



ENERGY STORAGE FOR SOCIAL EQUITY (ES4SE)

2022 DOE OE Peer Review
October 11th, 2022

Jennifer Yoshimura, Adrienne Rackley, Henry Guan



SAND2022-13825 C

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. **SAND2022-13825 C**





Agenda

1. Program Overview
2. Application and Selection Process
3. Technical Assistance
4. Equity and Workforce
5. Project Development and Deployment
6. Program Look Ahead
7. Q&A



Program Overview

U.S. DEPARTMENT OF
ENERGY


Pacific Northwest
NATIONAL LABORATORY

 **Sandia**
National
Laboratories





Program Overview – Energy Justice and Energy Storage

Energy Justice Tenets

Distributive Justice (where?)

The unequal allocation of benefits and burdens and unequal distribution of the consequences

Recognition Justice (who?)

The practice of cultural domination, disregard of people and their concerns, and misrecognition

Procedural Justice (how?)

The fairness of the decision-making process

Restorative Justice

The response to those impacted by the burdens of energy projects

Energy Inequities

Energy Burden

Percent of income spent to cover energy cost.

Energy Insecurity

The inability to meet basic household energy needs.

Energy Poverty

A lack of access to basic, life-sustaining energy.

Energy Vulnerability

The propensity of a household to suffer from a lack of adequate energy services in the home.



How Energy Storage Fits

- Curb demand charges
- Reduce affordable housing energy cost
- Maintain operation in facilities critical to public health and safety
- Reduce utility disconnection
- Support grid reliability and resilience (backup power)
- Intentional siting in underserved communities
- Serve remote communities
- Support energy independence
- Generate community wealth



Program Overview – Links Between Energy Storage & Community Objectives

WHY ENERGY STORAGE?

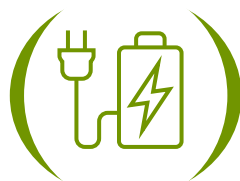
Locational flexibility



Wide applications



Broad uses for storage



HOW CAN ENERGY STORAGE SUPPORT COMMUNITY GOALS AND ADDRESS NEEDS?

Access



Affordability



Environmental Impact



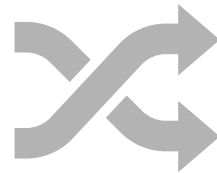
Social Impact



Decarbonization

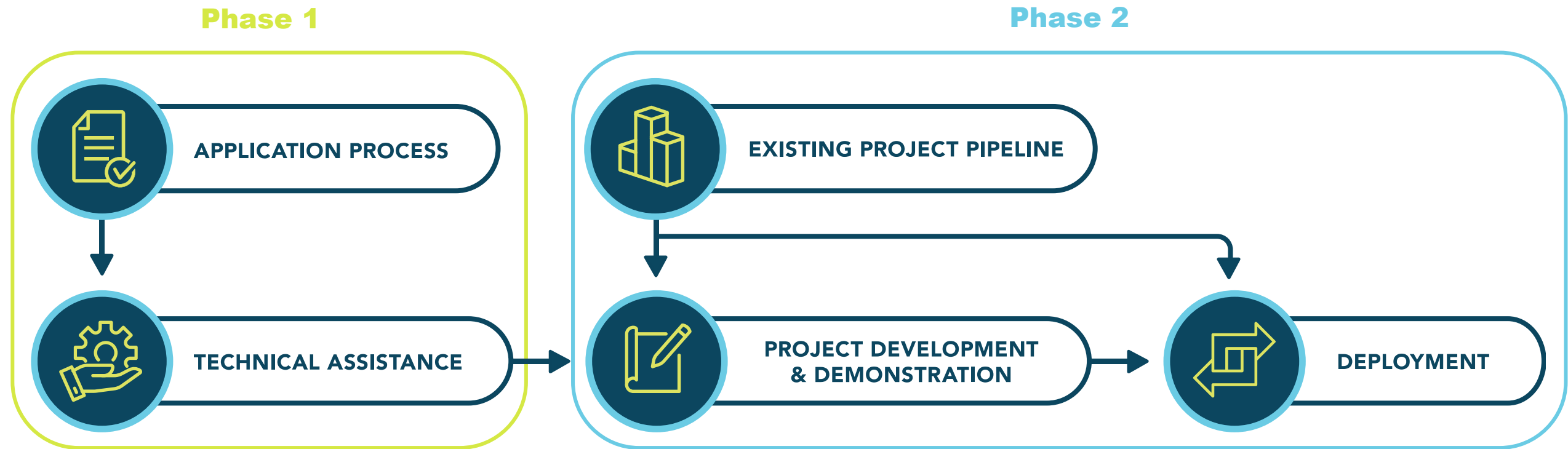


Resiliency





Program Overview – Program Phases



OUTCOMES

Connect disadvantaged communities with energy solutions that support equitable outcomes

Demonstrate the role of energy storage in energy equity

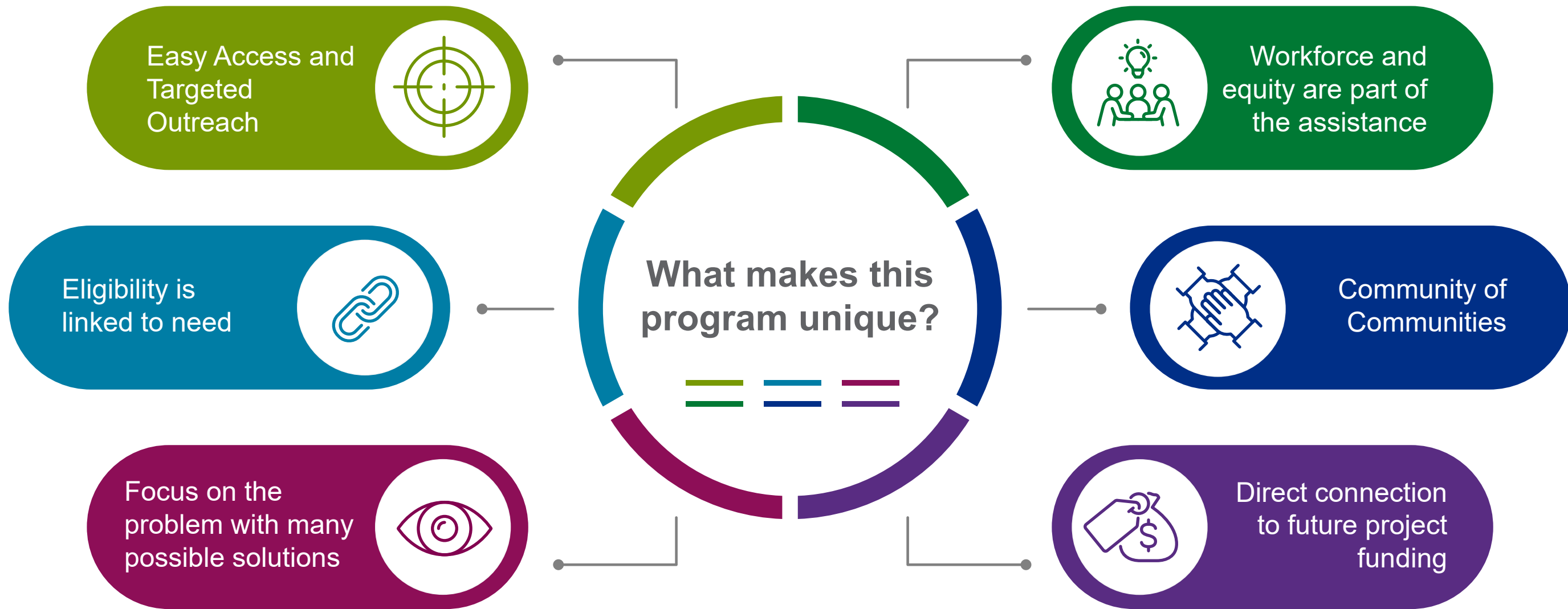
Develop methods and metrics to analyze impact of investment on equity

Report on lessons learned and best practices to support future work across DOE

Grow and strengthen DOE project pipeline



Program Overview – ES4SE Distinctions





Application and Selection Process

U.S. DEPARTMENT OF
ENERGY


Pacific Northwest
NATIONAL LABORATORY

 **Sandia**
National
Laboratories





Participant Selection – Application Snapshot

- Application process:
 - **Applications opened:** Sept. 23rd 2021
 - **Interest Forms due:** Nov. 5th 2021
 - **Application Forms due:** Dec. 3rd 2021
 - **Applicants notified of decision:** Feb. 2022

Total interest forms: 21

- 16 interest forms became applications
- Met with 11 interested organizations
 - 10 submitted applications

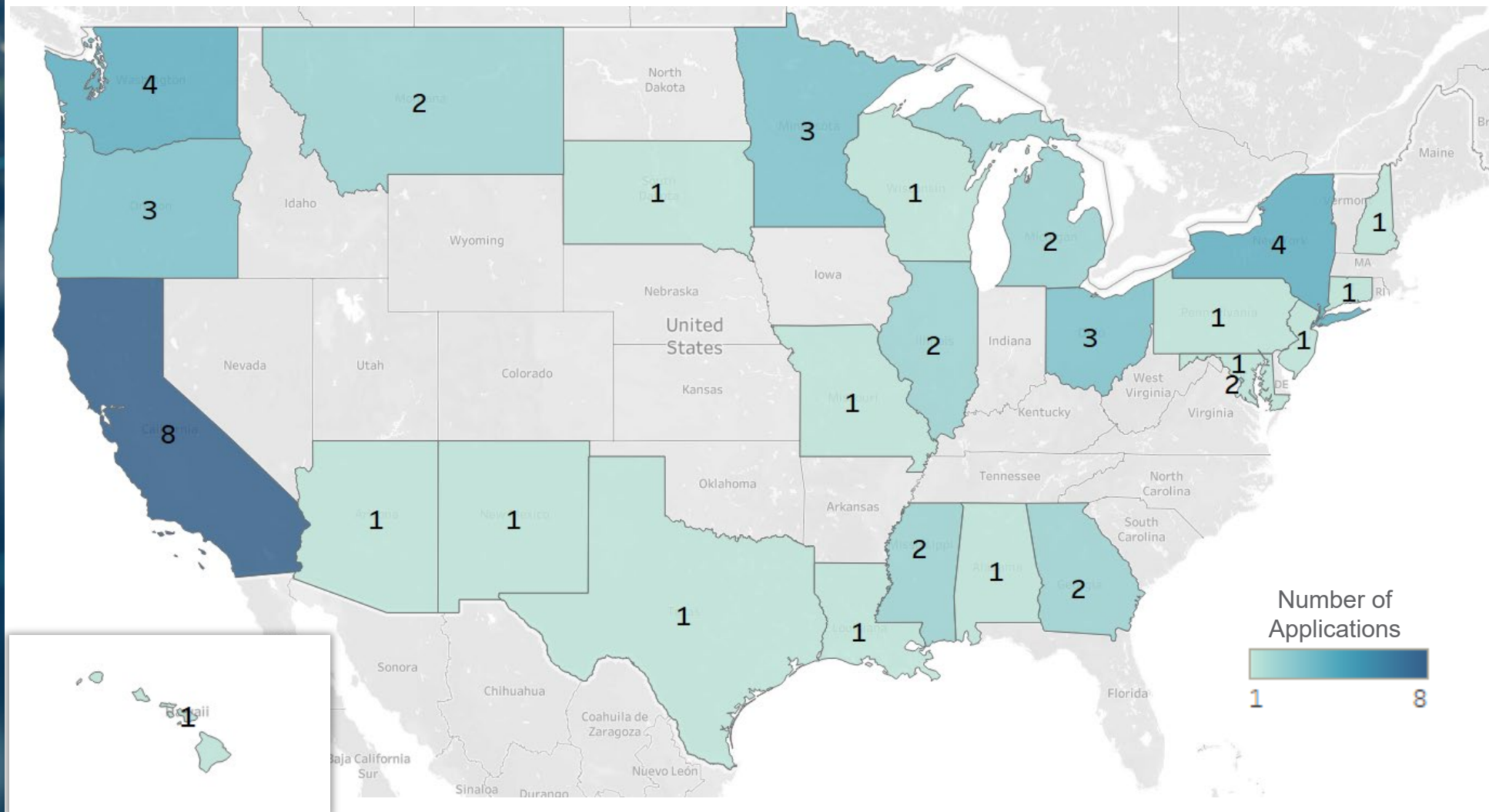
Total application forms: 64

- Tribal Applicants: 13
- Urban Applicants: 23
- Rural Applicants: 15
- Not identified: 9
- Non-US Applicants (ineligible): 4



Application Summary: Number of Applicants By State

Received applications from 23 states (and the District of Columbia)



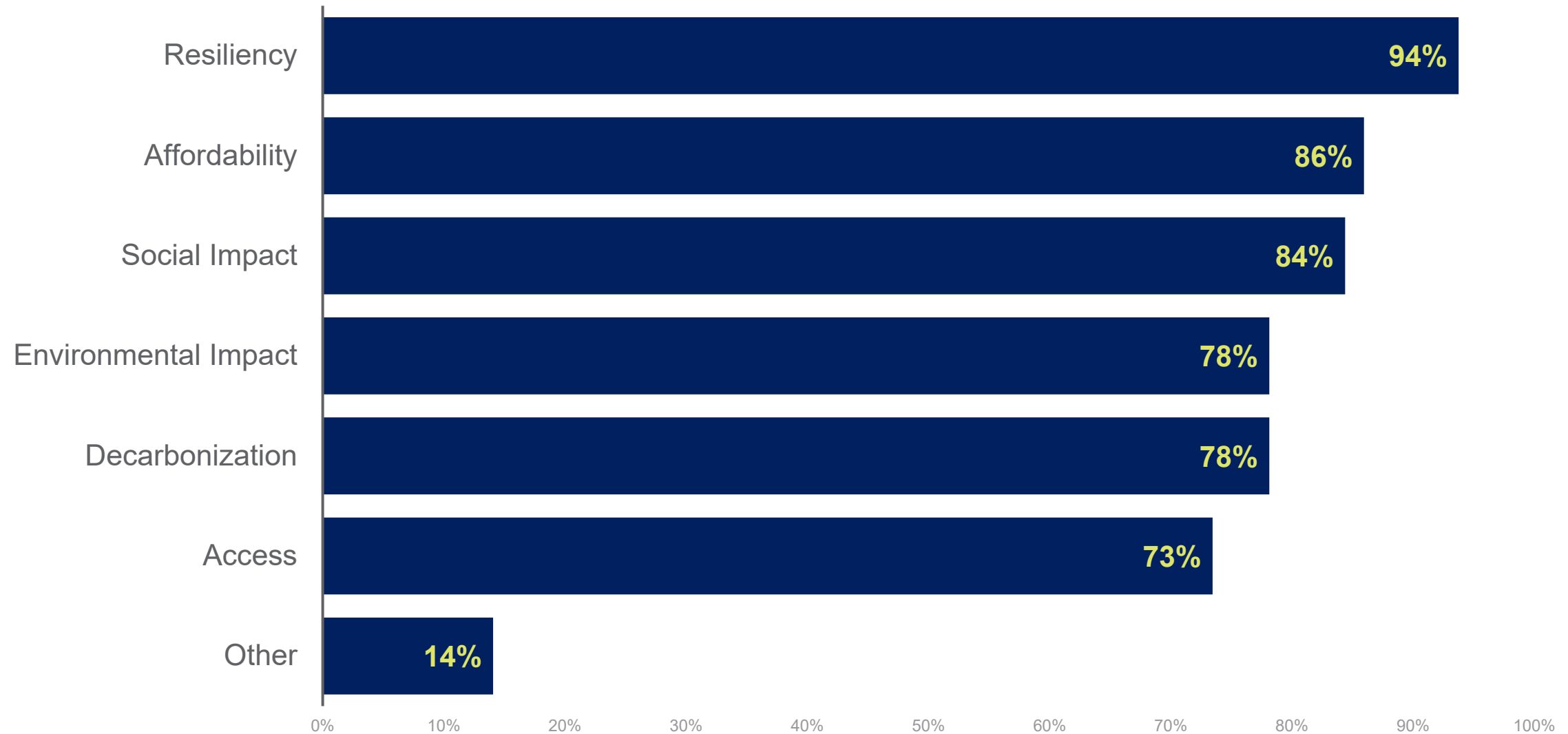
States with Multiple Applications

State	# applications in State:
California	8
New York	4
Washington	4
Minnesota	3
Ohio	3
Oregon	3
Georgia	2
Illinois	2
Michigan	2
Mississippi	2
Montana	2
D.C.	2



Application Summary: Energy Objectives

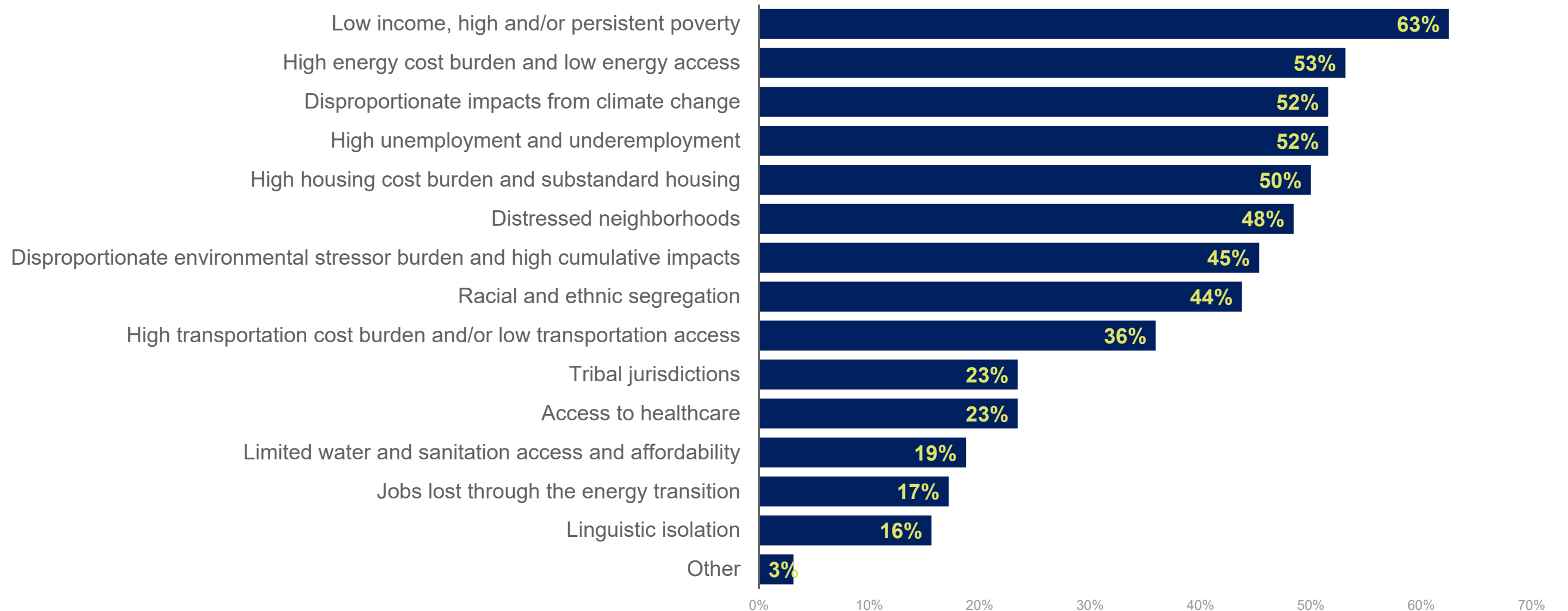
% Applications Selected Energy Objective of Interest





Application Summary: Disadvantaged Community Criteria

% Applications Selected DAC Criteria





Participant Selection – Technical Assistance Selection Criteria

Eligibility Criteria

- Technical assistance will be beneficial to a disadvantaged community
- Disadvantaged community experiences problems or challenges with their energy system that can be addressed or partially mitigated through electric service delivery and/or energy storage
- Applicant must have the capacity to support the technical assistance process
- Applicant must have credibility to support the disadvantaged community

Selection Criteria

- Impact potential of energy storage to contribute to community objectives
- Unique value of laboratory analysis (limited funding, need for scoping work, potential public benefit, etc.)
- Strength of team described in the application to support the technical assistance process, develop a cohort with other participants, and support the community
- Likelihood of technical feasibility to enable implementation of solution identified in technical assistance. Note: this program does not include implementation, demonstration, or deployment

Program Policy Factors:

1. Projects may be selected to best represent a range of issues.
2. Projects may be selected to support geographic diversity.
3. Projects may be selected to support diverse policy and operational contexts



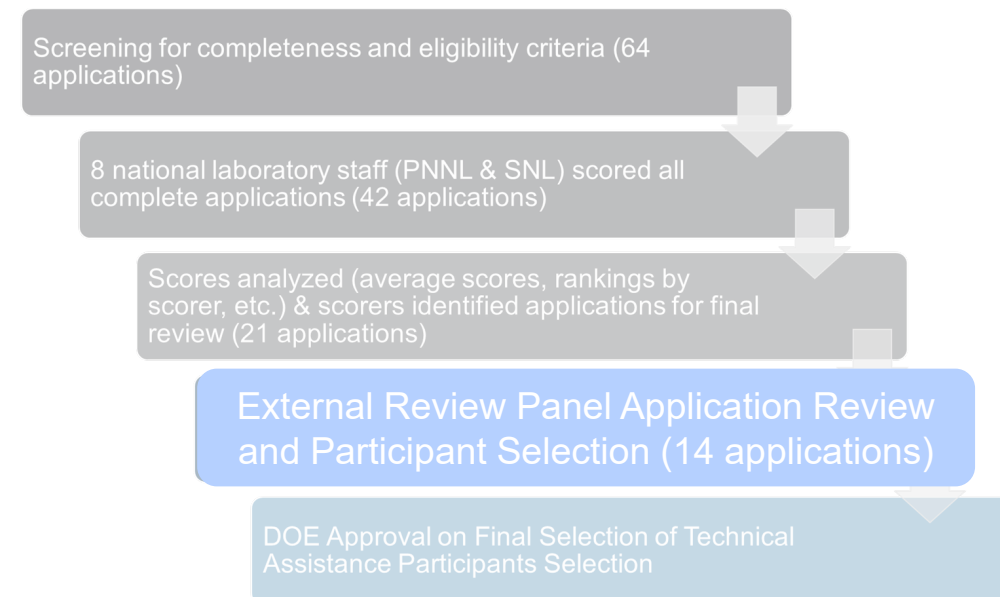
Participant Selection – ES4SE Review Panel

Objective:

Ensure the ES4SE selection process is externally vetted and community-grounded to ensure the program follows an equitable process

Goal:

Provide rigorous and transparent final ranking recommendations rooted in equity for ES4SE technical assistance participant selection



Megan Levy
Resilience Strategist & Energy Assurance Coordinator - Office of Energy Innovation
Public Service Commission of Wisconsin



Gwen P. Holdmann
Director,
Alaska Center for Energy and Power



Peter Muhoro, Ph.D.
Chief Strategy, Technology & Innovation Officer
Rappahannock Electric Cooperative

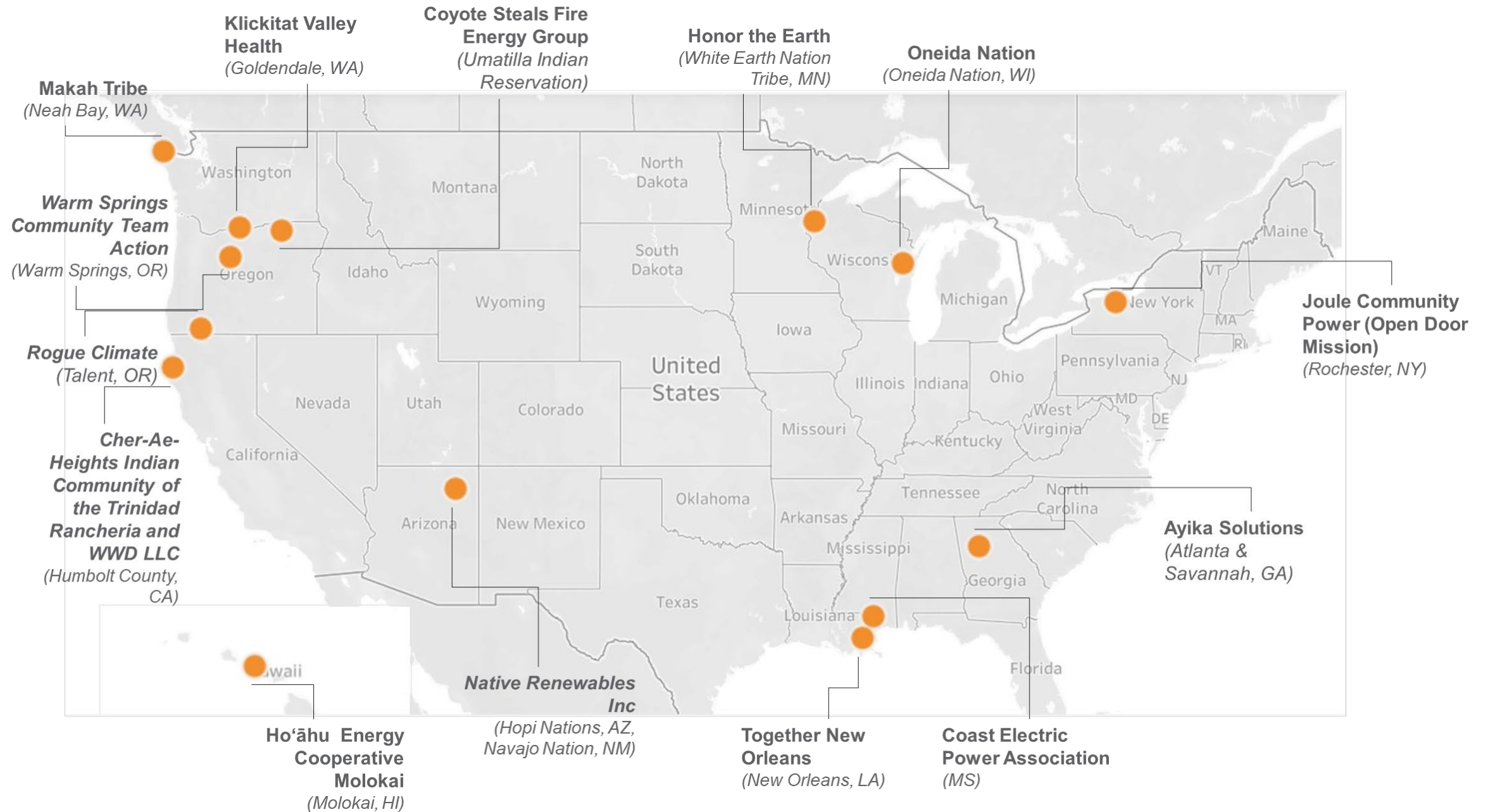
Vice President and General Manager,
RE Communications



Crystal Pruitt
Deputy Director - Office of Clean Energy Equity
New Jersey Board of Public Utilities



Participant Selection – ES4SE Selected Participants





Technical Assistance





ES4SE Technical Assistance Overview

Objective

Provide technical assistance (TA) to advance energy equity, targeted to disadvantaged communities, identifying energy challenges and meeting community-defined goals

Goal

Transition communities from problem to solution-identification through technical analysis and partnership development

Process

Pacific Northwest National Laboratory and Sandia National Laboratories provide TA through in-kind guidance, training, analysis, and support Group forums for TA participants to connect, share, and learn from other participants



Technical Assistance (TA)

Number of communities selected:

14

TA will vary based on project, but options may include:

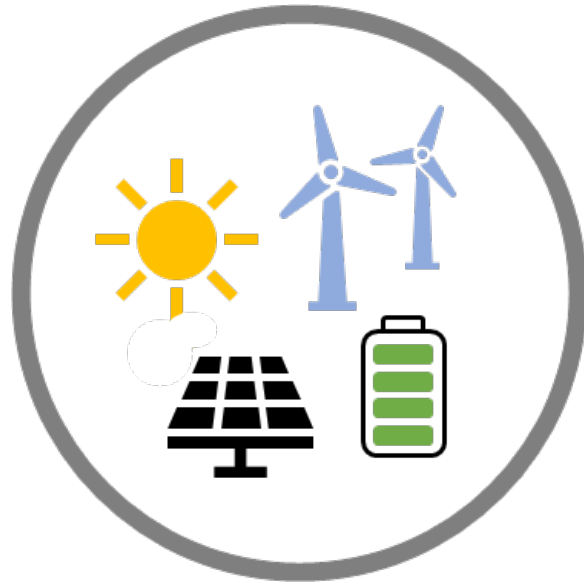
- *Economic Analysis*
- *Load Analysis*
- *Workshops*
- *Grant/Funding Application Assistance*

All TA is accompanied by equity and workforce analysis.

TA is free to selected communities but is **not** accompanied by funding



Technical Updates



Microgrids

0.076-4.2 MW PV
0.16-7.1 MWh BESS



Off-grid Systems

2.1-2.4 kW PV
11-19 kWh BESS



PV + BESS for
Commercial and
Residential Buildings

6-460 kW PV
0.003-3 MWh BESS



Resilience Hubs

2.7-126 kW PV
0.004-12 MWh BESS



The Makah Tribe



2 Microgrids

Wellness Center + Res. Neighborhood
Sail River Height Neighborhood

2 Resilience Hubs

Makah Community Gym (1200 people)
New School (400 people)

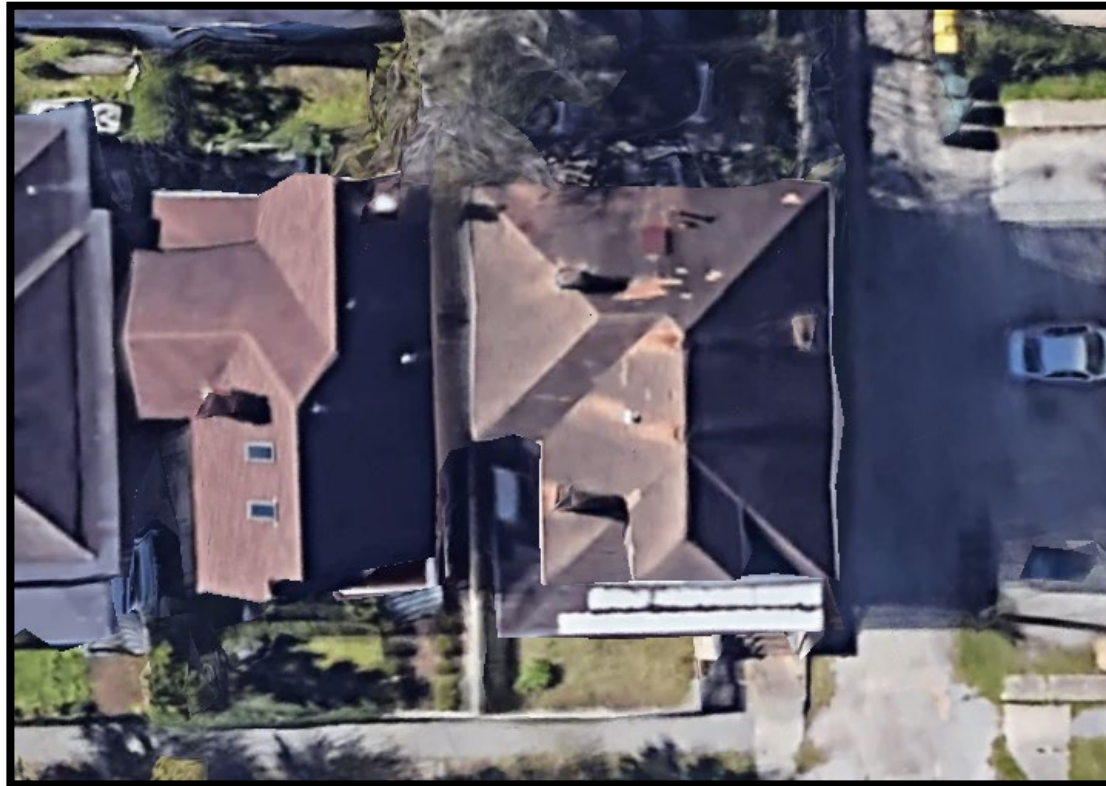


- **Energy Challenge:** Energy and Freshwater Reliability, Access, Outages, energy sovereignty
- **Project Type:** 2 resilience Hubs, 2 microgrids
- **Background Info:** Extreme weather events (tsunami, earthquake, winter storms, flooding, etc.); relocation planning, freshwater shortages,

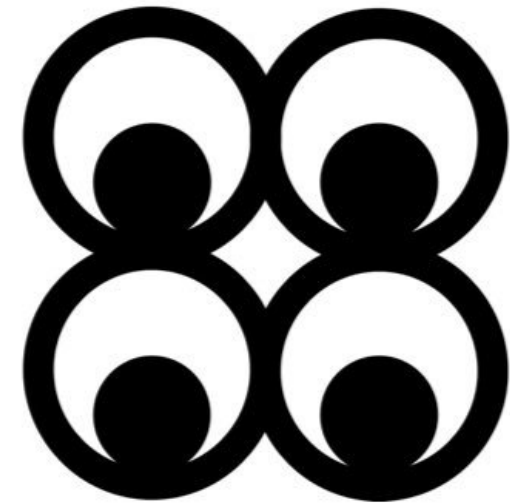


Ayika Solutions Savannah Res. Hub – Harambee House

- Savannah Resilience Hub:
 - Estimated to serve 25-35 people in a resiliency scenario
 - 4 hour and 7-day outage scenarios



- Atlanta Resilience Hub Locations:
 - Metropolitan Library
 - Neighborhood Union Health Center
 - Southeast Library



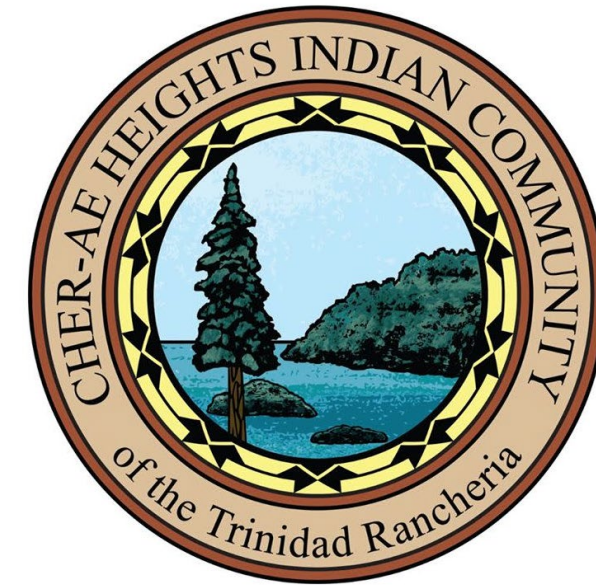
- **Energy Challenge:** Energy burden, resilience
- **Project Type:** PV + BESS for residential customers, 4 resilience hubs
- **Background Info:** Regulatory barriers; socioeconomic disadvantages; extreme weather events (flooding, heat waves, etc.); energy as a pathway of upward economic and social mobility for LMI households



Cher-Ae Heights Indian Community of the Trinidad Rancheria (Humboldt County, CA)



- The Casino serves as a local Red Cross shelter in the event of a disaster-type incident, and it is also the entity that will cover the project financially.
- Optimization: 1 day, 3 days, 2 weeks



- **Energy Challenge:** PSPS events, energy cost, reliability, resilience, energy sovereignty
- **Project Type:** Microgrid
- **Background Info:** Bring resilience to the community; tribe casino used as a recreation and employment center, and red cross-shelter



Coast Electric Wastewater Plants

- Northern Wastewater Plant (300kWac/384kW dc, 480V)
- Western Wastewater Plant (100kWac/136kW dc, 480V)
- BESS analysis
- Safety and O&M recommendations
- Educational Material on ES

Northern Plant



Western Plant



A Touchstone Energy® Cooperative 

- **Energy Challenge:** Affordability, resilience, received funding to install solar farms for wastewater treatment plants
- **Project Type:** BESS for 2 wastewater plants
- **Background Info:** Hancock County Utility Authority provides water and sewer service and is served by CEPA. BESS would save costs (demand charge and energy purchase); natural disasters (hurricanes); power outages



Honor the Earth (Ponsford, MN)



- Pine Point School (PV Expansion + BESS)
 - Potential for 3 sites
- Outage durations:
 - 4 hours, 1 day, 1 week
- PV + Wind + BESS Analysis



- **Energy Challenge:** Affordability, self-sufficiency, resilience
- **Project Type:** Commercial Building/Microgrid
- **Background Info:** Economic growth; capacity building; clean energy; cold location; expansion of PV system + BESS for elementary school



CSF Energy Group & Confederated Tribes of the Umatilla Indian Reservation



- Selection of storage technology
 - Ambri Liquid Metal Batteries
 - ISS Inc. Iron Flow Batteries
 - Lithium-ion LFP
- Microgrid Design for 27 low-income households
- Design and Interconnection coordination with utility (UEC)



Energy Challenge: Affordability, resilience, energy sovereignty

Project Type: Microgrid

Background Info: low-income neighborhood, energy burden, power outages, coordination with UEC



Ho'āhu Energy Cooperative Molokai (Moloka'i, HI)

HO'ĀHU ENERGY COOPERATIVE MOLOKAI

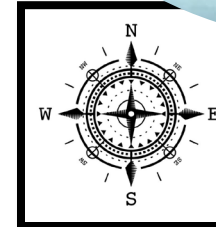
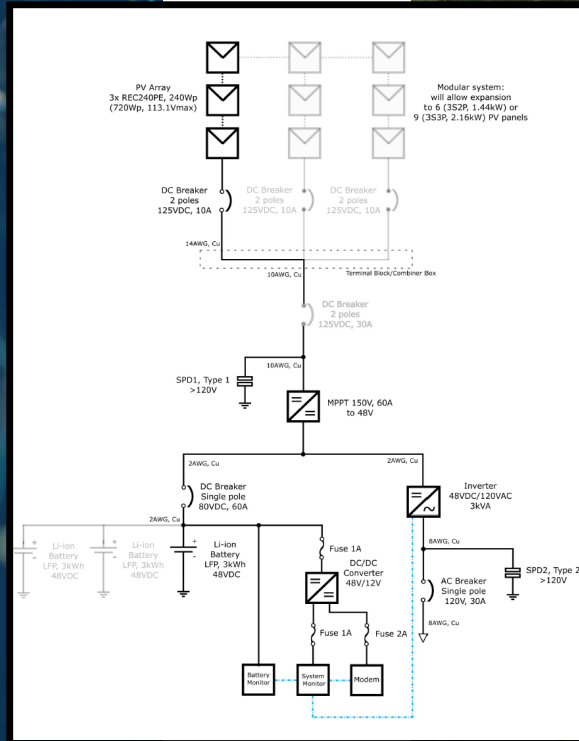
Nā'iwa Agricultural Subdivision Project

Nā'iwa, Island of Moloka'i

Molokai
Airport

Tax map Keys- (2) 5-2-004: 001, 002, 004, 007, and 046; and
58 LOTS
(2) 5-2-003: 001

[Google Earth](#) | [Department of Hawaiian Home Lands](#) | Nā'iwa Agricultural Subdivision Project



- Small Stand-alone Systems
- Nani Maunaloa Microgrid
 - Electric Storage Community Model Research
- Community Events

- **Energy Challenge:** Affordability, resiliency, reliability, energy access
- **Project Type:** Standalone systems and Microgrid
- **Background Info:** health issues due to diesel exhaust, improve livelihood reliability for homesteads, energy burden, energy efficiency, capacity building



Klickitat Valley Health (Goldendale, WA)

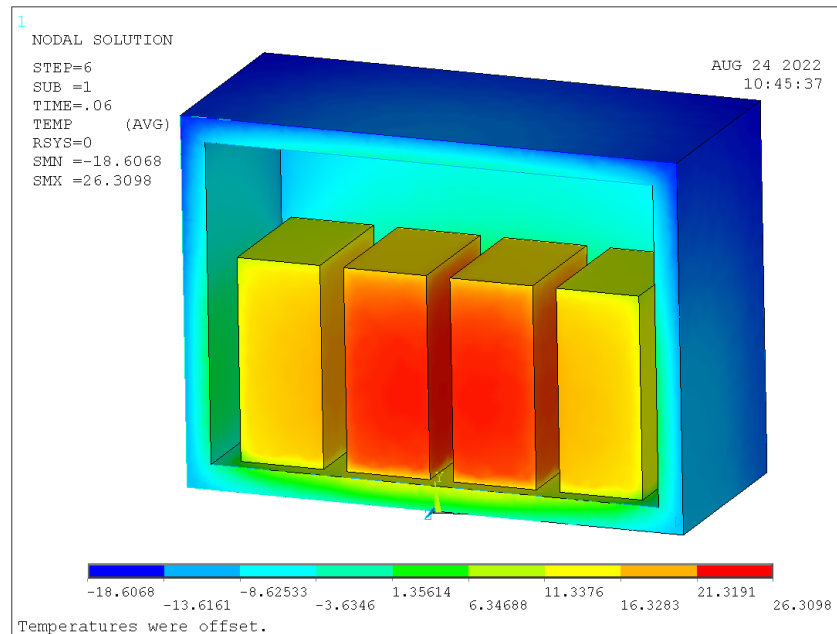


- FEMA Benefit Cost Analysis (BCA) support for Hazard Mitigation Grant Application
- Microgrid Feasibility Study Review, which will support KVH and Goldendale School District (Primary, Middle, and High School)
- Hydrogen Fuel Cell Interconnection Support to KPUD

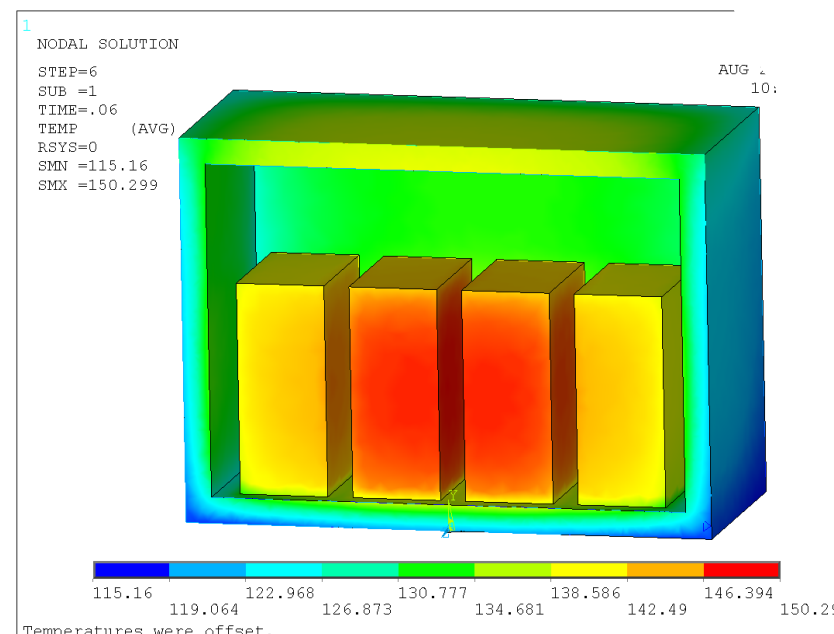
- **Energy Challenge:** Resilience, energy burden
- **Project Type:** Interconnection of Fuel Cell, Microgrid
- **Background Info:** Aging electrical infrastructure, weather, and climate risks (wildfires, heat, etc.), enhance hazard mitigation capacity, backup power and heating services, expand hospital services



Native Renewables



AGM Enclosure winter bounding temperature contour plot (°F)



AGM Enclosure summer bounding temperature contour plot (°F)

- Techno-economic study on ES for small scale systems
- Data collection systems
 - Battery monitoring
 - Remote & local
 - Data logging memory
- Battery enclosure analysis
 - LFP enclosures
 - AGM enclosures

- **Energy Challenge:** Energy self-sufficiency, energy access, affordability
- **Project Type:** Residential off-grid systems
- **Background Info:** capacity building, battery temperature constraints, many families not connected to the grid and relying on fossil fuel, support the local economy



Oneida Nation

Microgrid for Oneida's Health Campus



- **Energy Challenge:** Energy sovereignty, reliability, resilience
- **Project Type:** Microgrid
- **Background Info:** power outages, critical facilities at Oneida's health campus, capacity building



- Health Center
- Anna John Nursing Home
- Elderly Service
- Childcare
- 3 EV Charging Stations Level 2 (11kW each)
- Defining system size based on 3 days, 1-week, and 2-week outage scenarios



Equity & Workforce





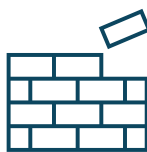
Why Equity and Workforce?



- Community's experience is centered, we listen to their challenges and needs and use those to create goals, identify opportunities, and guide the project to maximize impact.



- Intervention(s) are linked to results, ensure benefits flow to intended recipients.



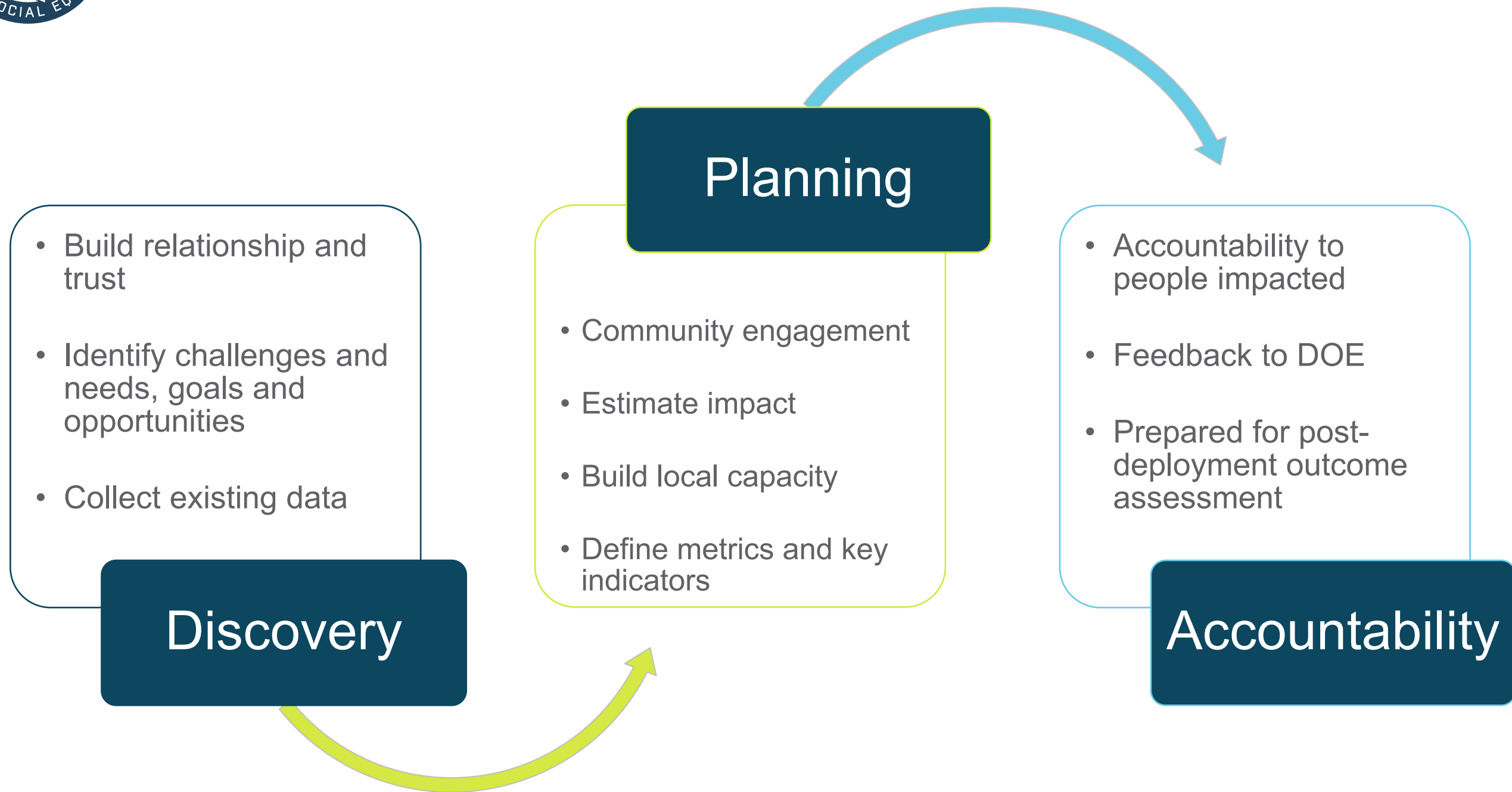
- Build community capacity and skills for amplified and sustained benefit.



- Share creative solutions across communities with similar challenges and suggest other opportunities that may not have been previously considered to achieve specific outcomes.

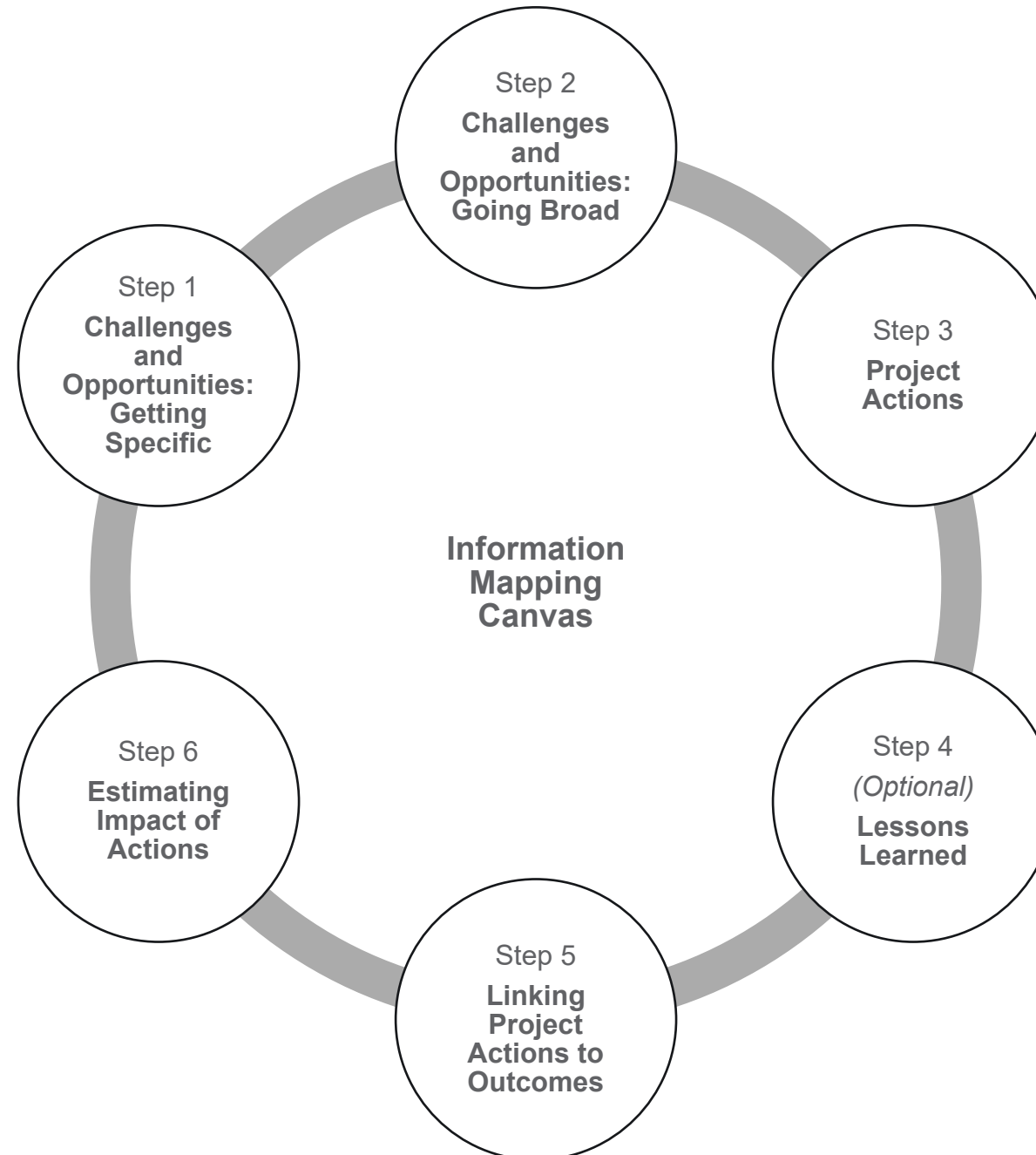


Our Approach





Information Mapping Canvas Supports Planning for Equitable Outcomes





Equity Themes Community Challenges and Opportunities

Resilience

- Create resilience hubs
- Power critical infrastructure

Energy Burden

- Reduce pass-through costs and free up cash flow
- Promote affordable housing

Energy Access

- Pilot for residential electrification
- Support uninterrupted business operations

Decarbonization & Environmental Impact

- Replace fossil fuel generators, wood stoves, grid energy
- Alignment with environmental values

Social Impact

- Support intergenerational engagement
- Inspirational aspect

Workforce

- Build local capacity
- Partnerships with training programs

Energy Independence

- A step towards energy sovereignty
- Places decision-making authority with those affected



Workforce and Capacity Building

- Goals
 - Build local capacity through awareness and skills
 - Intentionally consider opportunities for impacts to skills or job market
- Challenges for workforce impact
 - Small and one-off projects are unlikely to provide new direct job opportunities
- Opportunities
 - Direct
 - ✓ Large-scale projects requiring installation, operations, and maintenance crews
 - ✓ Capacity building for equity assessment and designing new projects using this one as an example
 - ✓ Learning new skills to manage energy transitions
 - ✓ Hands-on learning/training in conjunction with other workforce programs and schools
 - Indirect
 - ✓ Relationships with external consultants and training institutions may offer a pathway to national jobs
 - ✓ Awareness and inspiration around clean energy and energy efficiency interventions
 - ✓ Installation site is one that local businesses depend on or that itself offers job training



Project Development and Deployment

U.S. DEPARTMENT OF
ENERGY


Pacific Northwest
NATIONAL LABORATORY

 **Sandia**
National
Laboratories





ES4SE Project Development & Deployment Assistance (PDDA) Overview

Objective

Provide engineering support for project development and deployment of systems

Goal

Transition an identified solution into a system deployment to meet community defined goals

Process

Sandia National Laboratories and Pacific Northwest National Laboratory to provide Project Demonstration and Deployment support through Sandia's existing Demonstration program



Project Development & Deployment Assistance (PDDA)

Number of communities selected:

At least 5

Project support will vary based on project, but support may include:

- System and Equipment Sizing
- Site Development
- Cost Estimation
- Design Review
- System Safety Review (including Safety Codes and Best Practices)
- Installation and Commissioning Guidance
- System Performance Validation
- Potential Cost Share Funding



Project Development and Deployment Assistance

- FY22 Goals
 - Develop a selection process for selecting which TA participants will move on to PDDA
 - Smooth transition from Phase 1 to Phase 2 for participants
- Challenges
 - Equity in selection process. Projects that are the most appealing from a traditional perspective may not be the ones that need assistance the most.
 - Coordination between different teams to reduce burden on communities going from Phase 1 to Phase 2.
- Opportunities
 - Inclusion in community calls
 - Selection of projects based on community needs



Looking Ahead

U.S. DEPARTMENT OF
ENERGY


Pacific Northwest
NATIONAL LABORATORY

 **Sandia**
National
Laboratories



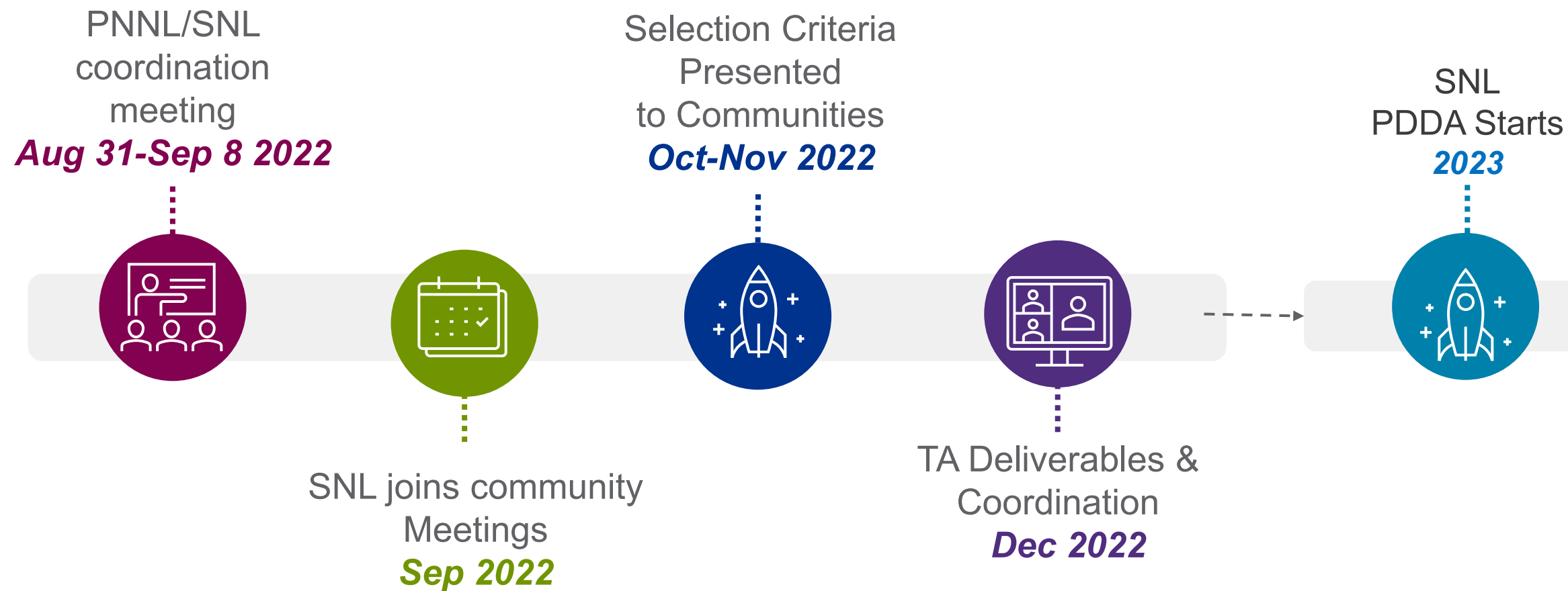


ES4SE Looking Ahead

- Bridging TA and PDDA
 - Focus on centering and maintaining community relationships
 - Smooth transition between PNNL and Sandia
 - Continue support of project development for some communities
 - Initiation of PDDA projects
- Financial opportunities
 - Cost Share
 - Investments
 - Federal Funding
 - Philanthropy
- Collaboration on continuing TA
- Continue analysis of equity and social benefits



ES4SE Timeline





Acknowledgements

We want to thank Dr. Imre Gyuk and the OE Energy Storage program for their support.





THANK YOU

Jennifer Yoshimura
Jennifer.Yoshimura@pnnl.gov

Adrienne Rackley
Adrienne.Rackley@pnnl.gov

Henry Guan
hguan@sandia.gov

