

MICROGRIDS FOR THE MILITARY



Wake Island Case Study

Dave McNeil

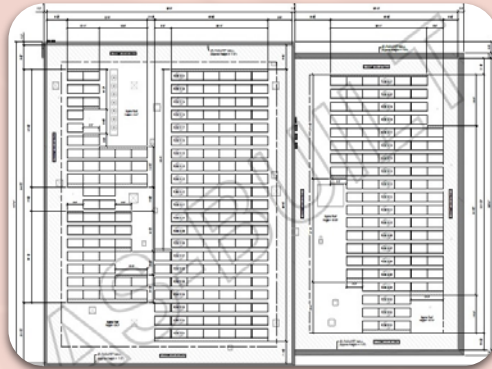
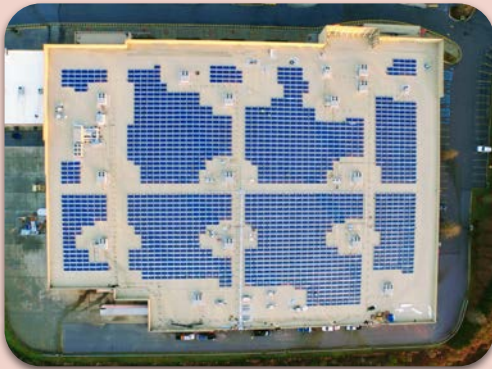
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COMPANY OVERVIEW

- ✓ A Service Disabled Veteran-Owned Small Business (SDVOSB)
- ✓ Licensed General, Electrical and Roofing Contractor
- ✓ Design, engineering, construction, and maintenance of:
 - Solar PV systems
 - Battery backup energy systems
 - Microgrids
- ✓ Customers include:
 - Government
 - Commercial & Industrial
 - Utility
- ✓ Work area includes:
 - All of the USA
 - Pacific Ocean
 - Caribbean



OUR SERVICES



Project Procurement

- Feasibility Studies
- Financial Analysis
- Energy Production Modeling
- Power Density Studies

Design & Engineering

- Electrical Design
- Plan Development & Array Layout
- Output Projection
- Project Estimate
- Permitting

Construction

- Equipment Specification
- Equipment Provision
- Project Management
- Self-Performed Installation
- Performance Testing
- Commissioning

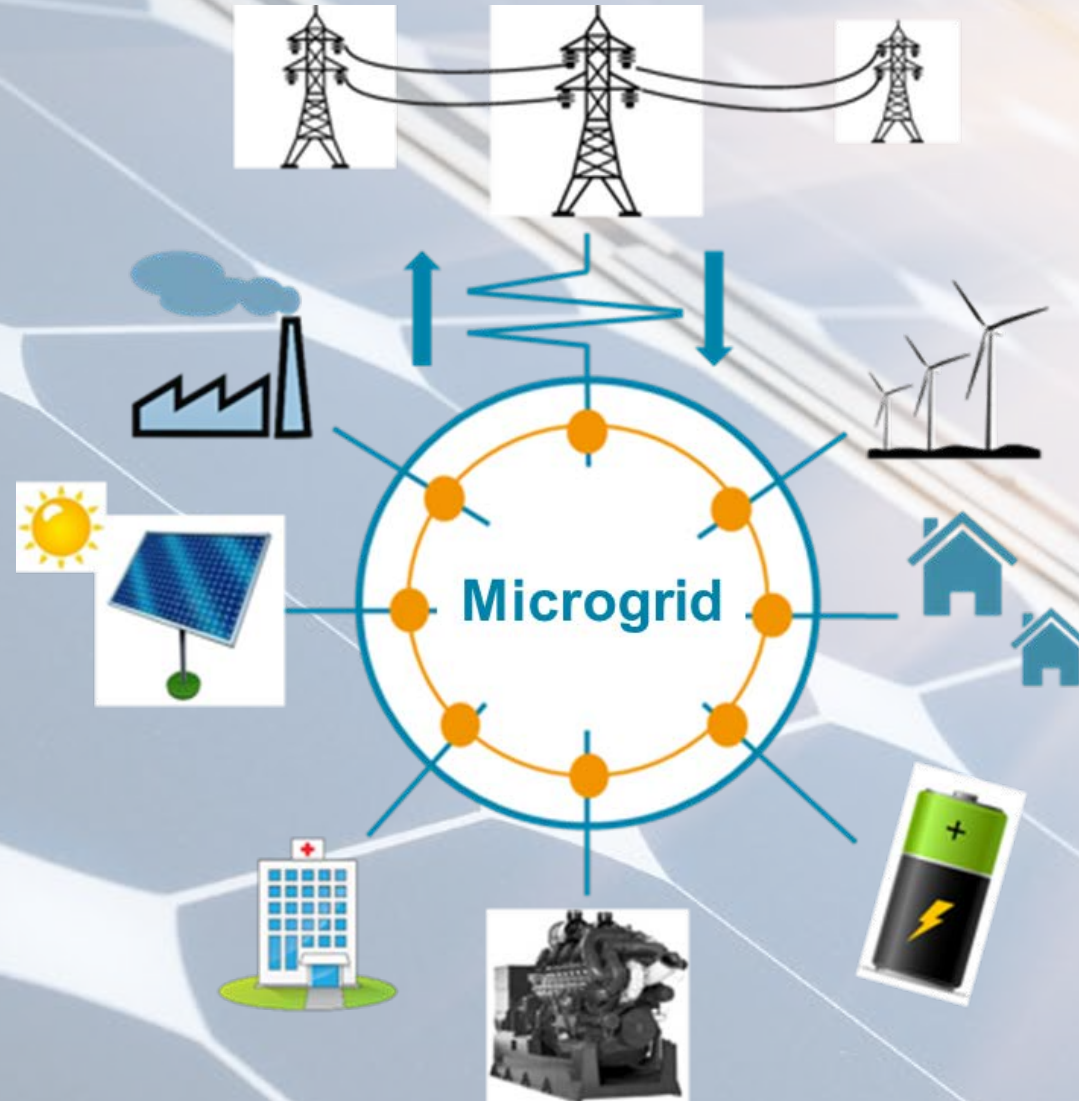
Operations & Maintenance

- Thermal Imaging
- Torque Checks
- Voltage Tests
- Electrical Inspections
- Module Cleaning
- Performance Verification
- System Monitoring
- Trouble Shooting

WHAT IS A MICROGRID?

A group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode

MICROGRID SOURCES



WHY MICROGRIDS?

1. Creates resiliency from the loss of utility power
2. Energy cost offset
3. Supports NDAA directives
4. Reduces use of foreign oil & fossil fuels
5. Demand offset
6. Photovoltaic (PV) firming

1. CREATES RESILIENCY

- **Resilience**- the ability to avoid, prepare for, minimize, adapt to, and recover from anticipated and unanticipated energy disruptions in order to ensure energy availability and reliability sufficient to provide for mission assurance and readiness.
 - ✓ Resilience is THE planning factor
 - ✓ Efficiency and savings count for nothing if the solution doesn't power the mission.
- Lessons Learned after Hurricane Maria devastated Puerto Rico and destroyed the utility system.
 - ✓ Several FAA sites across Puerto Rico were operating without utility power for over a year after Hurricane Maria hit.



2. Energy Cost Offset

- Cost of electricity to power small remote islands cost hundreds of thousands \$\$ annually.
- The power inputs for Wake Island's microgrid is automated to minimize costs by prioritizing each different energy generation source.



3. SUPPORT NDAA DIRECTIVES

- In the 2012 NDAA Congress directed the U.S. Military to achieve a goal of providing 25% of all military base power by renewable energy by 2025
- The U.S. Navy & Marine Corps have set a higher goal of 50% renewable energy used by their bases by 2020



4. REDUCE USE OF FOREIGN OIL & FOSSIL FUEL



- Minimize reliance on barges loaded with fuel to power generators
- Wake Island's microgrid generation is expected to supplement 35%-50% of all the power normally produced by diesel generators.
- This will reduce the amount of fuel shipments necessary to keep the Wake Island's power needs

5. DEMAND CHARGES OFFSET



- Some utility customers are subject to demand charges when a customer exceeds a utility specified instantaneous usage.
- Microgrids can redirect inputs or reduce loads to eliminate power instantaneous power usage.
- This can significantly reduce the demand charges and save the customer power costs due to demand charges.

6. Provide Photovoltaic (PV) Firming

- Photovoltaic power sources are impacted by the strength of the sun's intensity
- An increase in cloud cover can drop the power level provided by a solar PV array in a matter of seconds
- Microgrids can control the power inputs providing battery or other inputs to maintain the overall power input to a load



WAKE ISLAND

"Where America's Day REALLY Begins"



ABOUT WAKE ISLAND



- 6,754 miles from the Hannah Solar Government Services home office in Charleston, SC.
- Historic WWII landmark
- Noted as one of the most isolated islands in the world.
- Land area= 2.7 sqmi
- Wake Island hosts a U.S. Air Force Airfield and ballistic missile defense assets.

WAKE ISLAND MICROGRID

- Microgrid includes...
 - ✓ 740 kW Ground Mounted Solar PV System
 - SMA Inverters
 - Merlin Modules
 - APA Racking
 - ✓ 900 kW/ 571 kWh lithium-ion battery energy storage system by SMA
 - ✓ Microgrid controller by SMA
 - ✓ 4 Existing 750 Kw Diesel Generators



MICROGRID

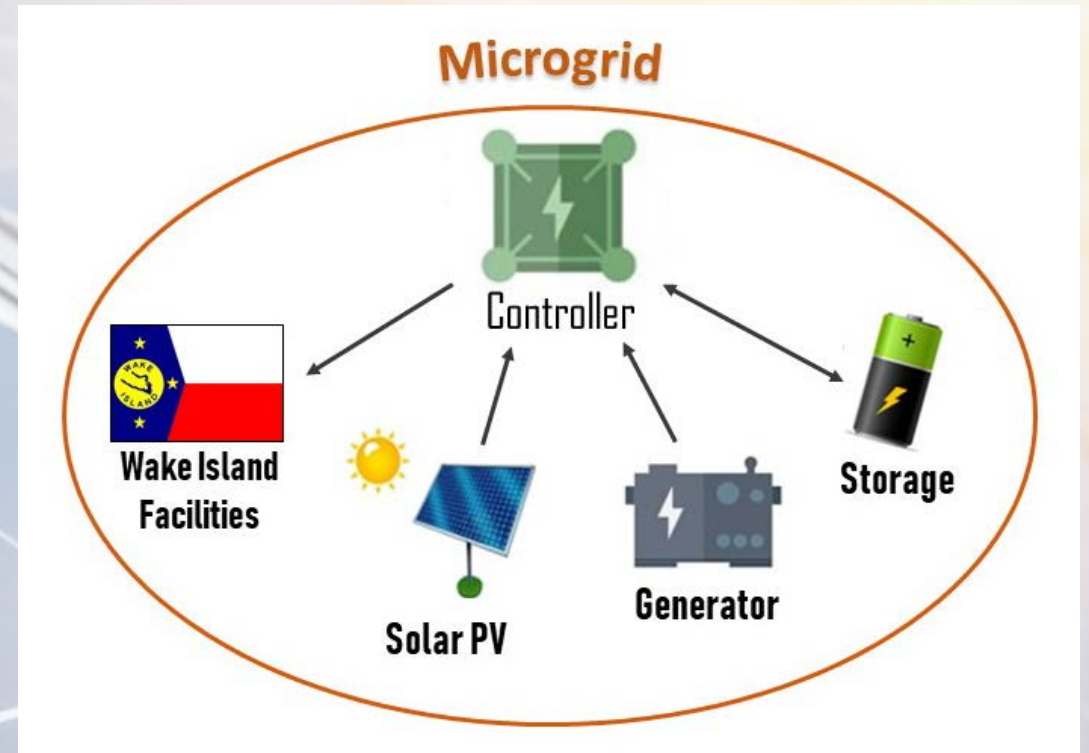
WAKE ISLAND MICROGRID



- The 740 kW solar PV system is not large enough to fully charge the 900 kW battery storage system.
- The diesel generation system assists in fully charging the battery storage system.
- The government designed on a larger battery energy storage system to accommodate a future solar PV system addition in order to provide adequate battery charging without using the diesel generation system.

WAKE ISLAND MICROGRID

- A Microgrid Controller will control **ALL** inputs by deciding which input is most efficient and reliable at any given point in time.
- Energy will be pulled from the selected input in order to power the day to day operations on Wake Island.



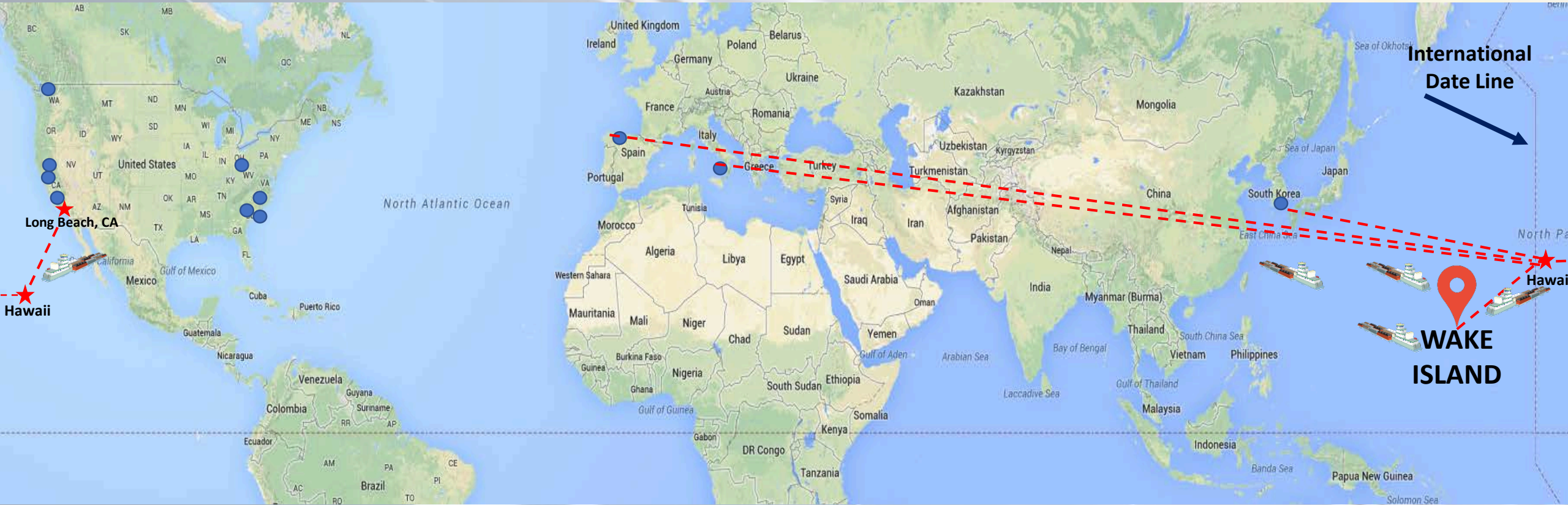
COMPLEX LOGISTICS OF CONSTRUCTION

- Barges loaded with containers filled with tools, heavy machinery, supplies, materials, and living essentials.
- **32** containers shipped to Wake Island
- Countless months of planning every detail.
- **NO** hardware store on Wake Island.
- To ship additional/replacement materials would take months.



WAKE ISLAND

COMPLEX LOGISTICS OF CONSTRUCTION







Solar Array

Questions?

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