



Sandia National Laboratories

Ongoing Demonstration Project Updates



Henry Guan

2023 DOE Office of Electricity Peer Review – Deployment Projects

October 24, 2023



Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

SAND2023-11404C

Current Demonstration Projects Map

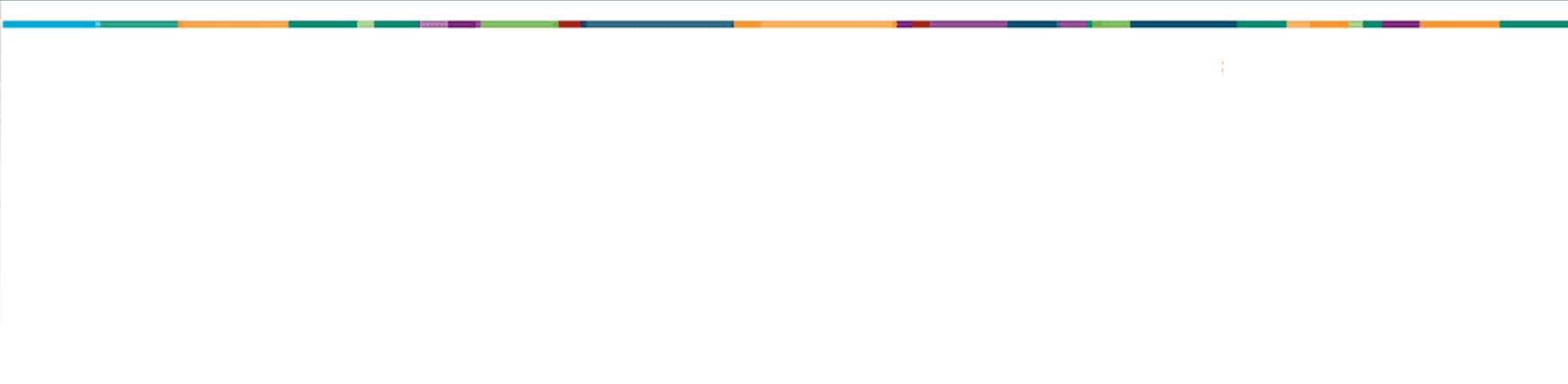


State or Territory	Partner
Alaska	Alaska Village Electrical Cooperative
Arizona	Navajo Tribal Utility Authority
Arizona	Native Renewables, Inc
Florida	Seminole Tribe
Georgia	Harambee House
Hawaii	Natural Energy Laboratory of HI Authority
Hawaii	Ho' ahu (ES4SE)
Mississippi	Coast Electric Power Association
New Mexico	Albuquerque Public Schools
New Mexico	Picuris Pueblo
Puerto Rico	Villalba Municipality
South Dakota	Ellsworth AFB West River Electric Association
Tennessee	Electric Power Board of Chattanooga
Vermont	Green Mountain Power





Energy Storage for Social Equity Projects



ENERGY STORAGE FOR SOCIAL EQUITY



➤ Four cost-share projects currently in-progress

- Native Renewables
 - 15 off-grid homes for the Navajo Nation and the Hopi Tribe (Arizona)
 - \$531,000
- Ayika Solutions/Harambee House
 - Community shelter in Savannah, Georgia
 - \$50,000
- Ho'ahu Energy Cooperative
 - 15 off-grid homes in Molokai, Hawaii
 - \$229,500
- Coast Electric Power Association
 - Resilience for wastewater treatment plant in Hancock County, Mississippi
 - \$302,400

Total Project Cost	~\$1.1M
DOE Cost Share	~\$1.1M



Native Renewables, Inc.



- There are approximately 14,000 homes in need of power in the Navajo Nation and Hopi Tribe. Native Renewables Inc. has a long history of successfully installing off-grid residential PV/BESS systems in these homes. Due to the size and isolation of the Navajo Nation and Hopi Tribe, installation and maintenance of these system requires significant travel and labor costs.
- Remote monitoring has proved difficult due to the isolation. Extreme temperature constraints, maintenance restraints, capital costs, and recyclability has limited NRI to using sealed lead-acid batteries.

Total Project Cost	\$531k
DOE Cost Share	\$531k



Locations:

Various across the Hopi Reservation and Navajo Nation (AZ, UT, NM)

Project Objectives:

- This project will install an off-grid residential PV/BESS system in a phased approach to 15 homes in the Hopi Tribe and Navajo Nation.
- Retrofit 42 off-grid systems with a battery monitoring system if the first 15 homes are successful
- Phased approach – Install systems at 5 homes per phase over 3 phases to apply lessons learned to future iterations. Each phase would last 1 year.

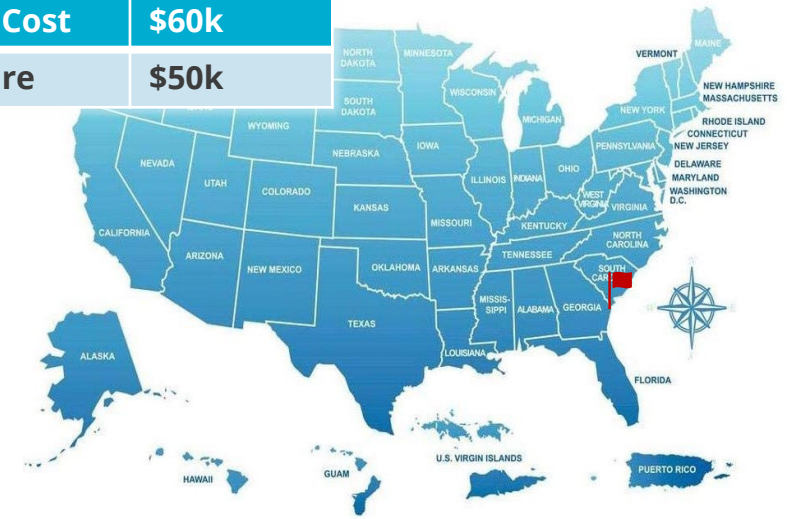


Ayika Solutions/ Harambee House



- The Harambee House in Savannah, GA has been selected for a resiliency hub demonstration project to serve the community in the event of an outage and also to demonstrate the increased resilience and projected benefits that a PV + Storage system can have for LMI households in Georgia.
- The City of Savannah has some of the highest energy burdened census tracts in Georgia, ranging from 2-12%. The project participants hope to pilot a community-led energy burden reduction program to better understand the projected benefits, scalability, and financial mechanisms needed to install a PV + BESS system

Total Project Cost	\$60k
DOE Cost Share	\$50k



Locations:

Harambee House location in Savannah, Georgia

Project Objectives:

- Proposing storage + solar (7.5kW/4-hr, 3.6kW) for a community resilience hub
- Solar, solar installation, and some electrical upgrades already funded
- Project is to fund and install the BESS and associated equipment (microgrid controller) to combine the solar for use in creating an islanded microgrid

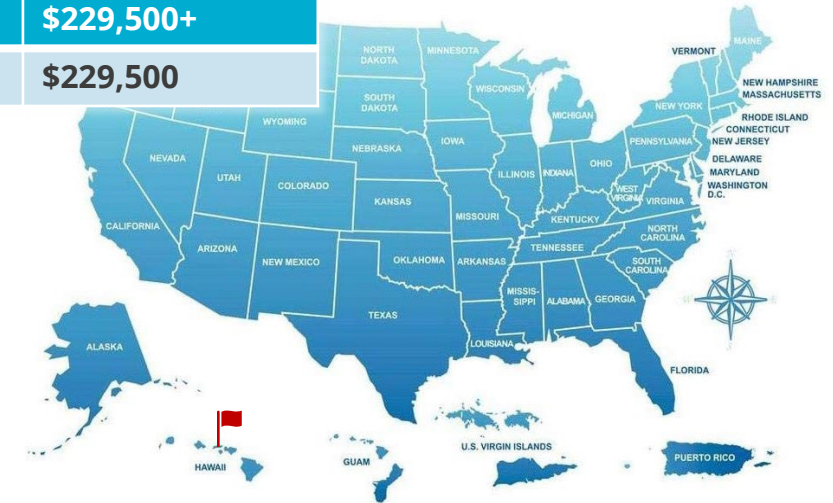


Ho'ahu Energy Cooperative Molokai



- Molokai is a rural isolated island in Hawaii with a total population of about 7,500, for which 65% identify as Native or part Native Hawaiian. The mean family income for Molokai is between 53-58% of the Statewide mean family income depending on the census tract-with poverty rates of 15-25%.
- 129 out of 514 residents who live on Native Hawaiian Homestead Lands do not have access to the grid. There are many other families not living on Native Hawaiian Homestead Lands who also do not have access to electrical, communications, and other utility infrastructures.
- These systems will provide access to electricity to Native Hawaiian families who currently do not have access to electric infrastructure, goal of reducing or eliminating household burden for gasoline (generator and transportation costs), costs of ice, and transportation costs.

Total Project Cost	\$229,500+
DOE Cost Share	\$229,500



Locations:

Various locations across the island of Molokai, Hawaii.

Project Objectives:

- This project will install an fifteen (15) nano grid (e.g. off-grid) residential systems (4kW PV and 11 kWh BESS)
- HECM will use recycled 240W PV panels (estimated 10 years of previous installation period) which have already been donated to the cooperative.

Coast Electric Power Association



- The Hancock County Utility Authority community faces issues related to natural disasters and service interruptions, with an elevated risk index as measured by FEMA, particularly for hurricanes and other storms. Properly treated wastewater is essential to modern life and the Nation's economy, and vital for preventing disease and protecting the environment. Many of HCUA's customers are in a rural, low-to-moderate income demographic. The cost savings HCUA sees in their peak demand charges will help stabilize customer water and sewer rates and provide resilience benefits to critical wastewater treatment infrastructure.

Total Project Cost	\$302,400
DOE Cost Share	\$302,400



Location:

Kiln, Mississippi

Project Objectives:

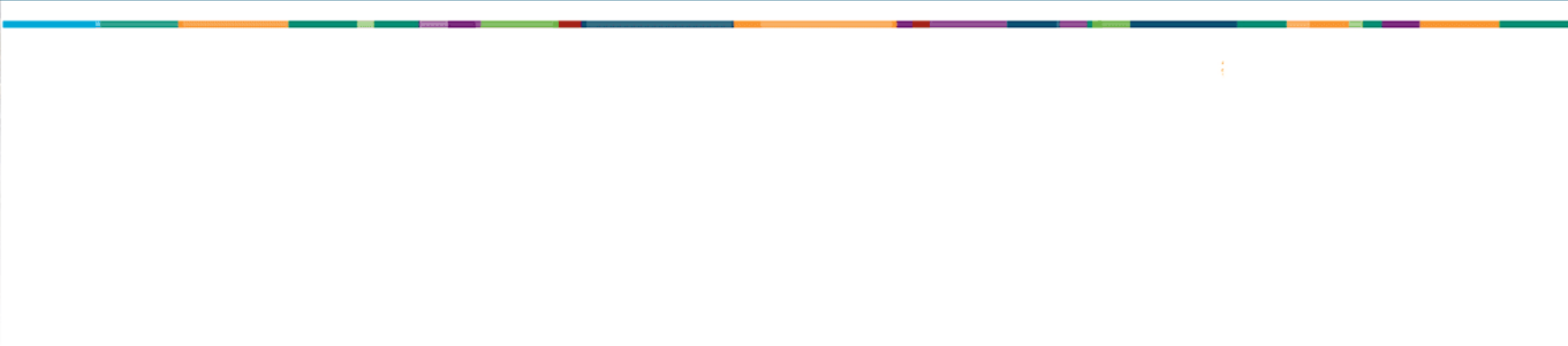
- This project will install 592kWh of lithium-ion battery energy storage system (BESS) at an outdoor location near HCUA's northern plant in Kiln, MS. The BESS will support small solar farms for three of HCUA's wastewater treatment plants and connect to the Utility's voltage distribution loop serviced by CEPA for 1 day of resilience.
- The solar farms being installed through other means (non-ES4SE funded)



HCUA Western Treatment Plant



Other Projects In-Progress



Natural Energy Laboratory of Hawaii Authority (NELHA)

– Kona, Hawaii



Project Information:

- NELHA installed a 100kW/400kWh UET Vanadium Redox flow battery in Kona, Hawaii for demonstration of its use for renewable firming and other applications. The battery was installed within the NELHA research campus and to be operated by HELCO. The system has operational issues and UET was to replace the initial system prior to going bankrupt. NELHA now has a non-functional system that needs to be decommissioned.

Updates/Challenges:

- Initial bid (\$0 – too good to be true?) from a company resulted in a delay of nearly a year as the company eventually became completely unresponsive
- Secondary bidder (\$250k) had to ‘refresh’ their bid after a nearly year-long delay and is currently working with Sandia as we are decommissioning the same kind of flow battery system at the Sandia NM campus (Sandia’s system is twice as big)
- Sandia sent electrolyte samples to multiple recyclers to find out who and if they can recycle the mixed-acid vanadium electrolyte

Total Project Cost	\$UNKWN
DOE Cost Share (Initial installation)	\$275k
DOE Cost Share (Decommissioning and removal)	\$250k



Albuquerque Public Schools – Atrisco Heritage Academy High School – Albuquerque, NM



Total Project Cost	\$3.2M
DOE Cost Share	\$650k

Project Information:

- 721kW/4hr battery storage and 850kW rooftop PV project to reduce school's demand charges.
- Largest energy footprint for any school in the district with a large percentage due to peak load demand charges.
- Future Resilience Hub - The school also functions as a community gathering center during emergencies and hosts an onsite health clinic. Cost avoidance funds will go toward student programs and other expenses for the school.



Updates/Challenges:

- Battery system installation is complete and has completed initial commissioning
- Solar PV systems have been installed and are awaiting "permission to operate" from local utility to complete inspection and commissioning
- Interconnection process delays. Original interconnection request Sept. 2021 and completed April 2023. Utility identified the need to upgrade protection systems due to project. Substation relay upgrades planned to be completed by Dec. 2023.



Picuris Pueblo – Northern New Mexico



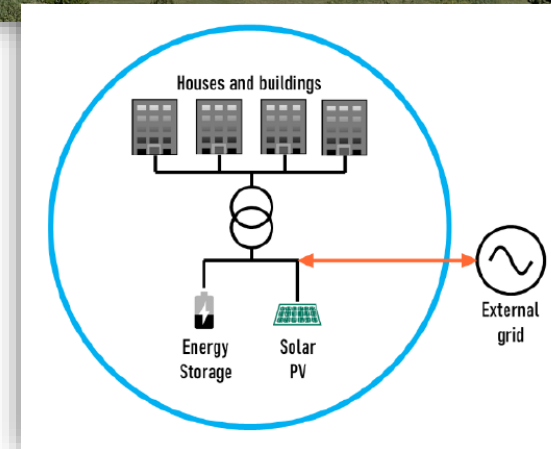
Total Project Cost	\$TBD
DOE Cost Share	\$500k

Project Information:

- The Picuris Pueblo is located in San Juan Mountains of Northern New Mexico. Due to their remote location, power system outages are a frequent occurrence and utility maintenance travel long distances to fix damaged equipment and restore power.
- Picuris Pueblo will be installing a battery energy storage system (estimated at least 400kW/4hr) to enable microgrid operation for resiliency when combined with the planned Picuris Phase II Community Solar system
- Support local utility grid operations

Updates/Challenges:

- Construction of the Solar project is currently underway. Grant from DOE Office of Indian Energy
- Need to coordinated with local co-op to define operational plan for the battery
- Currently in contract development with Sandia for cost share funding



Municipality of Villalba – Villalba, Puerto Rico



Total Project Cost	~\$1M
DOE Cost Share	\$1M

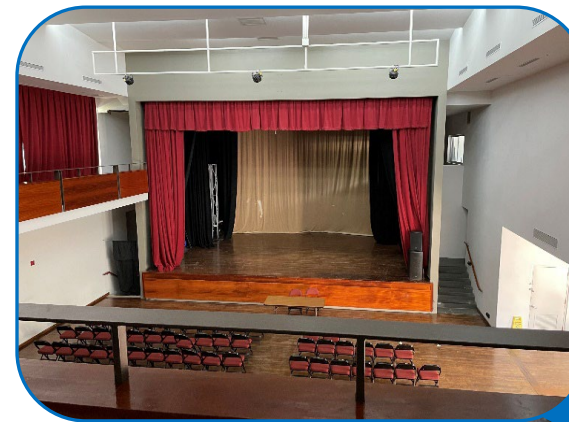


Background:

- The Municipality of Villalba is creating a local resiliency hub by installing a storage plus solar system at the local theater building. The theater currently serves as a backup emergency operations center for the Municipality.
- The resilience hub will be able to serve the local community with additional resources such as a continuity of city services, heating/cooling center, water/food distribution, phone charging, etc.
- Villalba is one of five municipalities that formed the Mountain Energy Consortium (CEM) post Hurricane Maria
- Previous microgrid analysis was performed for all of the municipalities as part of a larger effort of Sandia supporting CEM

Updates/Challenges:

- Project analysis has been completed
- Sandia cost share contracting completed
- The project is currently in the Request for Proposal (RFP) stage and expects to award and begin construction in 2024.



Microgrid Location

Ellsworth Air Force Base (NRECA) – Rapid City, South Dakota



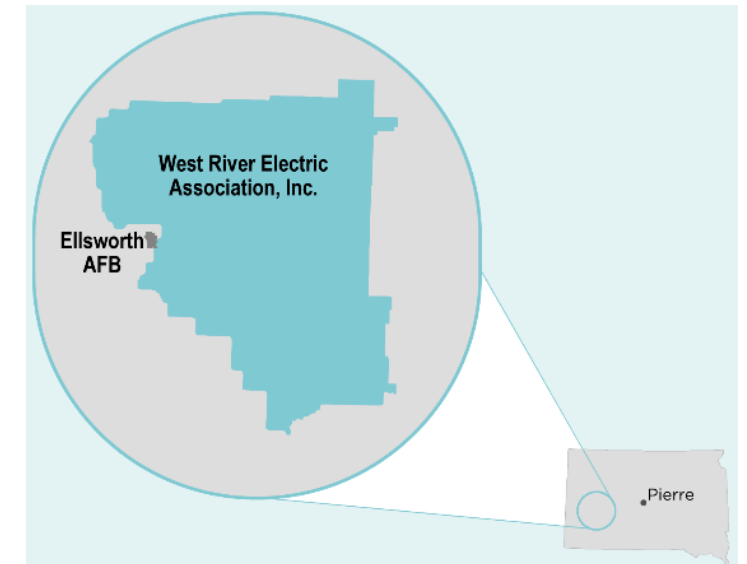
Total Project Cost	\$400k
DOE Cost Share	\$250k

Background:

- This project is a National Rural Electric Cooperative Association (NRECA) Rural Energy Storage Deployment Program (RESDP) Project, in partnership with the WREA, PNNL, and Ellsworth Air Force Base. The project will provide a battery energy storage system to a site for 24/7 operation.

Updates/Challenges:

- The battery energy storage system supplier has spent most of 2023 designing and building an NFPA 855 compliant application which is difficult and uncommon for smaller energy storage systems of this size today.
- Site construction is complete, and the system is expected to be commissioned and operational by Q4 2023.



Energy Power Board of Chattanooga – Chattanooga, Tennessee



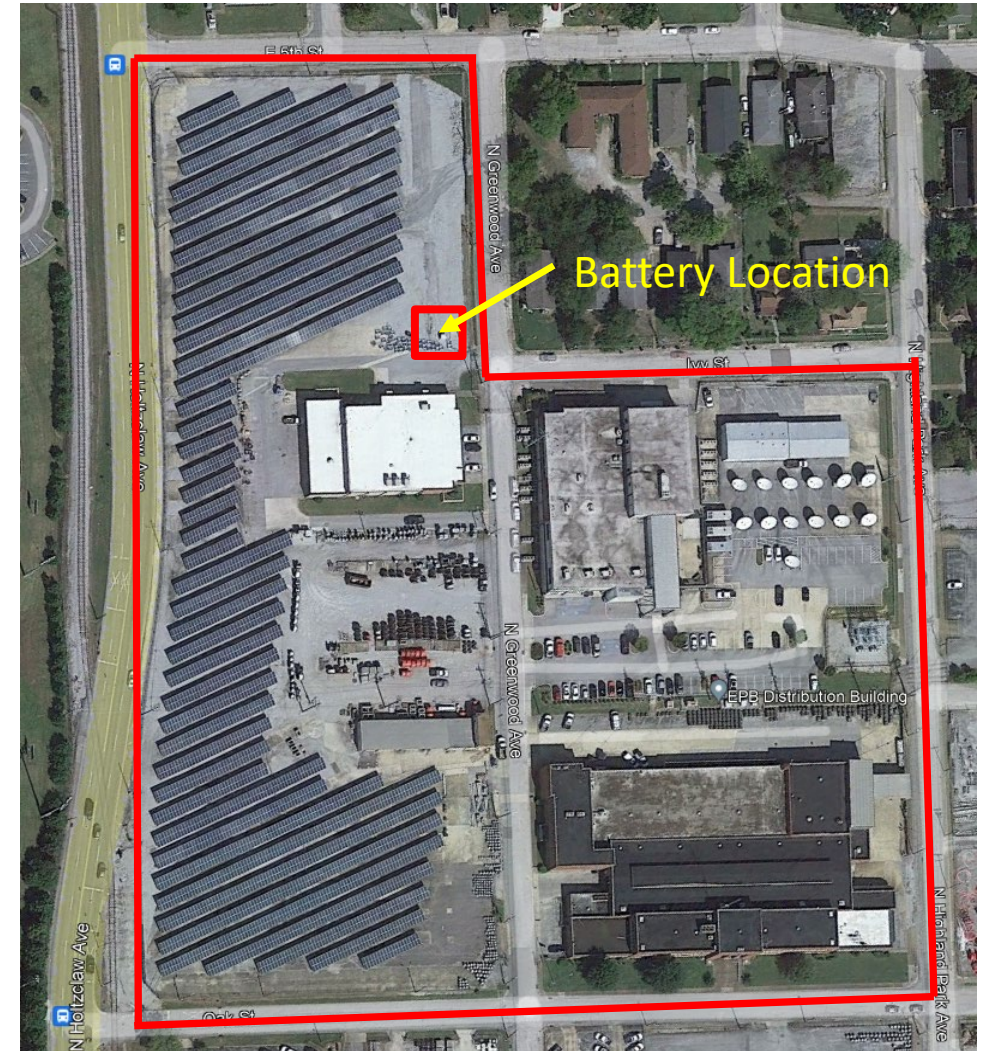
Total Project Cost	\$970k
DOE Cost Share	\$250k

Background

- EPB installed and commissioned a 1.25 MW, 2.5 MWh battery energy storage system to supplement their existing Community Solar site (1.3 MW) to create a microgrid for the EPB Control Center Campus. The battery system is operational and has been in use for monthly demand reduction.

Updates/Lessons Learned:

- Project is complete and in-service
- Sandia set up and is currently collecting operational data from the project to validate the performance of the system.





This work was directed by Dr. Imre Gyuk through the Department of Energy Office of Electricity Delivery and Energy Reliability (DOE-OE) Stationary Energy Storage Program.



Thank You

Contact:

Henry Guan | hguan@sandia.gov

O: (505) 845-7524 | C: (505) 206-2257