PNNL-SA-220593

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2026 DLA Energy Worldwide

Microgrids and Batteries: You Need Both but How?

April 21, 2026

U.S. DEPARTMENT of ENERGY BATTELLE

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Microgrids and Batteries: You Need Both but How?

- Frank Tuffner, Pacific Northwest National Laboratory
- Waylon Clark, Sandia National Laboratory
- Jeff Worley, Schneider Electric

Large-scale lithium-based batteries are a known technology at this point. DOE and the National Laboratories are leading major efforts to develop the energy storage systems of the future. This session describes those efforts and includes projects completed at DoD installations. In addition, an overview of the use of microgrid analytics to increase cost effectiveness, and resilience showcases a microgrid assessment project at a military base and discusses key lessons learned.

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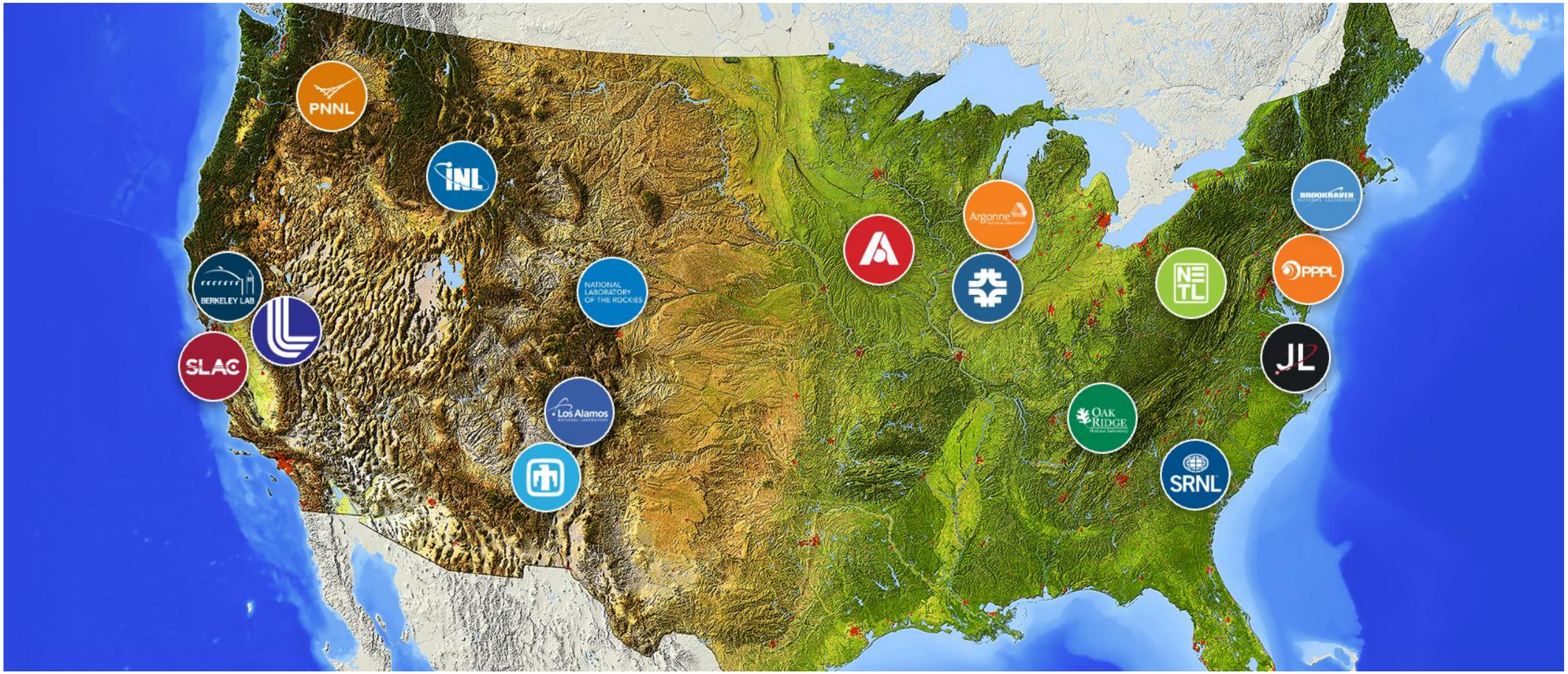
DOE's 17 National Laboratories



Types of Microgrid Operations

Role:

- Backup Power
- Grid Resource

Size:

- Single/Small Entity
- Larger/Networked Microgrid

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Challenges in Planning

- Permitting
  - Who are the authorities holding jurisdiction (AHJs)?
  - What is the process?
- Interconnection
  - What is needed to connect to other systems?
  - Do you want to connect to them?
- Design
  - Are there specific equipment requirements?
  - What restrictions are there on the deployment/space?
- Cybersecurity
  - How are devices connected/controlled?
  - Is the network enclaved/isolated?

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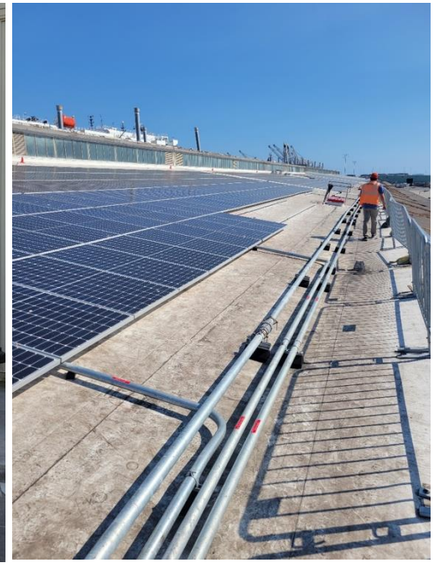
Challenges in Operation

- Ownership/Authority
  - Who owns the assets within?
  - Who has authority to operate the microgrid?
- Operating mode
  - Is this backup only?
  - If grid connected, are the assets doing anything else?
- Cybersecurity
  - How do you maintain security?
  - Are there any critical components that require additional protection?

Microgrid Challenges



Port of Long Beach

Camp Smith

Fort Carson

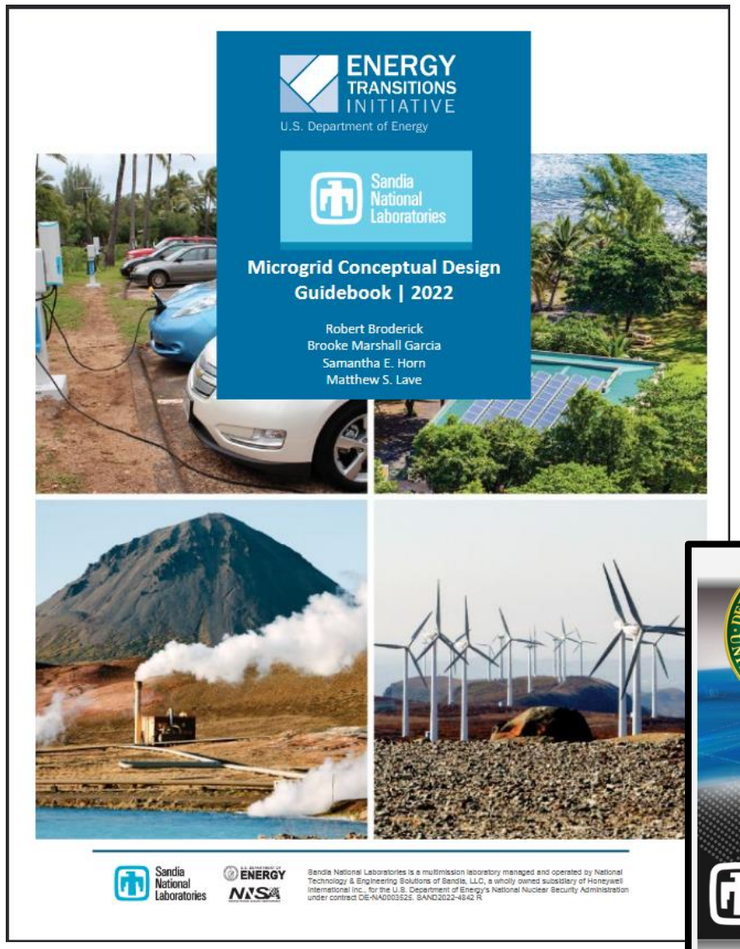
Numerous resources to get you started

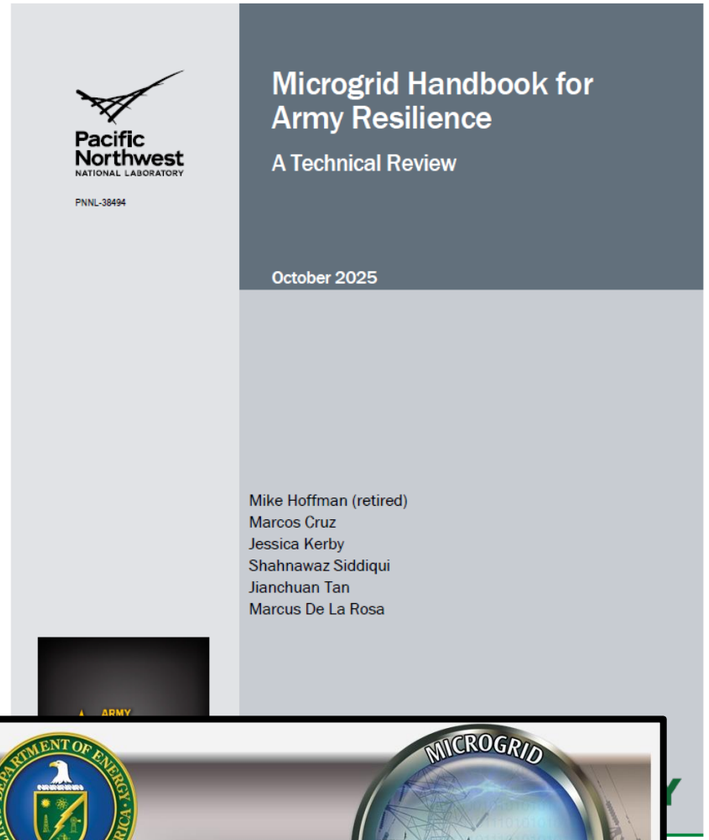
References:

- Microgrid Handbook for Army Resilience
- Microgrid Conceptual Design Guidebook

Tools

- Microgrid Design Toolkit
- Distributed Energy Resources Customer Adoption Model (DER-CAM)
- Other research tools



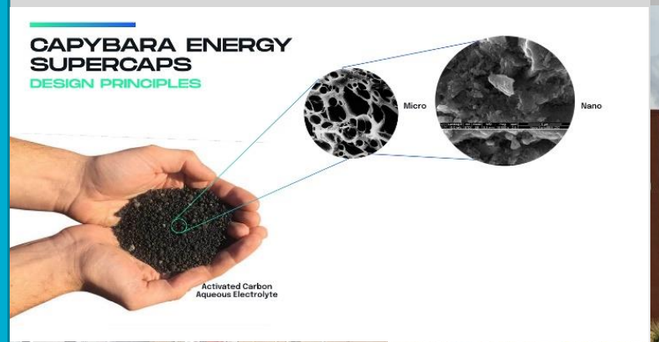


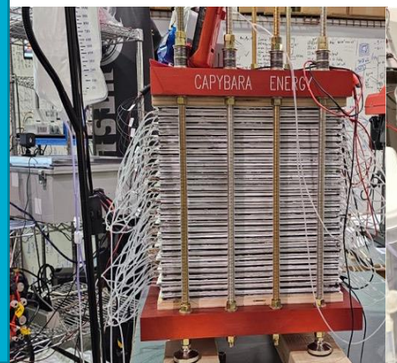
This is how we move from research to real-world deployment

DEMONSTRATION PROJECTS

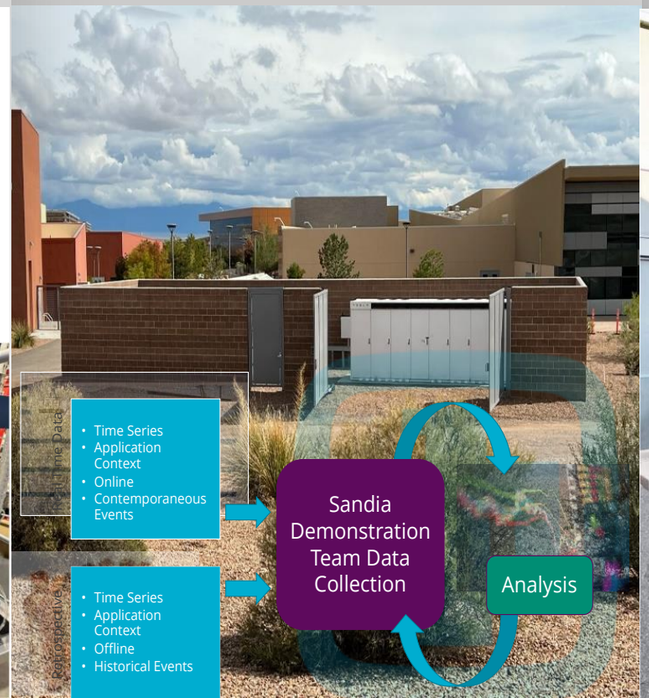
SNL ES Field Validation Projects

1
Act as a Bridge To Commercialization





2
Validate Technical Models



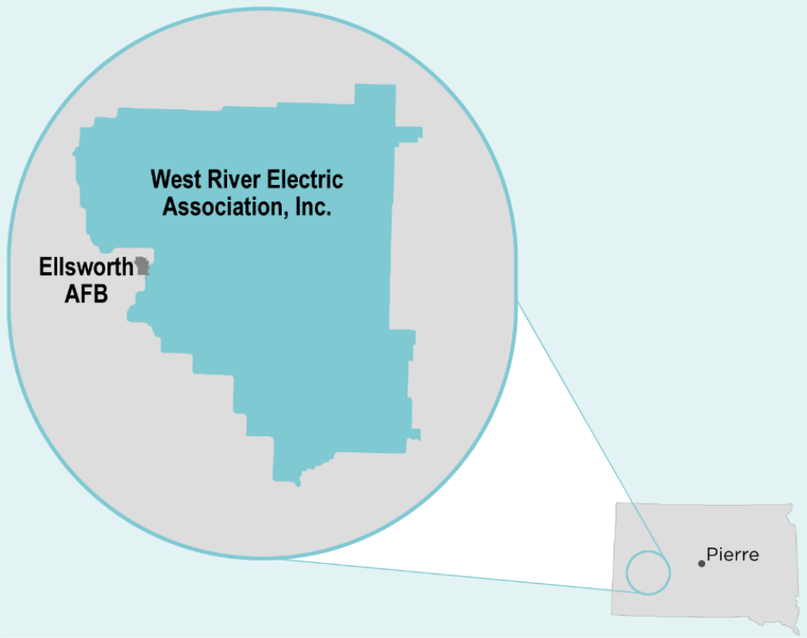
3
Inform Codes, Standards, & Regulations

4
Increase Stakeholder Confidence

OUC
The Reliable One®

CAPACITECH

West River Electric Association (WREA) at Ellsworth Air Force Base (SD)



Project Partners:

- DOE Office of Electricity
- Sandia National Laboratories
- Pacific Northwest National Laboratory
- West River Electric Association (WREA)
- Ellsworth AFB
- NRECA Rural Energy Storage Deployment Program (RESDP)
- Go Electric

https://www.cooperative.com/programs-services/bts/Rural-Energy-Storage-Deployment-Program/Documents/RESDP-Case-Study-WREA-August-2024.pdf

Site Location #1:

- On base critical infrastructure (building)
- Multiple challenges
  - Buried utilities
  - Terrain
  - United Facilities Criteria (UFC 3-600-01)

Site Location #2:

- Off base critical infrastructure utilized by Ellsworth and FAA
- Multiple challenges
  - Understanding and implementation of NFPA 855 (explosion mitigation)
  - ES system QA/QC

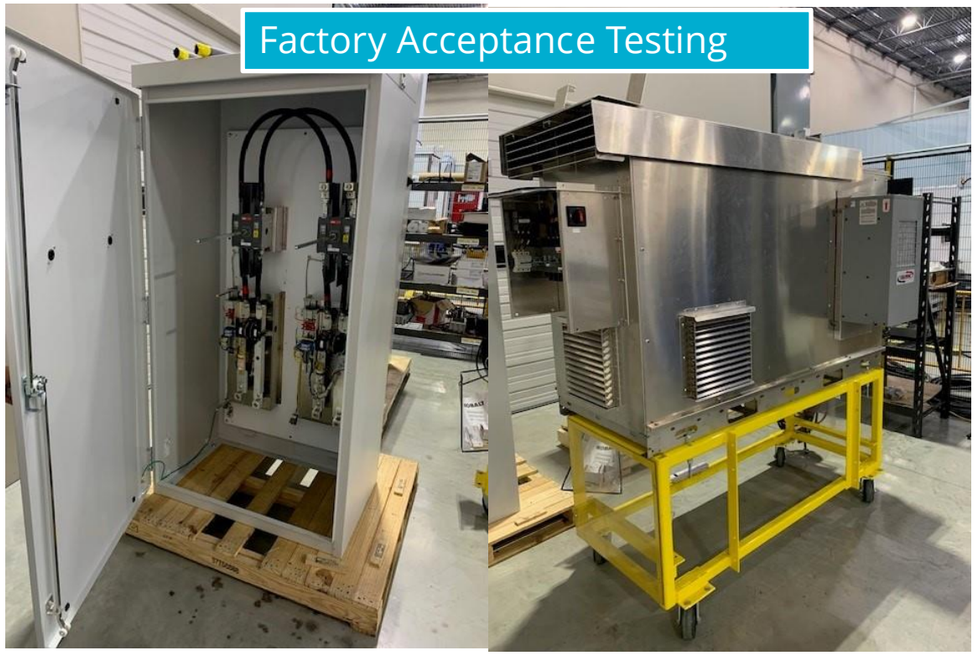
West River Electric Association (WREA) at Ellsworth Air Force Base (SD)

Site construction

Application:
Critical infrastructure resilience & peak shaving
Resources:
BESS and existing diesel generator
System size:
75kW/277kWh

Commissioning

Factory Acceptance Testing



Commissioning

Energy Storage Project Challenges

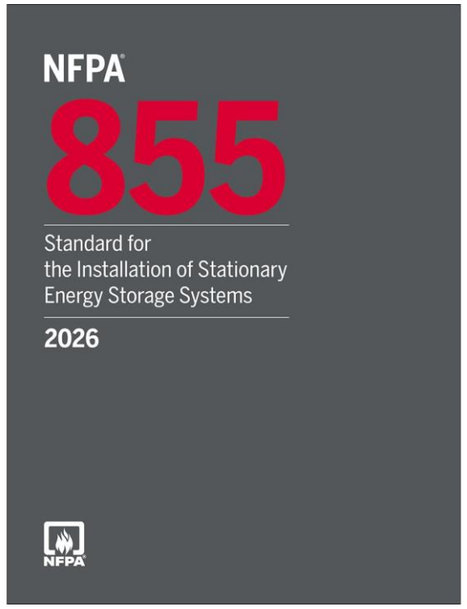
All ES Projects

- Availability of ES in the C&I Space (BABA compliant)
- CSR's Compliance
- Equipment Lead Times
- Integration

Military ES Projects

- Large number of stakeholders
- Bureaucracy
- UFC (additional requirements)
- Lowest bid
- Comms
- Aging Infrastructure

Codes, Standards, & Regulations – NFPA 855



Multiple requirements that can cause project delays from lack of understanding:

- UL 9540 Listing
- UL 9540A data
- Size and setback requirements
- Explosion mitigation
- Deliverables:
  - Hazard Mitigation Analysis (HMA)
  - Commissioning Plan
  - Decommissioning Plan

NFPA 800 Battery Safety Code (PS)

Proposed Scope: Requirements for the identification, prevention, mitigation, and control of fire, explosion, and related hazards for the life safety and property protection associated with electrochemical cells and batteries

- Developed as a Provisional Standard (PS) but will be a *Code* and enforceable as such
- 500+ public comments addressed during NFPA 800 Technical Committee meeting February 2026

Case Studies

Microgrid Solutions: Eliminate risk while maximizing your resiliency, efficiency, and sustainability

Yokota Air Base, Japan
Combined Heat & Power Microgrid

Customer Challenge

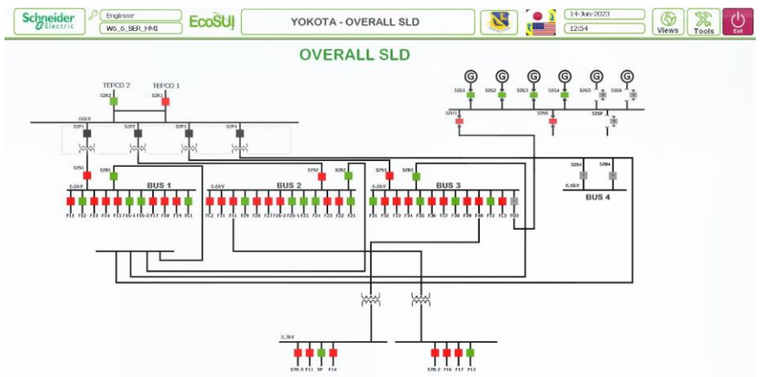
- Aging grid infrastructure and severe storm events caused frequent power outages in the electrical grid. These threats created a risk in maintaining mission readiness and base resiliency, limiting the base's ability to optimize energy usage, resulting in increased operational cost and reduced efficiency.

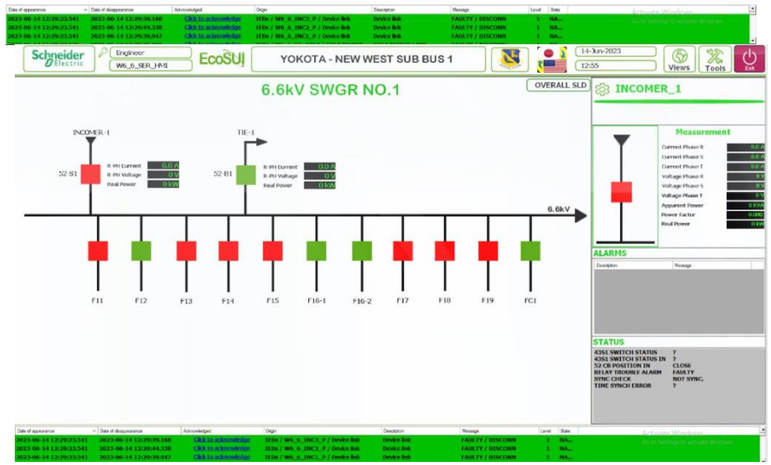
The Solution

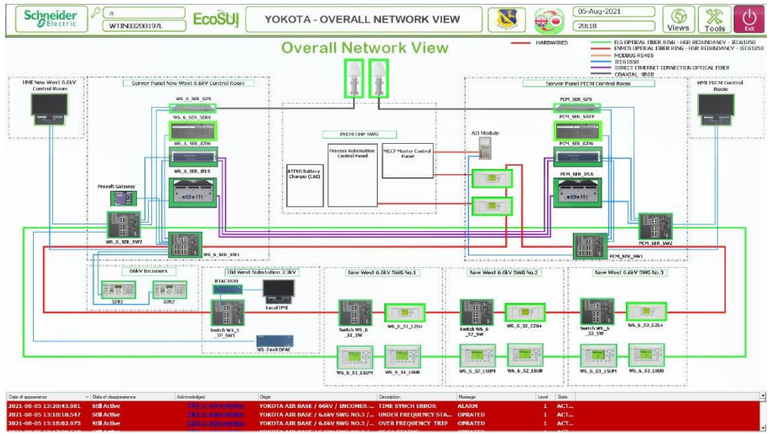
- Construct a 10MW prime power generating system using Natural Gas Reciprocating Engine Generators and a Heat Recovery Steam Generator
- Microgrid controls to ensure 24/7 continuous operations during emergencies and grid interruptions.
- Energy Efficiency Upgrades to improve infrastructure, lighting, HVAC and plumbing systems in more than 450 buildings.
- Operation, Maintenance, Repair, Replacement and Training

Customer Benefits

- Enhanced Energy Security, Resiliency and Readiness
- Reduction in Energy Costs by improving efficiency
- Environmental Stewardship







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MCAS Miramar

Innovative Resiliency Solution

Customer Challenge

- Ensure resilient power at the base to support over 100 mission critical buildings and the flight line

The Solution

- Construct a system to power mission-critical and support facilities throughout Marine Corps Air Station Miramar in the event of an outage.
- Manage electricity use at the base during peak times when the system is connected to a utility grid thru use of diverse energy sources including 3.2MW landfill gas, 1.6 MW solar photovoltaic, 6.45MW Natural Gas and Diesel Power Gen, and 1.5MW/2.5MWh Battery energy storage systems

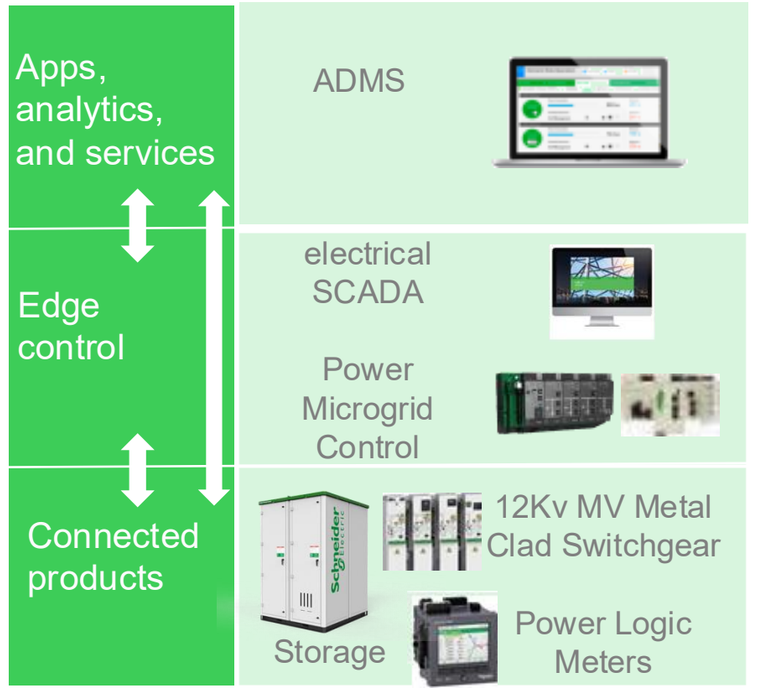
Customer Benefits

- Provide support services to the central grid
- Manage overall energy load
- Enhance renewable energy deployment
- Bolster cybersecurity practices base-wide
- Help the installation reduce its utility demand charges
- Facilitate demand response programs

""Partnering with Schneider Electric will help us deliver a sustainable energy solution to enhance energy security for MCAS Miramar mission."

Bill Van Dyke, President of Special Projects for Black & Veatch

New system to **power mission-critical facilities** in the event of outage



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Port of Long Beach

Zero Emissions Future

Customer Challenge

- Port-wide electrical load is expected to quadruple.
- Increased reliance on electricity adds risk to marine terminal operations in that a single point of failure—the utility grid—could result in millions of dollars per day of damage to the economy in lost work hours and perished cargoes.

The Solution

- Design, engineer and build a new microgrid enabling critical energy resilience
- Robust microgrid to add zero emission DERs with grid services capabilities to the JCCC.
- Microgrid's DERs include new solar photovoltaic (PV), stationary battery storage, mobile battery storage, and peak shaving and demand response.
- Use of mobile battery storage will allow for the JCCC to extend the "range" of the renewable microgrid to a variety of distributed assets that would otherwise be cost-prohibitive to hardwire into a microgrid.

Customer Benefits

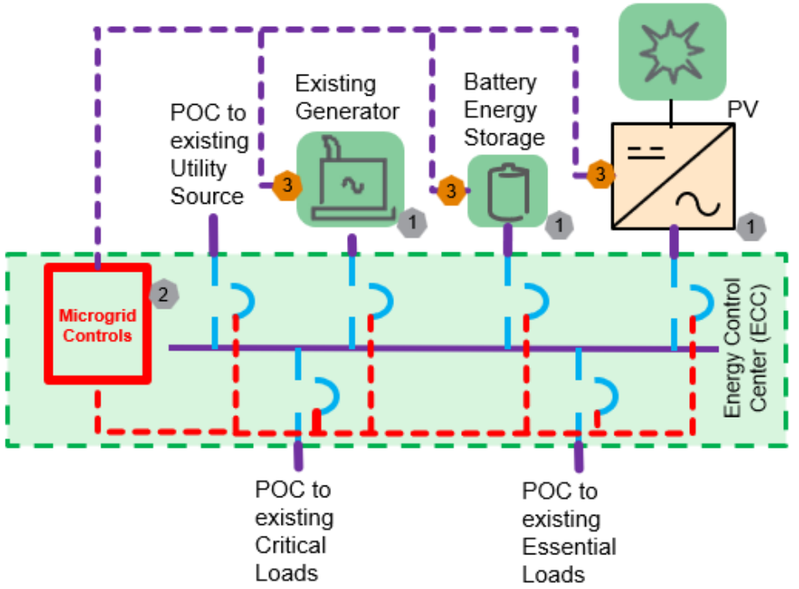
- Greater reliability and business continuity
- Increase safety
- Environmental benefits
- Energy security
- 100% resilient energy for critical infrastructure

"Ensuring a stable supply of energy is crucial to the zero-emissions future the Harbor Commission envisions for the Port of Long Beach. We welcome this microgrid technology demonstration in Long Beach."

— Tracy Egoscue, Long Beach Board of Harbor Commissioners President

www.schneider-electric.us/microgrid

Microgrid at Critical Response Command and Control Center



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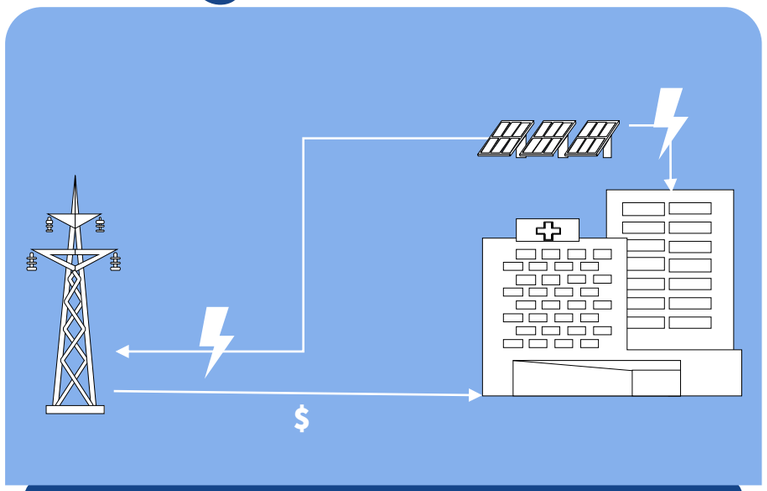
Range of Financing Strategies



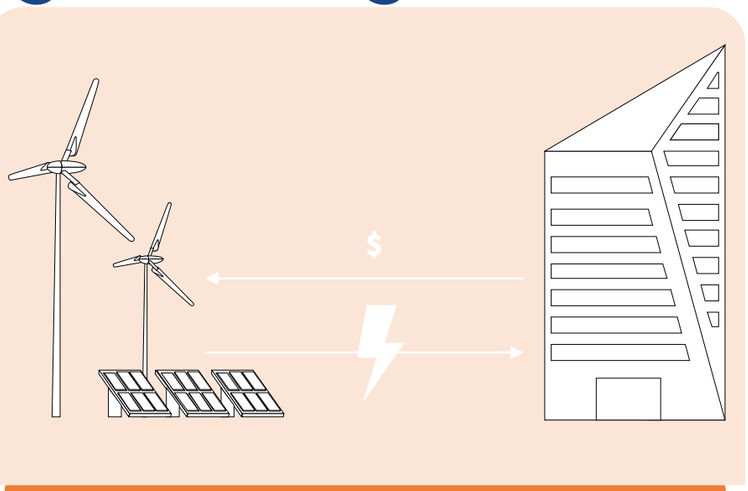
Government Own, Operate and Maintain

Example Models:

- Appropriated Funds
- Military Construction (MILCON)
- Energy Resilience and Conservation Investment Program (ERCIP)

Revenue & Resourcing:

- Cost savings over current or future market utility rates



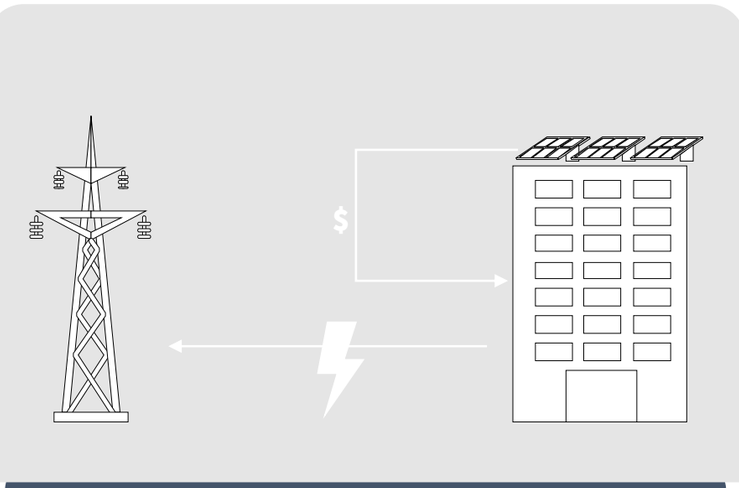
Third Party Financing

Example Models:

- Power Purchase Agreement (PPA)
- Energy Savings Performance and Utility Energy Service Contract (ESPC/UESC)
- Energy as a Service (EaaS)

Revenue & Resourcing:

- Cost savings over current or future market utility rates



Monetize Real Property

Example Models:

- Enhance use lease

Revenue & Resourcing:

- Lease payment
- In-kind consideration

Additional benefits and considerations:

- Resilience benefits when paired with energy storage or on-site generation
- Deferred upgrades in transmission and utility distribution through peak-shaving

Challenges during Design and Commissioning

Black Start Exercises

Cybersecurity

Outage Planning – testing transitions & degraded modes

OCONUS Specific Challenges – Interconnect Agreement, perimeter of control,

Energy Systems Integration –

a) **Networking & Protocols**

b) **Single Pane of Glass**

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References/Resource Links

- Microgrid Handbook for Army Resilience
  https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-38494.pdf
- Microgrid Conceptual Design Guidebook
  https://www.sandia.gov/app/uploads/sites/273/2022/05/ETI_SNL_Microgrid_Guidebook_2022_SAND2022-4842-R_FINAL.pdf
- Microgrid Design Toolkit
  https://energy.sandia.gov/programs/electric-grid/advanced-microgrids/microgrid-design-toolkit/
- Distributed Energy Resources Customer Adoption Model (DER-CAM)
  https://gridintegration.lbl.gov/der-cam
- Other research tools
  https://www.energy.gov/oe/planning-and-design-tools

Questions?

This material is based upon work supported by the U.S. Department of Energy, Office of Electricity (OE), Energy Storage Division.