

# 2025 DOE Office of Electricity Energy Storage Program Annual Meeting and Peer Review

Presentation 601:  
*Reducing Investment Risk for Energy Storage Financing*

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Mustang Prairie Energy

# Reducing Investment Risk for Energy Storage Financing

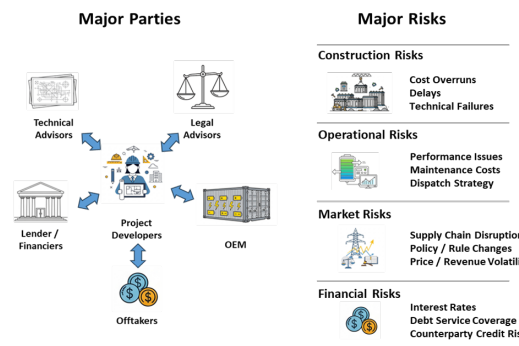
## Technology



## Economics

Market	Role	Applications
Wholesale	Stand Alone Hybrid Operation	<ul style="list-style-type: none"> <li>Arbitrage</li> <li>Peak Capacity Deferral</li> <li>Reserves</li> <li>Frequency Regulation</li> <li>Ramping</li> <li>Synthetic Inertia</li> </ul>
Utility	Transmission Distribution Island / Microgrid Behind the Meter	<ul style="list-style-type: none"> <li>Transmission Deferral</li> <li>Transmission Congestion Relief</li> <li>Blackstart</li> <li>Voltage Support</li> <li>Microgrid / Islanding</li> <li>Distribution Deferral</li> </ul>
Behind the Meter	Industrial Commercial Hybrid Generation Residential	<ul style="list-style-type: none"> <li>TOU Energy Management</li> <li>Demand Charge Management</li> <li>Backup Power</li> <li>Working Storage</li> <li>Distribution Energy Management</li> <li>Power Quality</li> </ul>

## Financing



## Energy Storage Technologies

- Emerging: Support Investment to Achieve Faster Commercialization
- Existing: Highlight Best Practices to Speed Maturity of Industry

## Project Development

- Reduce Project Development Risk
- Promote Project Risk Transparency
- Promote Wider Access to Low-Cost Capital
- Reduce Project & Transaction Costs

## Goal

- Support Grid Reliability & Resiliency
- Clarify Performance Impacts on Financial Returns
- Reduce Friction for Financial Industry Participation

Energy Storage  
Pricing Survey

Investment Risk Insights  
LDES Bankability

Energy Storage  
Financing Studies

# Technology: Energy Storage Pricing Survey

## Energy Storage Pricing Survey (ESPS)

- Sandia National Laboratories
- 2018 – 2024 [2025 ongoing]

## Technologies Covered (2024)

- 16 Primary Technologies
- 14 Emerging Technologies

## Range of System Costs

- 10kW, 100kW, 1MW, 10MW, 100MW
- 2 Hour to 10 Hour

## Provides

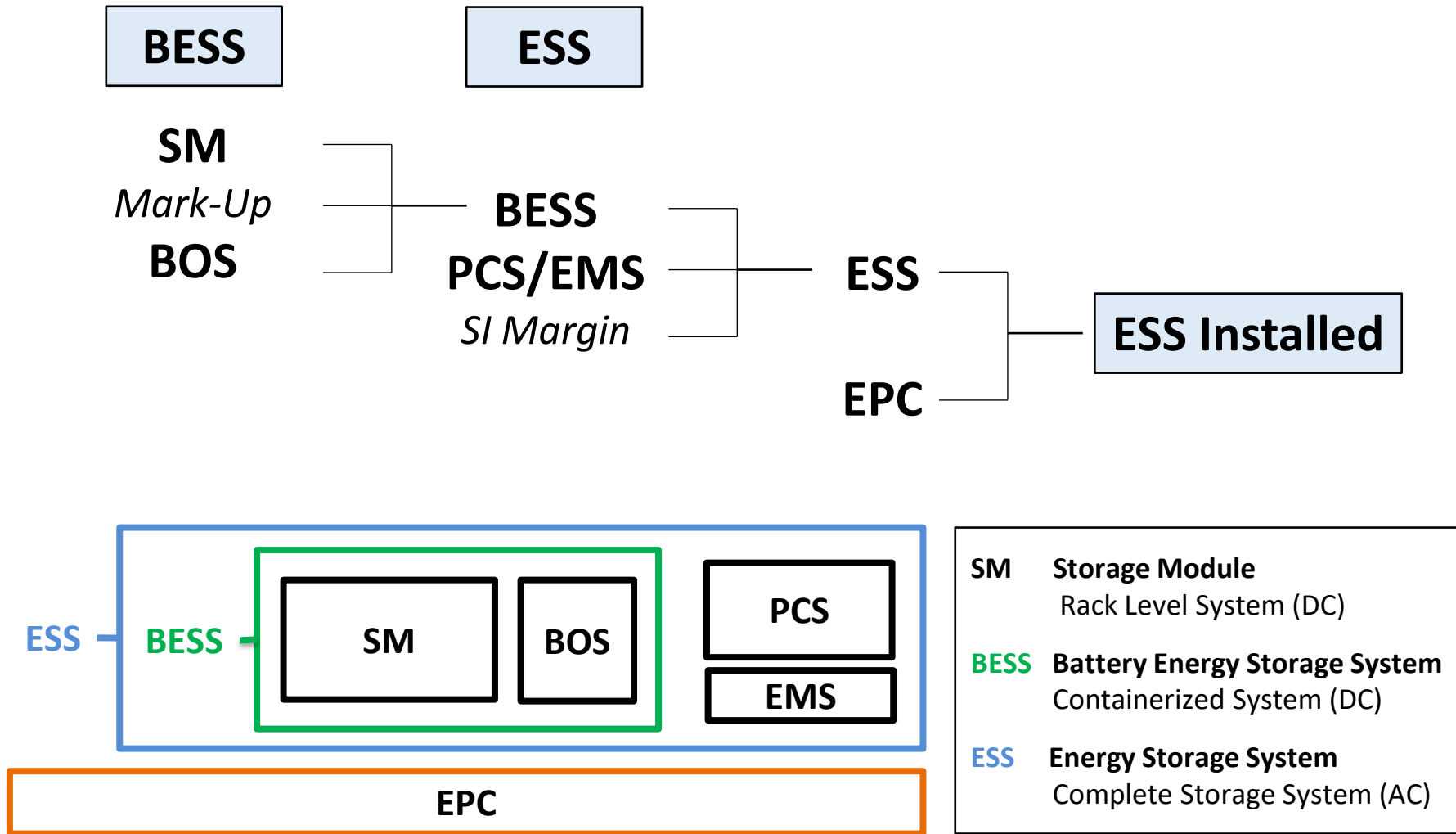
- Realistic Expectation for System Price
- Standardized Reference Benchmark Price

## Latest Report

- <https://www.sandia.gov/ess-ssl/>
- 2024 ESPS: SAND2024-12994

	Primary Technologies	Emerging Technologies
1	Pumped Hydro Storage	Flow Battery: Iron Chrome
2	Compressed Air Energy Storage: Diabatic	Flow Battery: Organic
3	Compressed Air Energy Storage: Adiabatic	Flow Battery: Polysulfide Bromine
4	Compressed Air Energy Storage: CO2	Iron Air
5	Liquid Air Energy Storage	Liquid Metal Battery
6	Gravity Energy Storage	Sodium Ion
7	Sodium Sulfur	Sodium Nickel Chloride
8	Flow Battery: Vanadium	Nickel Hydrogen
9	Flow Battery: Zinc Bromine	Nickel Zinc
10	Flow Battery: Iron	Zinc Air
11	Non-Flow Battery: Zinc Bromine	Lithium Sulfur
12	Flywheel: Long Duration	Supercapacitor
13	Flywheel: Short Duration	Superconducting Magnetic Energy Storage
14	Lithium Ion: NMC	Thermal Energy Storage
15	Lithium Ion: LFP	
16	Lead	

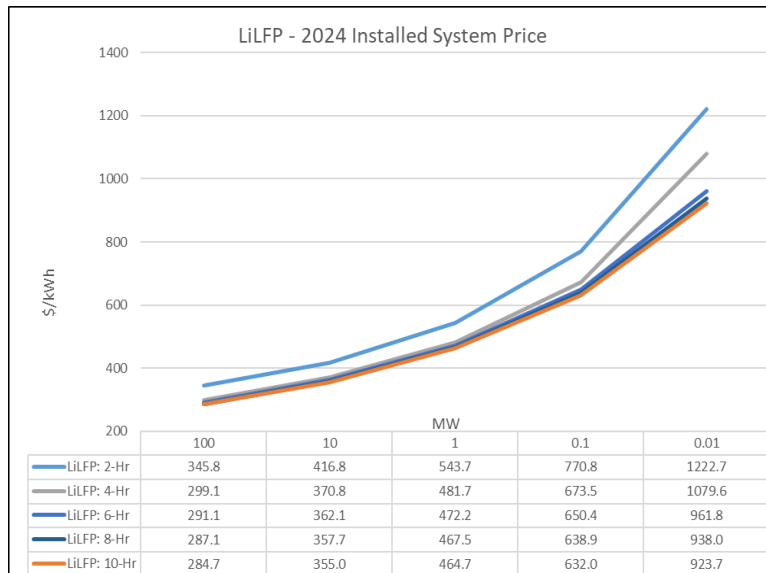
# Technology: Energy Storage Pricing Survey: Component Waterfall



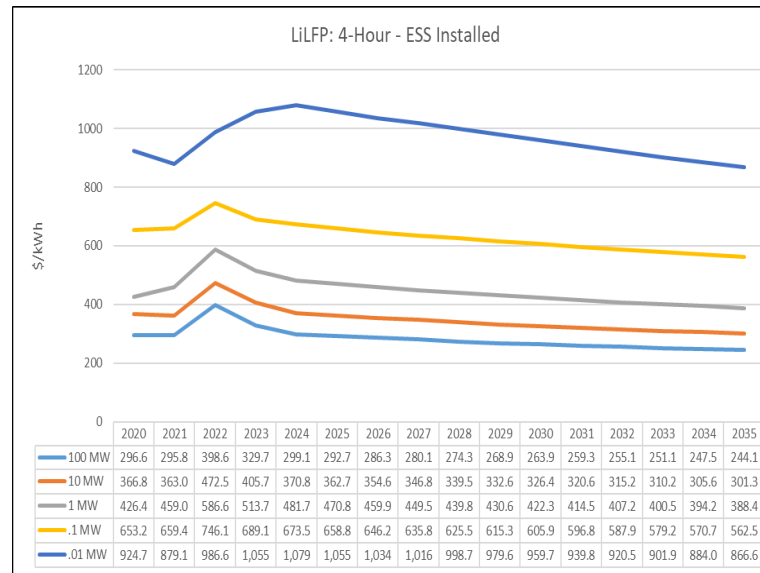
	Description
SM	Storage Module
BOS	Balance of System
BESS	Battery Energy Storage System
PCS	Power Conversion System
EMS	Energy Management System
ESS	Energy Storage System
EPC	Engineering Procurement & Construction
ESSI	Installed Complete System

# Technology: Energy Storage Pricing Survey

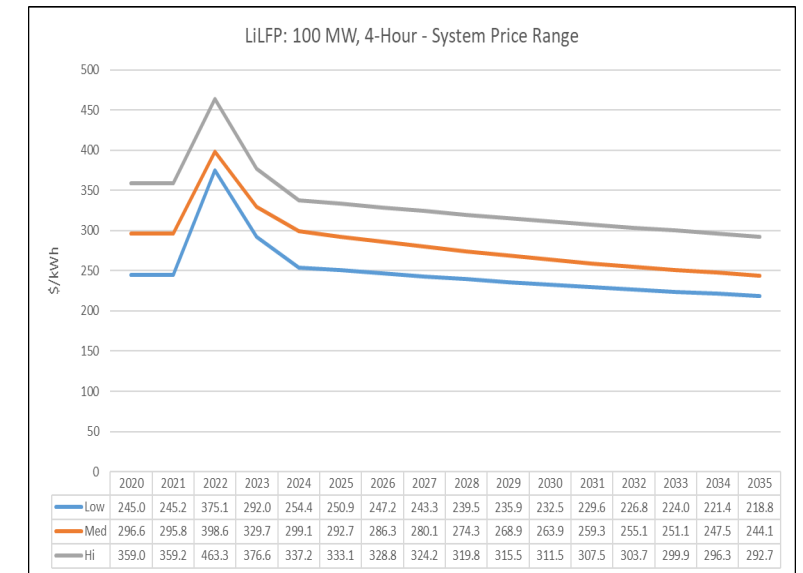
## 2024 Installed System Costs



## System Price Forecast



## High / Low Price Range

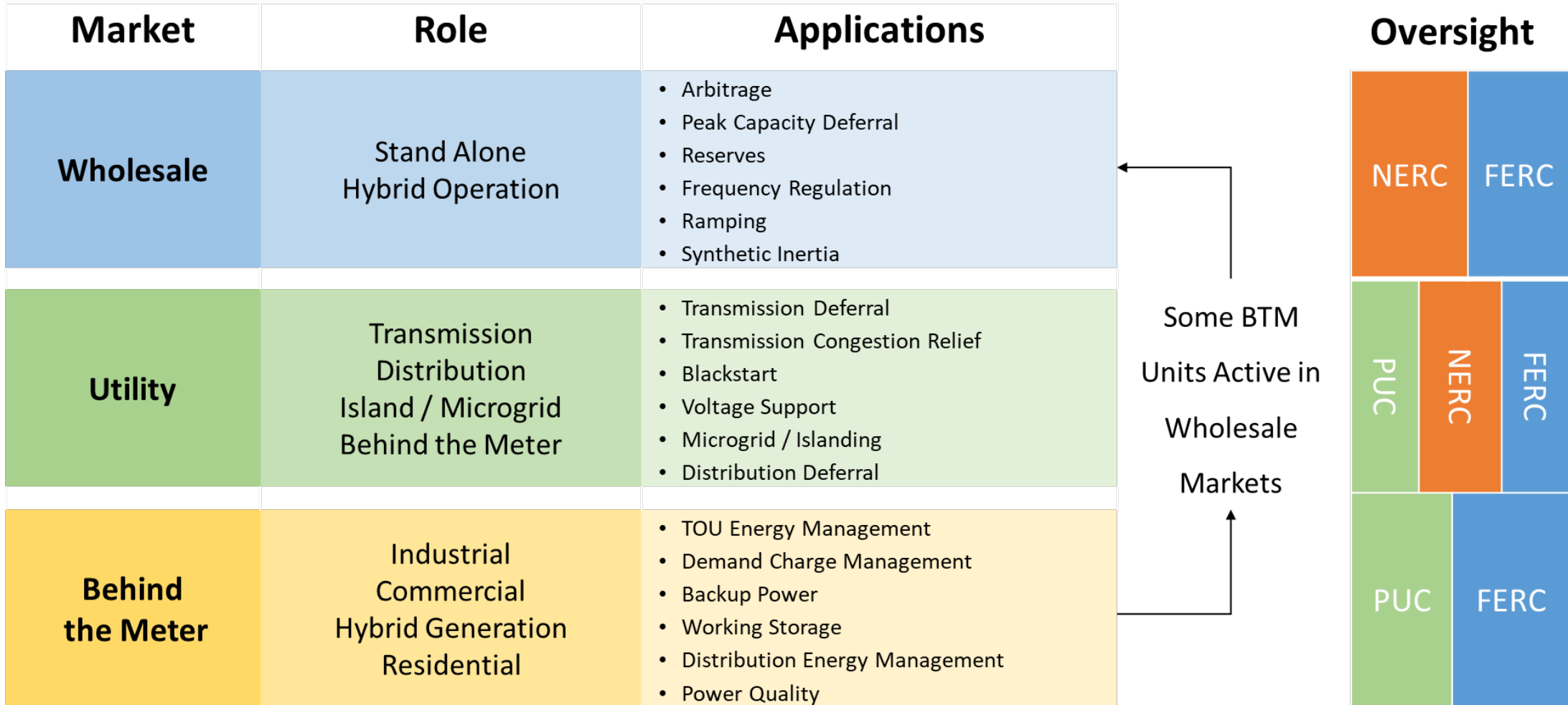


- System Scale: Power
- System Scale: Energy

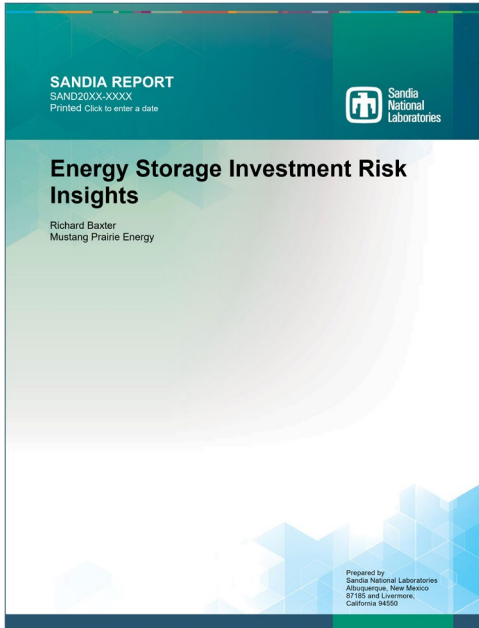
- Forward Price Decline Reduced
- Smaller Systems Cost Structure

- Equipment Cost Range by Scale
- Profit Margins

# Economics: Market Applications



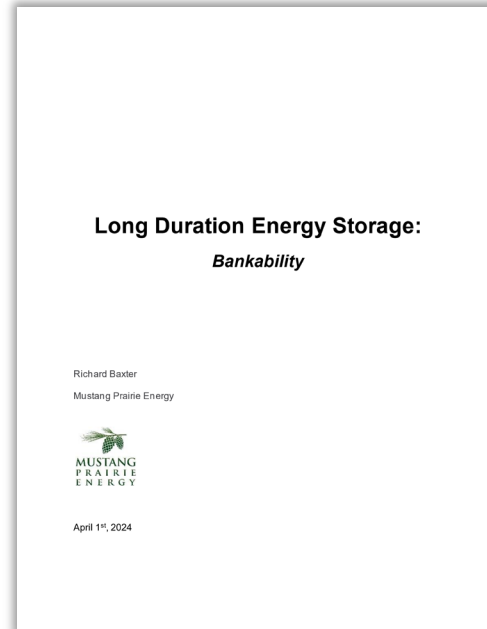
# Economics: Investment Risk Insights & LDES Bankability



SNL  
January 8<sup>th</sup>, 2025

This Study is designed to provide insights from the financial investment and insurance industry concerning how performance metrics impact investment decisions for emerging energy storage technologies. This study was conceived by the U.S. Department of Energy for the Rapid Operational Validation Initiative (ROVI) in order to better target the effort of that program.

The goal of this portion of the ROVI program is to define the process and information needed for insurance and financial industry participants to make a transaction decision for emerging energy storage technologies. These insights are gathered through interviews, surveys, and key reports from leading firms in these industries already addressing these challenges.



PNNL  
April 1<sup>st</sup>, 2024

This Study provides an overview of bankability concerns that affect Long Duration Energy Storage (LDES) systems at distinct levels of development and provides a framework to address these challenges. Ensuring bankability for LDES is critical to identify and quantify development risks in order to attract financing from banks and investors for corporate and project investment. This need for addressing bankability concerns is an ongoing issue for LDES systems as energy storage project financing remains plagued with a lack of clarity for investors, and LDES projects in particular can require extensive capital outlays due to their scale.

The most direct approach to address these overall bankability concerns causing hesitancy by capital providers is to address three key areas of development—corporate, technology, and project—through a standardized due diligence review process. Improving clarity through a structured due diligence efforts is imperative for the LDES community to help to reduce investment risk and attract sustainable financing from banks and investors for corporate and project investment.

# Financing: Energy Storage Financing Study Series

## Outreach to Financial Industry

- Improve Project Development Risk Management
- Promote Technology and Project Risk Transparency
- Promote Wider Access to Low-Cost Capital
- Reduce Project & Transaction Costs

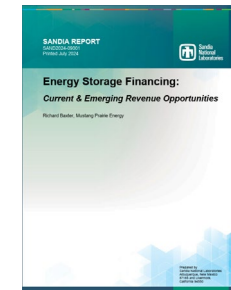
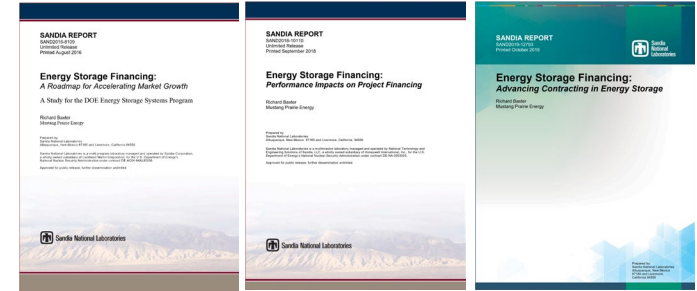
## Study Components

- Summits: Current Market Assessment
- Reports: Document Lessons Learned

## Energy Storage Financing:

- A Roadmap for Accelerating Market Growth
- Performance Impacts on Project Financing
- Advancing Contracting in Energy Storage
- Project & Portfolio Valuation
- Operations & Strategy
- Cost & Revenue Certainty
- Current & Future Revenue Opportunities
- Deployment: Challenges & Opportunities
- Operational Strategies & Impacts

SAND2016-8109  
 SAND2018-10110  
 SAND2019-14896  
 SAND2021-0830  
 SAND2022-0422  
 SAND2024-07453  
 SAND2024-09001  
 SAND2025-xxxx  
 SAND2025-In Progress



# Financing: Reducing Investment Risk in Energy Storage Financing Survey

- **Separate Survey Begins with 2025 Energy Storage Financing Study**
- **Seeks Industry Insights Into Key Drivers for Reducing Risk in Energy Storage Financing**
- **Respondents Cover 10 Organization Types**
  - **Highlights Different Drivers per Org. Type**
- **Highlight Linkage of Technology and Performance Risk to Financial Return**
- **Future Editions Allow for Tracking of Industry Interest Over Time**

Take the Survey: <https://www.surveymonkey.com/r/VJDLZ6P>

## Survey Questions

1. **What Group Best Describes Your Organization?**
2. **Which Lithium-Ion Technology Risk is Your Primary Concern?**
3. **Which Emerging Technology Risk Is Your Primary Concern?**
4. **Which Counter Party Risk Is Your Primary Concern?**
5. **What Data And Software Risk Is Your Primary Concern?**
6. **Which Construction and Development Risk Is Your Primary Concern?**
7. **Which Operational and Performance Risk Is Your Primary Concern?**
8. **What Insurance Risk Is Your Primary Concern?**
9. **What Market and Revenue Risk Is Your Primary Concern?**
10. **Which Regional Market Is the Most Appealing?**
11. **What Contract Provision Is Your Primary Concern?**
12. **What Off-Take Revenue Structure Risks are your Two Primary Concern?**
13. **What Revenue Driver Is Your Primary Concern?**
14. **What Other Question Should Be Added to the Survey?**

# Financing: U.S. DOE Energy Storage Financing Summits: In-Person



**Engagement**

DOE Direct Engagement with Financing Community

Financial Community Networking for Energy Storage

**Outreach**

Promote DOE Programs with Financial Community

OE, FERC, NERC, etc.

Outreach to the Financial Community

**Feedback**

Feedback to DOE and Laboratories on Existing Programs

Feedback to DOE and Laboratories to Design New Programs

**Education**

Lessons Learned on Project Development

Insights from Other Industry Leaders

What to Be Concerned About

**Past Events**

2025 – Jan 28 & 29	NY, NY	170 Attendees
2024 – Jan 23 & 24	NY, NY	170 Attendees
2023 – Jan 26 <sup>th</sup>	NY, NY	150 Attendees
2020 – Jan 14 <sup>th</sup>	NY, NY	170 Attendees
2019 – Oct 22 <sup>nd</sup>	SF, CA	74 Attendees
2019 – Jan 23 <sup>rd</sup>	NY, NY	146 Attendees
2018 – Oct 6 <sup>th</sup>	SF, CA	104 Attendees
2018 – Jan 18 <sup>th</sup>	NY, NY	124 Attendees
2017 – June 7 <sup>th</sup>	D.C.	84 Attendees
2017 – Jan 11 <sup>th</sup>	NY, NY	68 Attendees
2014 – Dec 16 <sup>th</sup>	NY, NY	65 Attendees

# Financing: Energy Storage Financing Summits: Virtual

## 2024 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2024/10/2024-virtual-doe-energy-storage-financing-summit>

225 Attendees, October 19-20<sup>th</sup>, 2024

## 2023 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2023/01/2023-doe-energy-storage-financing-summit>

250 Attendees, October 19-20<sup>th</sup>, 2023

## 2022 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2022/10/2022-us-doe-energy-storage-financing-summit>

250 Attendees, October 19-20<sup>th</sup>, 2022

## 2022 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2022/01/2022-us-doe-energy-storage-financing-summit>

400 Attendees, January 19 & 20<sup>th</sup>, 2022

## 2021 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2021/09/2021-us-doe-energy-storage-financing-summit>

240 Attendees, September 28 & 29<sup>th</sup>, 2021

## 2021 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2021/01/2021-us-doe-energy-storage-financing-summit>

300 Attendees, January 26 & 27<sup>th</sup>, 2021

## 2020 Virtual U.S. DOE Energy Storage Financing Summit

<https://www.kirkland.com/events/kirkland-seminar/2020/09/2020-kirkland-doe-energy-storage-financing-summit>

150 Attendees, September 22 & 23, 2020

# Future: Reducing Investment Risk – Sandia Website & Webinars

## Technology

Energy Storage Pricing Survey  
Expand Technologies Covered  
Expand Cost / Economics

## Financing

Energy Storage Financing Studies  
In-Person Summits Focused on  
Financial Community Participants

## RIR Webinars

Replace the Virtual Energy Storage Financing Summits  
Individual Webinars Hosted at Sandia Website  
Held Throughout the Year  
Allows More Focused Webinars  
Speakers Provide Supporting Presentations  
Builds Knowledgebase

## RIR Surveys

Part of Energy Storage Financing Reports  
Also Published Separately  
Expand Reach into Financial Community  
Conduct Annually  
Seeks Industry Insights Into Key Drivers for Reducing Risk in Energy Storage Financing

## RIR Working Group

Modeled on Advancing Contracting in Energy Storage (ACES) Working Group  
Document existing energy storage expertise and best practices to improve project development and financing efforts across the energy storage industry  
<https://www.mustangprairie.com/index.php/aces-best-practice-guide/>

# Acknowledgements

The author would like to acknowledge the support and guidance of Eric Hsieh, Deputy Assistant Secretary, Office of Electricity Energy Storage Division, Dr. Imre Gyuk, Chief Scientist, Energy Storage, Department of Energy's Office of Electricity, and Dr. Ray Byrne, Manager, Electric Power System Research Program of Sandia National Laboratories.

## Eric Hsieh, DOE – Office of Electricity

- Deputy Assistant Secretary, Office of Electricity Energy Storage Division

## Dr. Imre Gyuk, DOE – Office of Electricity

- Chief Scientist, Energy Storage, Office of Electricity

## Dr. Ray Byrne – Sandia National Laboratories

- Manager, Electric Power System Research

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U.S. DEPARTMENT  
of ENERGY

OFFICE OF  
ELECTRICITY



Sandia  
National  
Laboratories



# Presenter Biography

## Richard Baxter - President Mustang Prairie Energy



Richard Baxter is President of Mustang Prairie Energy where he advises clients in competitive strategies to reduce the investment risk in energy storage corporate and project financing. Richard has been active in the energy storage industry for over 20 years, working across the industry, including at a storage OEM, investment bank, strategy consultant, and multiple Boards of Directors.

Richard is the author of the U.S. DOE sponsored study series on Energy Storage Financing published through Sandia National Laboratories (SNL), and Chairman of the associated Energy Storage Financing Summits. He is also the author of the Energy Storage Pricing Survey series through SNL and supports the Technology Cost and Performance Assessment for the DOE's Grid Energy Storage Technology Cost and Performance Assessment. Previously, he supported the initial development and first three years of the Lazard Levelized Cost of Storage (LCOS) Survey.

He has served on the Board of Directors for the Energy Storage Association, the Charitable Foundation of the Energy Bar Association, and NovoCarbon. He was also the founder and Executive Director of the Advancing Contracting in Energy Storage (ACES) Working Group where he led the development of the ACES Energy Storage Best Practice Guide, and author of the book Energy Storage: A Nontechnical Guide.

Energy Storage  
Technologies

Energy Storage  
Financing

Enable Market  
Strategies