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SANDIA DEMONSTRATION PROJECTS STATUS

Colorado Public Utilities Commission

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Energy Storage Technology & Systems

Sandia National Laboratories

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SANDIA DEMONSTRATION PROJECT STATUS



Agenda

- Selected Sandia Demonstration Projects
- Key Takeaways
- Future Interests & Initiatives



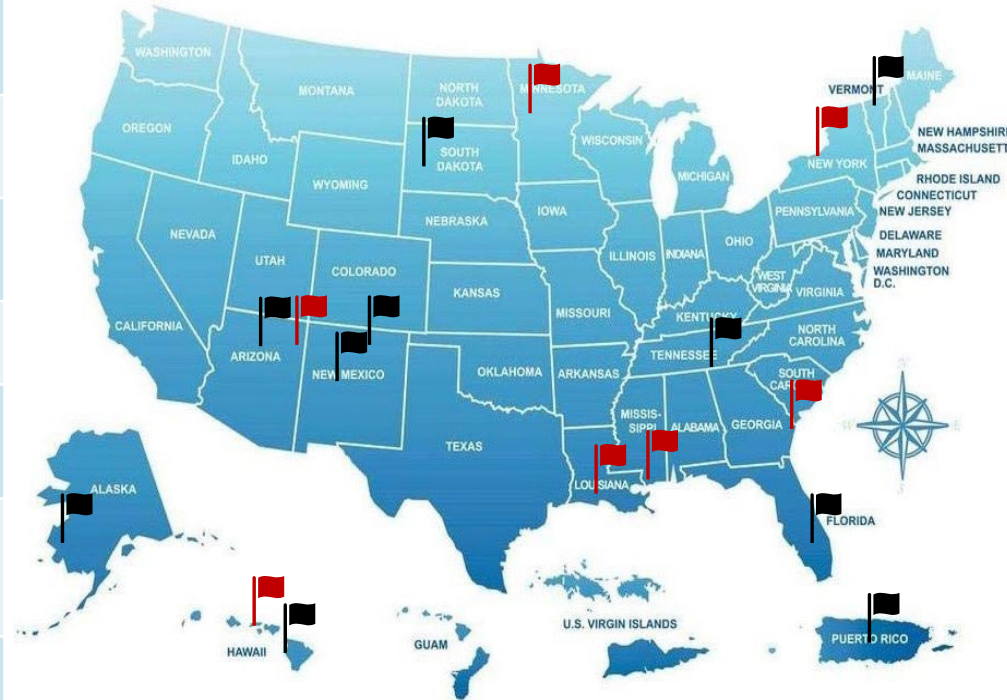
CURRENT PROJECTS

SANDIA ENERGY STORAGE DEMONSTRATION TEAM

CURRENT SANDIA DEMONSTRATION PROJECTS



State or Territory	Partner
Alaska	Alaska Village Electrical Cooperative
Arizona	Navajo Tribal Utility Authority
Arizona	Native Renewables (ES4SE)
Florida	Seminole Tribe
Georgia	Harambee House (ES4SE)
Hawaii	Natural Energy Laboratory of HI Authority
Hawaii	Ho'ahu (ES4SE)
Louisiana	Together New Orleans (ES4SE)
Minnesota	Pine Point School (ES4SE)



NOTE: ES4SE Projects in RED

State or Territory	Partner
Mississippi	Coast Electric Power Association (ES4SE)
New Mexico	Albuquerque Public Schools
New Mexico	Picuris Tribe
New York	Unity Renewables /Open Door Mission (ES4SE)
Puerto Rico	Villalba Municipality
South Dakota	Ellsworth AFB West River Electric Association
Tennessee	Electric Power Board of Chattanooga (EPB)
Vermont	Green Mountain Power

ATRISCO HERITAGE ACADEMY, ALBUQUERQUE NM



Background

- Atrisco Heritage Academy has the largest energy footprint of any school in the district and serves 2,200 students
- 99% of students are eligible for free or reduced lunch (compared to 65% average across all APS schools)
- Peak load demand charges are very high
- On-site University of New Mexico health clinic
- Future Resilience Hub – intended to function as a community gathering center during emergencies



ATRISCO HERITAGE ACADEMY, ALBUQUERQUE NM



Project Information

- SNL provided analysis for optimal BESS size
- Contractor recommended addition of PV showing improved payback from 17 to 13 years
- 721 kW/ 2,884 kWh Tesla Megapack 2 battery + 2,200 PV panels (850 kW)
- Assisted APS with RFP development & design review process

Challenges/Lessons Learned

- Interconnection approval took significantly longer than expected
- PV placed into service March 2024
- Ongoing delays in commissioning

Funding Details	
Total Project Cost	\$3.2M
DOE Cost Share	\$650K

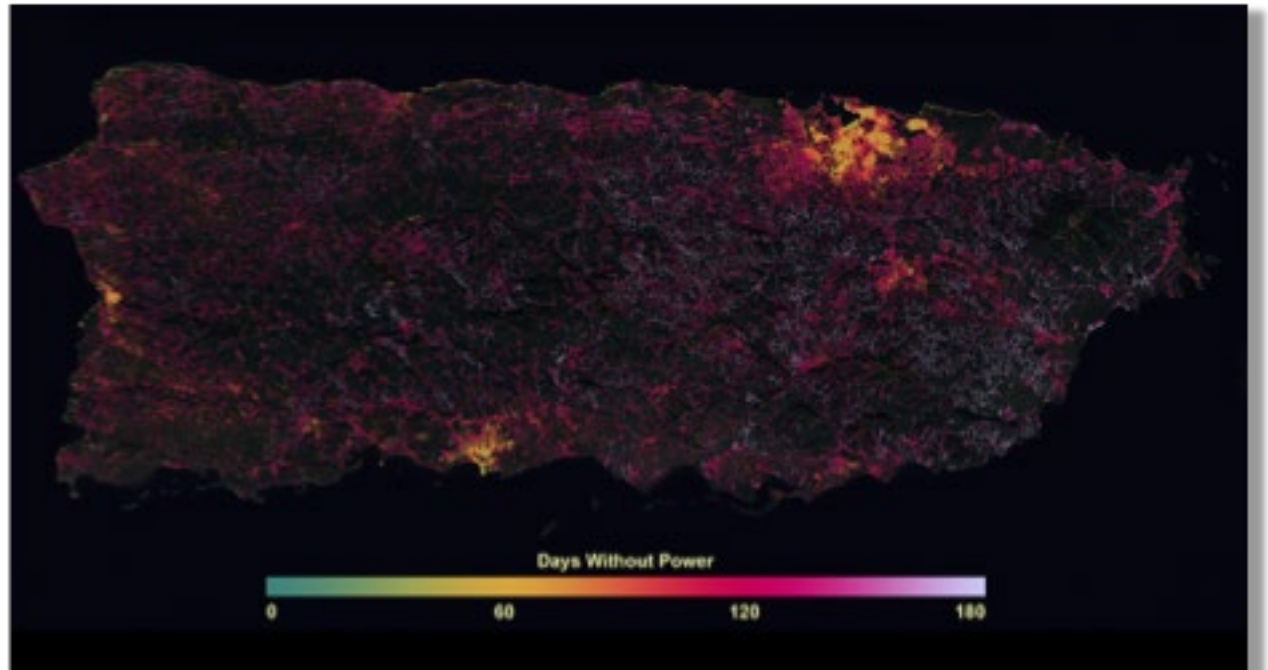


TEATRO MUNICIPAL, VILLALBA, PUERTO RICO



Background

- Hurricane Maria devastated the island of Puerto Rico in 2017
- In addition to crippling the fragile power grid, the storm washed out roads and made access to resources especially difficult for the mountainous regions of central Puerto Rico
- Some customers remained without power for more than 6 months following the Hurricane
- Villalba, a municipality in the central mountainous region, was among the hardest hit



TEATRO MUNICIPAL, VILLALBA, PUERTO RICO



Project Information

- Based on input from municipality officials, SNL developed an analysis of 3 locations for a resilience hub (BESS + PV).
- Theater chosen due to its central location, available generator, rooftop availability for PV
- SNL is co-developing the RFP with local government officials in Villalba

Challenges/Lessons Learned

- Initial theater wiring information was not complete
- Genset/BESS cannot feed HVAC load

Funding Details	
Total Project Cost	TBD
DOE Cost Share	Up to \$1M



COMMUNITY LIGHTHOUSES, NEW ORLEANS, LOUISIANA



Background

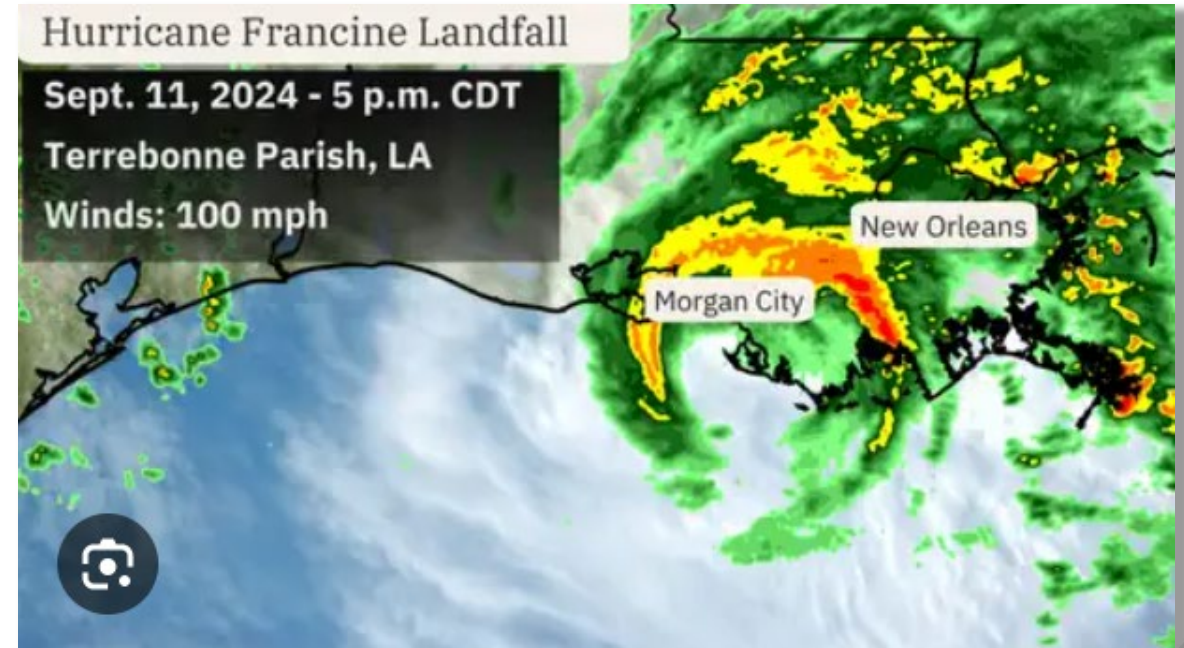
- Since 2000, more than 40 tropical or subtropical cyclones have impacted the state of Louisiana
- Major storms cause hundreds of Billions in damage and loss of life
- The community organization Together New Orleans (TNO) has created a network of solar powered microgrids across Louisiana.
- DOE created the Energy Storage for Social Equity (ES4SE) Initiative to “empower urban, rural, tribal, and indigenous disadvantaged communities to consider energy storage technologies and applications as a viable path toward community prosperity, well-being, and resilience”
- PNNL & SNL lead different phases of the program



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COMMUNITY LIGHTHOUSES, NEW ORLEANS, LOUISIANA



Project Information

- TNO has completed 9 Community Lighthouses across the New Orleans area so far with plans to build many more
- DOE is providing cost-share and project development assistance to 7 Lighthouses
- Each Lighthouse can act as a resiliency hub, community gathering space, supply distribution center

Impact

- During Hurricane Francine, all 9 completed Lighthouses opened after the storm and functioned as designed, some of which were islanded during extended outages
- 2 of the 9 were ES4SE funded Lighthouses
- Lighthouses provided meals, bottles of water, and deployable batteries for medical devices to more than 2,300 residents

Funding Details	
Total Project Cost	Ongoing
DOE Cost Share	\$850,000

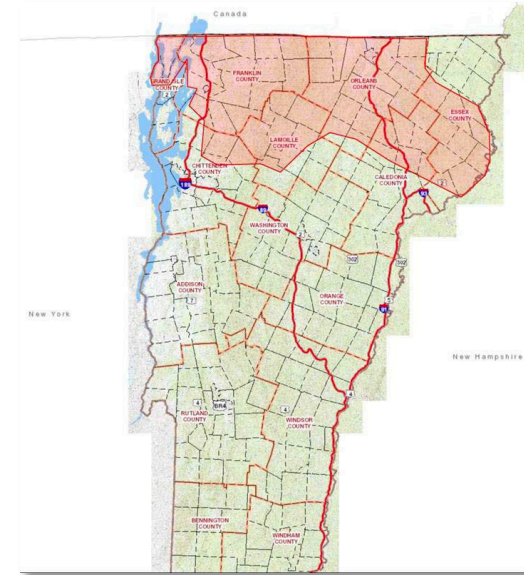


WIND CURTAILMENT MITIGATION PROJECT, TROY, VERMONT



Background

- Northern VT has over 400 MW of renewable generation, much of it coming from wind
- The load in this area is between 30-50 MW
- Only 250 MW of transmission export capacity
- Curtailment of wind generation in up to 15% of the year
- Green Mountain Power (GMP) is an investor-owned utility with 255,000 customers and a large wind farm
- Vermont Electric Cooperative (VEC) is a consumer-owned utility with 34,000 and a PPA with GMP's wind generation



WIND CURTAILMENT MITIGATION PROJECT, TROY, VERMONT



Project Information

- Upgrade/add new transmission lines to alleviate capacity burden
- Install EVLO 3.6 MW 4 hr BESS system to
 - Capture curtailed energy, provide resiliency, and reduce demand charges
 - Dispatch energy when generation is low and load is high

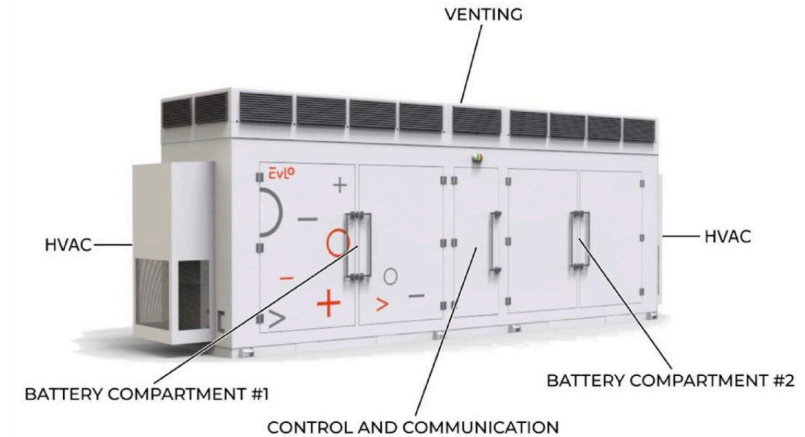
Impact

- Project designed to enable GMP and VEC to learn about renewable storage
- System is currently operating for peak reduction

Issues/Lessons Learned

- Some bad modules were identified during commissioning
- HVAC issues are being addressed by the vendor

Funding Details	
Total Project Cost	\$5.5M
DOE Cost Share	\$2M

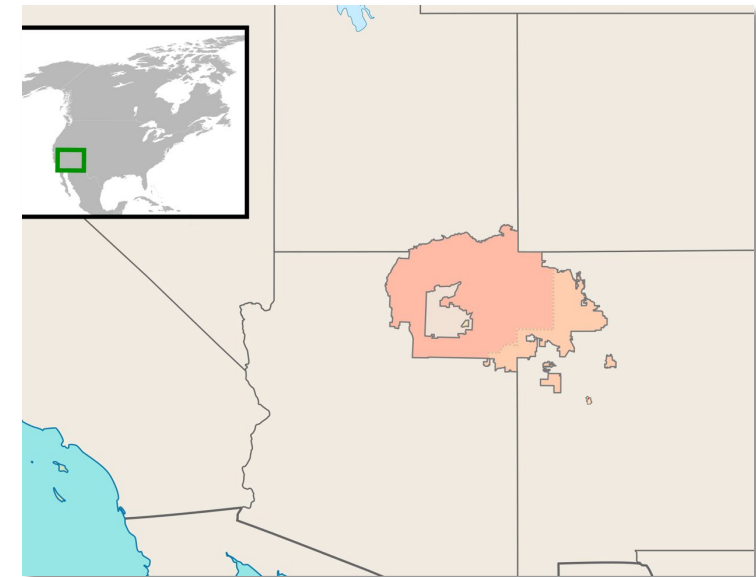


OFF-GRID HOMES, NAVAJO NATION, ARIZONA



Background

- The largest Indian reservation in the US, the Navajo Nation is home to almost 175,000
- More than 15,000 people on the Navajo Nation live without electricity
- Many homes are in rural and remote locations
- Cost is prohibitively high to extend power to these areas
- Navajo Tribal Utility Authority (NTUA) provides qualifying residents solar + storage through their off-grid program
- Urban Electric Power (UEP) is developing long-life rechargeable alkaline batteries (Zn-Mn-O₂) for multiple use cases



OFF-GRID HOMES, NAVAJO NATION, ARIZONA



Project Information

- Install a series of deployments of Zn-Mn-O₂ batteries in place of traditional AGM batteries
- First deployment (near Dilkon, AZ) completed after ~1 year
- Second deployment location identified (near Bisti, AZ)

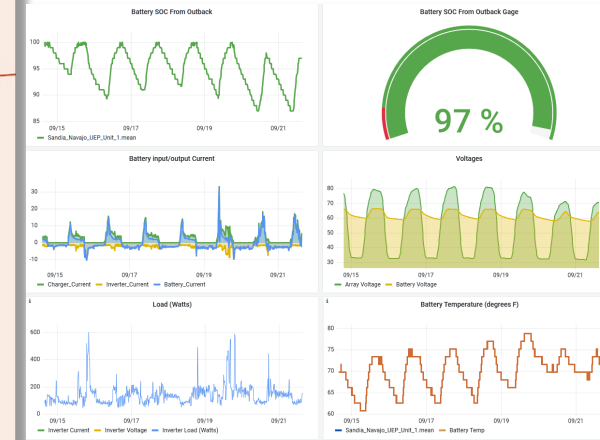
Impact

- Data collection demonstrated battery performance and contributed to improvements for second
- Voltage ripple was observed during MPPT

Issues/Lessons Learned

- Extreme environment contributed to premature failure of some cells leading to enclosure redesign
- Different inverters selected
- UEP increasing number of modules from 12 – 16 to increase system reliability
- Second deployment will be evaluated at Sandia's Energy Storage Test Pad prior to delivery

Funding Details	
Total Project Cost	\$TBD
DOE Cost Share	\$106k



CURRENT DEMONSTRATION PROJECTS



Key Takeaways

- The interconnection process takes time. Engage stakeholders as early as possible!
- Commissioning should not be a check-the-box exercise. Commissioning occurs throughout the entire project lifecycle...from conceptual development to disposal.
- Data collection is important. Gather as much data as is available at project inception. This is helpful for techno-economic analyses as well as a double- or triple-check on project feasibility.
- Initiatives like ES4SE help address energy equity by enabling communities to realize solutions AND communicate successes & opportunities for future projects.
- The Grid is growing more complicated, but energy storage will continue to play a larger role into the future.
- Partnerships are a force multiplier for project success, and should be considered for any size of project.



FUTURE INTERESTS & INITIATIVES

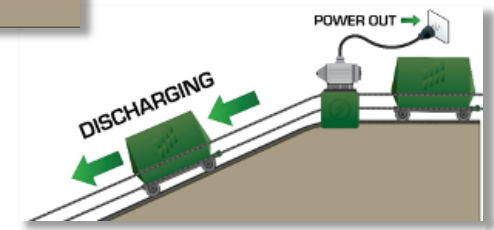
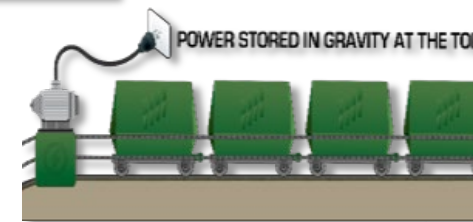
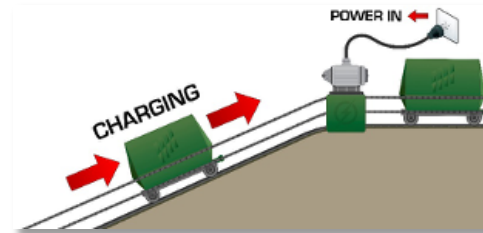
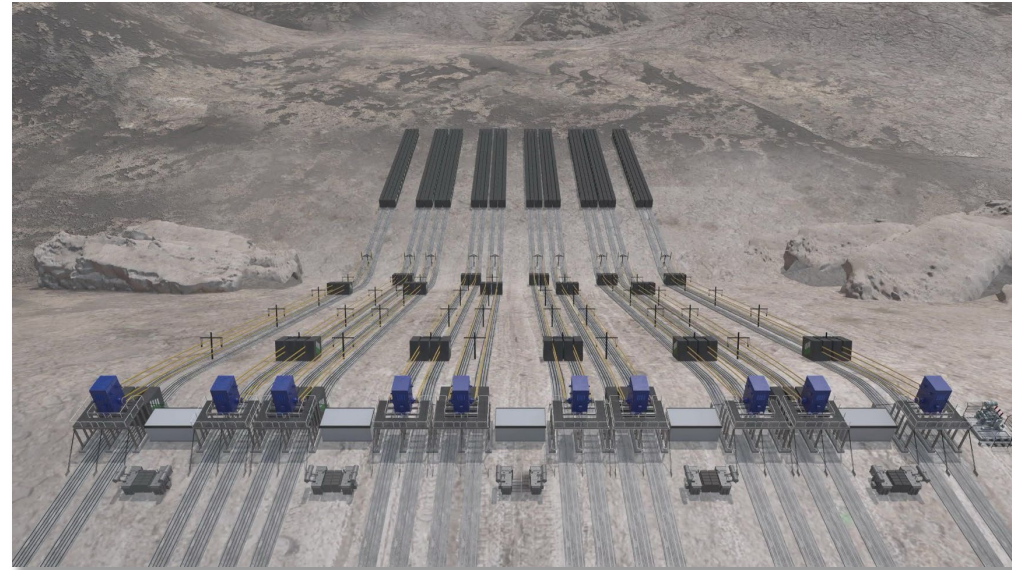
SANDIA ENERGY STORAGE DEMONSTRATION TEAM

FUTURE INTERESTS & INITIATIVES



Background

- Advanced Rail Energy Storage (ARES) has developed a mechanical energy storage system that uses potential and kinetic energy to store and deliver energy at the MW-scale
- Sandia and ARES are exploring a technology validation exercise at ARES' Gamebird Pit mine near Pahrump[, Nevada.



Updates

- Sandia is planning a site visit in early December 2024

FUTURE INTERESTS & INITIATIVES



Background

- Focusing on environmentally conscious material sourcing and long-duration energy storage (LDES), CapyBara Energy has invented an aqueous supercapacitor technology for multiple applications
- Sandia and CapyBara are collaborating on a lab-level demonstration project to test and validate the technology

Updates/Lessons Learned:

- Sandia cost share contract is complete
- Project development is underway (safety/test plans, lab set up, etc.)

Total Project Cost	TBD
DOE Cost Share	\$150K



Background

- Sandia and ISU are developing a collaborative project to demonstrate an NFPA 855 safety compliant, dual-use mobile lithium ion energy storage system (mBESS)
- The system will provide resilient power for wastewater treatment and disaster response for critical community loads

Updates/Lessons Learned:

- Sandia Scope of Work (SOW) is being developed currently that will lead to a cost share contract

Total Project Cost	TBD
DOE Cost Share	\$150K

FUTURE INTERESTS & INITIATIVES



Background

- Sandia and Capacitech are considering a collaboration with a Florida utility to investigate uses for their flexible super cap cable technology

Updates/Lessons Learned:

- PO Issued on 6/24/2024

Total Project Cost	TBD
DOE Cost Share	\$65K



Background

- Ambri has developed a "Liquid Metal" battery for various use cases including LDES (10+ hours).
- Sandia and Ambri are considering a partnership on DE-FOA-0003399: Energy Storage Pilot Demonstrations for an LDES demonstration project at the Energy Storage Test Pad

Updates/Lessons Learned:

- Ambri will submit a concept paper with input from Sandia on 10/16/24

Total Project Cost	TBD
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THANK YOU

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