for LDES developers

Decarb goals rarely define specific LDES actions.

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	STATE	DEADLINE	GOAL	CLEAR ROLE FOR ES/LDES
2	CA	2045	100% carbon-free electricity	YES
3	CO	2050	100% carbon free electricity	Somewhat
4	CT	2040	100% carbon-free electricity	NO
5	HI	2045	100% renewable energy	Somewhat
6	IL	2050	100% carbon-free electricity	Emerging
7	LA	2050	Net zero greenhouse gas emissions	NO
8	ME	2050	100% clean energy	NO
9	MA	2050	Net-zero greenhouse gas emissions	NO
10	MI	2050	Economy-wide carbon neutrality	NO
11	NJ	2050	100% carbon-free electricity	Somewhat
12	NM	2045	100% carbon-free electricity	NO
13	NV	2050	100% carbon-free electricity	Somewhat
14	NY	2040	100% carbon-free electricity	Somewhat
15	OR	2040	Greenhouse gas emissions reduced 100 percent below baseline emissions	Somewhat
16	RI	2030	100% renewable energy	NO
17	VA	2045	100% carbon-free electricity	NO
18	WA	2045	100% zero-emissions electricity	Somewhat
19	WI	2050	100% carbon-free electricity	NO

LDES can be supported by various technologies.

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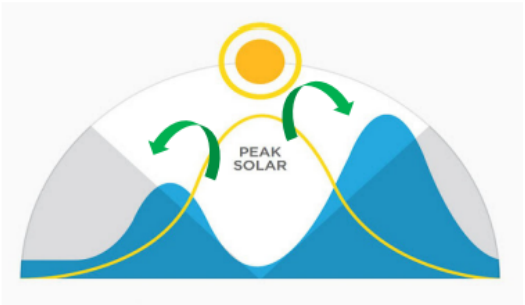
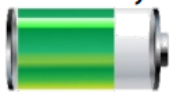
As non-programmable renewables increase, the need for long duration (>4-6 hours) is becoming a critical topic for the balancing of electric systems



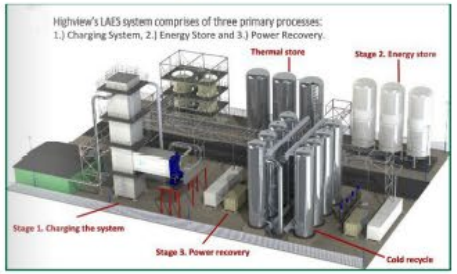
Currently, about 95% of the LDES in the U.S. consists of pumped-storage hydropower, but opportunities are limited by geography.

Today, lithium batteries represent the state of art for current needs of energy storage: they're fast, flexible, modular, and getting cheaper and cheaper (cost in 10 years is almost reduced by a 10x factor!)



Lab experiments, commercial developments and new market needs support the development of a portfolio of LDES solutions necessary to meet decarb goals.

…Liquid Air..



…Flow Batteries...

…Thermal Storage…

…Gravitational...

…Liquid CO_2...

Regardless of technology, LDES continues to face policy challenges.

- *Challenge #1:* Lack of policy consistency
  - Most states have not developed an LDES policy (CA is an exception)
  - Little agreement about where, how and why LDES will be deployed.
- *Challenge #2:* It's unclear what LDES should do, and where.
  - Most regions have only adopted a 4 hour-or-less energy storage requirement
  - Currently little need or value beyond 4 hours
- *Challenge #3:* Little consensus on how LDES should be valued or compensated.
  - In restructured markets, LDES needs to make money.
  - Efforts to define ISO/RTO, utility and customer services remain incomplete.

How LDES is defined varies by jurisdiction. 4+ hours, 10+ hours, seasonal?

The lack of consistency in defining LDES creates policymaking challenges.

Policy & Outreach (Org. 8811)
Energy Storage Webinars for Regulators

Hosted by the DOE Office of Electricity, Sandia National Laboratories

These workshops, free for all attendees and funded by the DOE Office of Electricity (Dr. Imre Gyuk, Director), are intended to help regulatory commissions and related institutions around the United States (including utilities, NGOs, and academia, at the discretion of the commissions) develop the expertise they need to more quickly and efficiently integrate energy storage into their regional operations.

Our workshops, custom-designed in close collaboration with regulatory commission staff, have already engaged regulators from over a dozen states with one- or two-day workshops on topics including energy storage technologies, performance, economics, valuation, interconnection, commissioning, safety, and policy.

CURRICULUM

The curriculum is developed with input from each commission. Presentations are tailored to meet special regional concerns. A sampling of energy storage (ES) topics included in previous workshops and sessions include:

• ES Systems Overview • Chemistries and Technologies • Policy and Regulatory Perspectives • Applications & Value Streams • Using Analytics to Improve the Value Proposition • System Design & Installation • Commissioning & Interconnection • ES Project Case Studies & Financing • Safety • Grid Resilience • ES as a Non-Wires Alternative for New Generation, Transmission, & Distribution

ISSUE BRIEFS

Published analysis of key policy issues related to energy storage.

PARTICIPATING STATES

California, Illinois, Maryland, Nevada, New Jersey, New Mexico, Utah, Wisconsin + a coalition of Midwestern states + the New England Conference of Public Utility Commissions .

Regulatory Best Practices Initiative with CESA.

- Survey on regulatory best practices for energy storage distributed to state regulatory commissions & state energy offices across the United States.
- Focus on the relationship between decarbonization and energy storage.
- Survey included 15 open-ended questions such as the following:
  - What practices has your state identified for integrating energy storage with decarbonization objectives?
  - What are the main challenges your state has faced in creating and implementing effective energy storage plans?
  - What specific energy storage policies has your state adopted?
- Summary of results and accompanying analysis is currently being prepared; plan to publish NARUC and other venues.

Collaboration on BTM energy storage rate analysis.

- Current initiative with Andrew Benson.
- Analytical white paper being prepared and will be submitted for publication.

This work is in progress. When complete, it will be submitted for peer-review and publication.

Scope of Analysis

1. Theory, History & Current Practice of Retail Rate Design
2. Survey of Innovative Practices
   - Incentive Programs for BTM ES adoption
   - Retail Rate Designs for BTM ES operation
3. Open Policy Debates in Retail Rate Design
   - Fixed Charges
   - Time-Varying Pricing
   - Demand Charges
   - Compensation for Grid Exports
4. Menu of Policymaker Objectives
   - Maximize DER Deployment
   - Minimize Total Social Cost
   - Promote Equity
   - Increase Reliability & Resilience
   - Accelerate Decarbonization

Research Objective

The purpose of this work is to inform policymakers' decision-making on retail rate design related to BTM energy storage. We will:

- Survey historical, current, and emerging practices in rate design and their impacts
- Summarize the latest research and arguments offered by policy advocates in presenting the case for and against several competing approaches to rate design, including explicit consideration of equity
- Identify the impacts of each approach on the adoption and operation of BTM ES
- Formulate recommendations that align with a menu of policy objectives that policymakers may choose to prioritize

Expanding policy analysis for tribal communities

- Section 40101(d) of the federal Bipartisan Infrastructure Law provides support for States, Tribes, and US Territories for electric grid resilience enhancements.
- Within the STARS (Support and Technical Assistance for Resilience Solicitations) project, Sandia is one of four national labs providing technical support to states, tribes, and territories (S&T) on electricity sector resilience planning activities.
- In September we launched a collaborative initiative subtask under STARS project to assess state energy plans; related to this initiative will be a comprehensive review of tribal energy plans and current energy policies and compare them to state initiatives.
- Develop Journal review paper on findings.

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Q&A Session

Thank you!

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