IACC 2023 Conference

Advancing Clean Energy and Resilience through Microgrid Project Development

October 26, 2023

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IACC Conference Presentation Agenda

1. Introductions & Clean Energy Project Background
2. Microgrid Technologies & Resilience Framework
3. Solar + Storage Feasibility Process Overview
4. Funding Resources for Project Development
7. Project Case Study Examples
8. Q&A Discussion

IACC Conference Presentation Overview

Presentation Description

As microgrid projects continue to reshape the framework for the energy grid, new technologies, funding resources and partnership models are providing key resources for new project development. This presentation provides insights into microgrid systems, technologies, standards, and case study examples to help expand access and build capacity for future project opportunities.

IACC Conference Presentation Learning Objectives

Learning Objectives

1. Understand basic microgrid technologies.
2. Identify required equipment and capabilities.
3. Evaluate microgrid project development strategies.
4. Demonstrate how financial resources and market trends can provide a cost-effective approach for microgrid project development.
5. Navigate microgrid design & implementation strategies.

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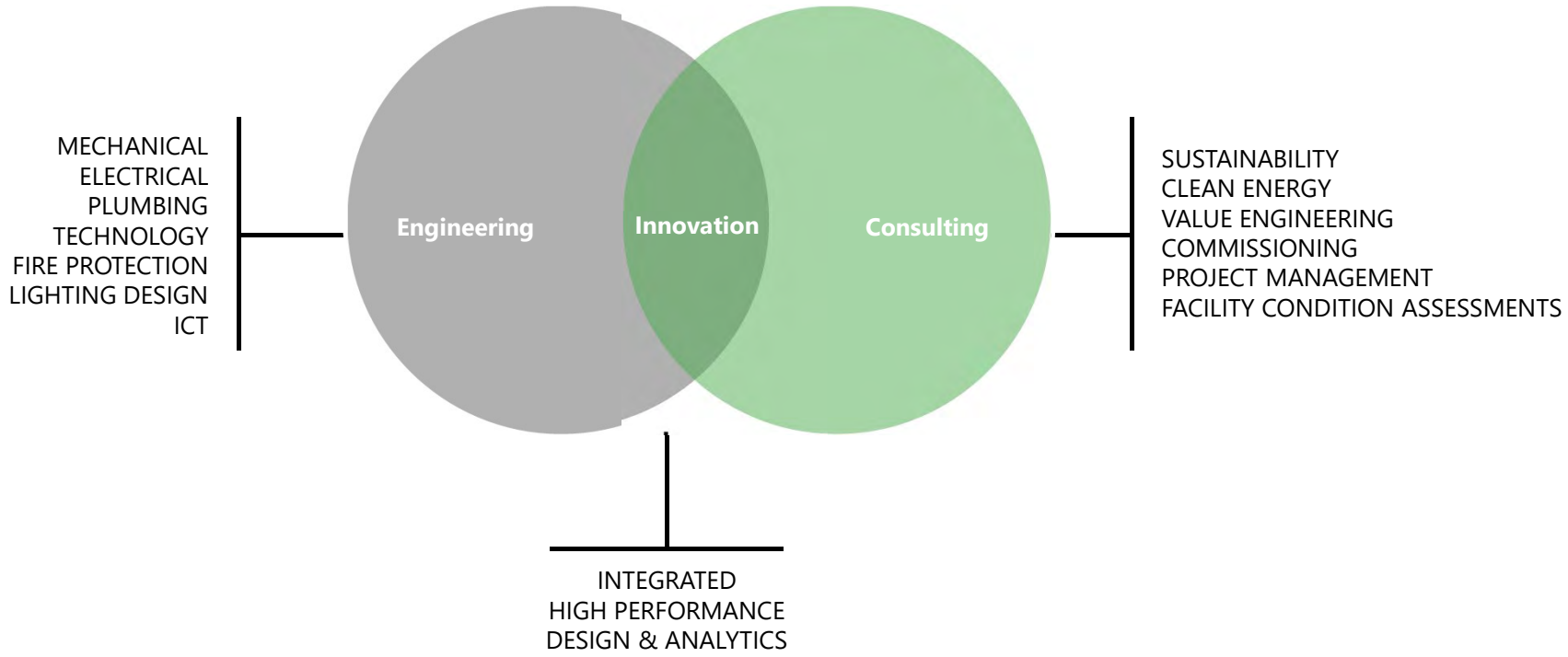
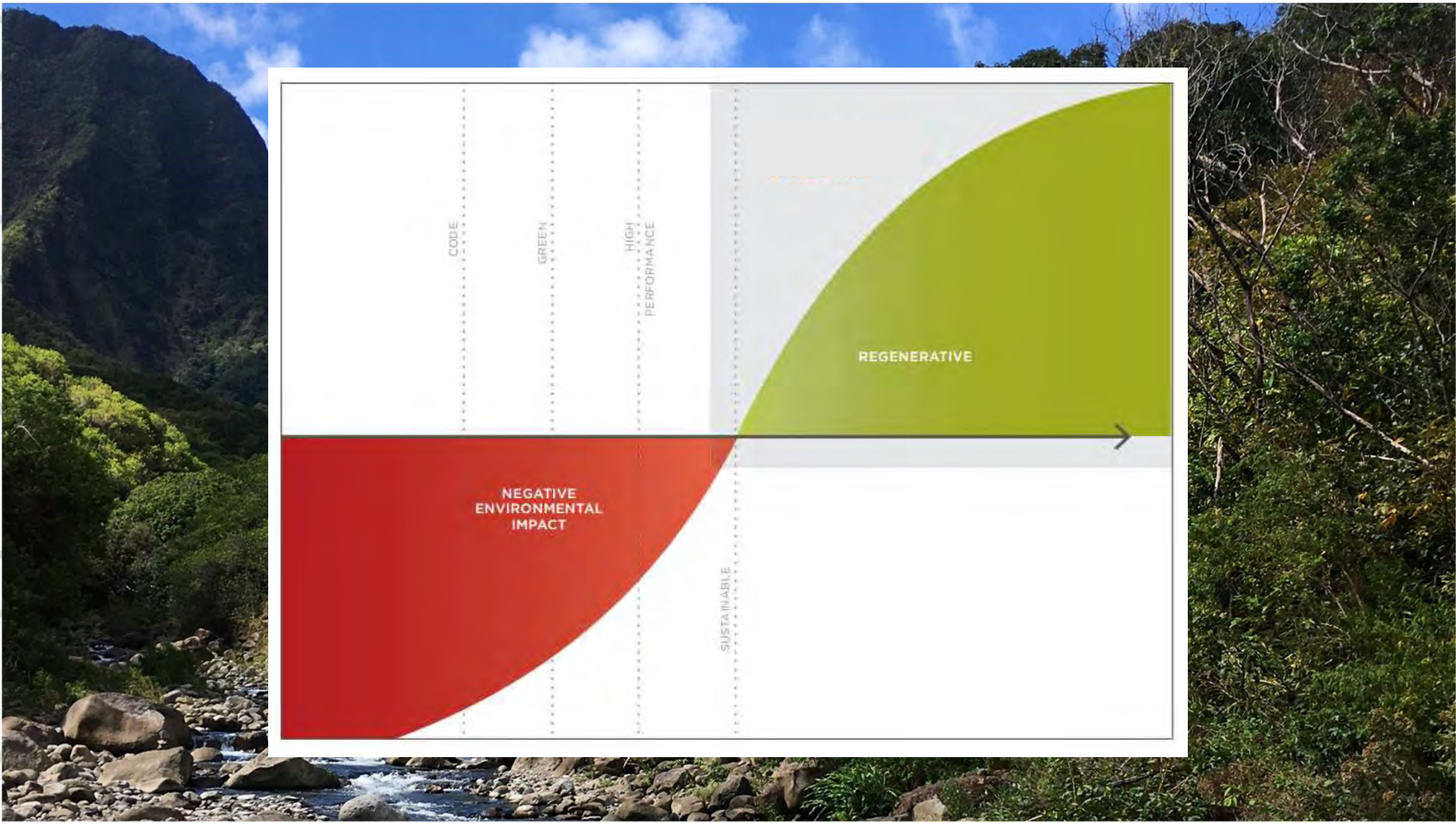
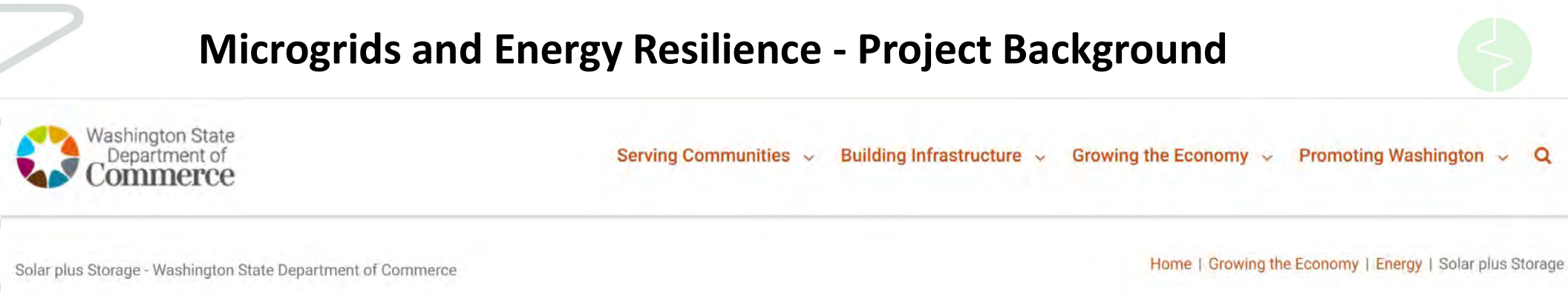


25 Years of Optimizing a Resilient Future


CODE
GREEN
HIGH PERFORMANCE
SUSTAINABLE
REGENERATIVE
NEGATIVE ENVIRONMENTAL IMPACT

Microgrids and Energy Resilience - Project Background



Microgrids and Energy Resilience - Project Background

JAY INSLEE
Governor

STATE OF WASHINGTON
OFFICE OF THE GOVERNOR
P.O. Box 40002 • Olympia, Washington 98504-0002 • (360) 902-4111 • www.governor.wa.gov

EXECUTIVE ORDER 20-01

STATE EFFICIENCY AND ENVIRONMENTAL PERFORMANCE

b. New Facility Construction. For a growing number of facilities, the life-cycle cost of constructing a zero energy or zero energy-capable building is now drawing closer to that of a conventional building, promising decades of reduced energy consumption. Therefore, subject to available funding, Directors shall ensure that all newly-constructed state-owned (including lease-purchase) buildings shall be designed to be zero energy or zero energy-capable, and include consideration of net-embodied carbon. In unique situations where a cost effective zero-energy building is not yet technically feasible, buildings shall be designed to exceed the current state building code for energy efficiency to the greatest extent possible.

Microgrid Feasibility Study – Project Partners

Washington Department of Commerce “Solar + Storage for Resilient Communities” – Technical Assistance (Track 1)

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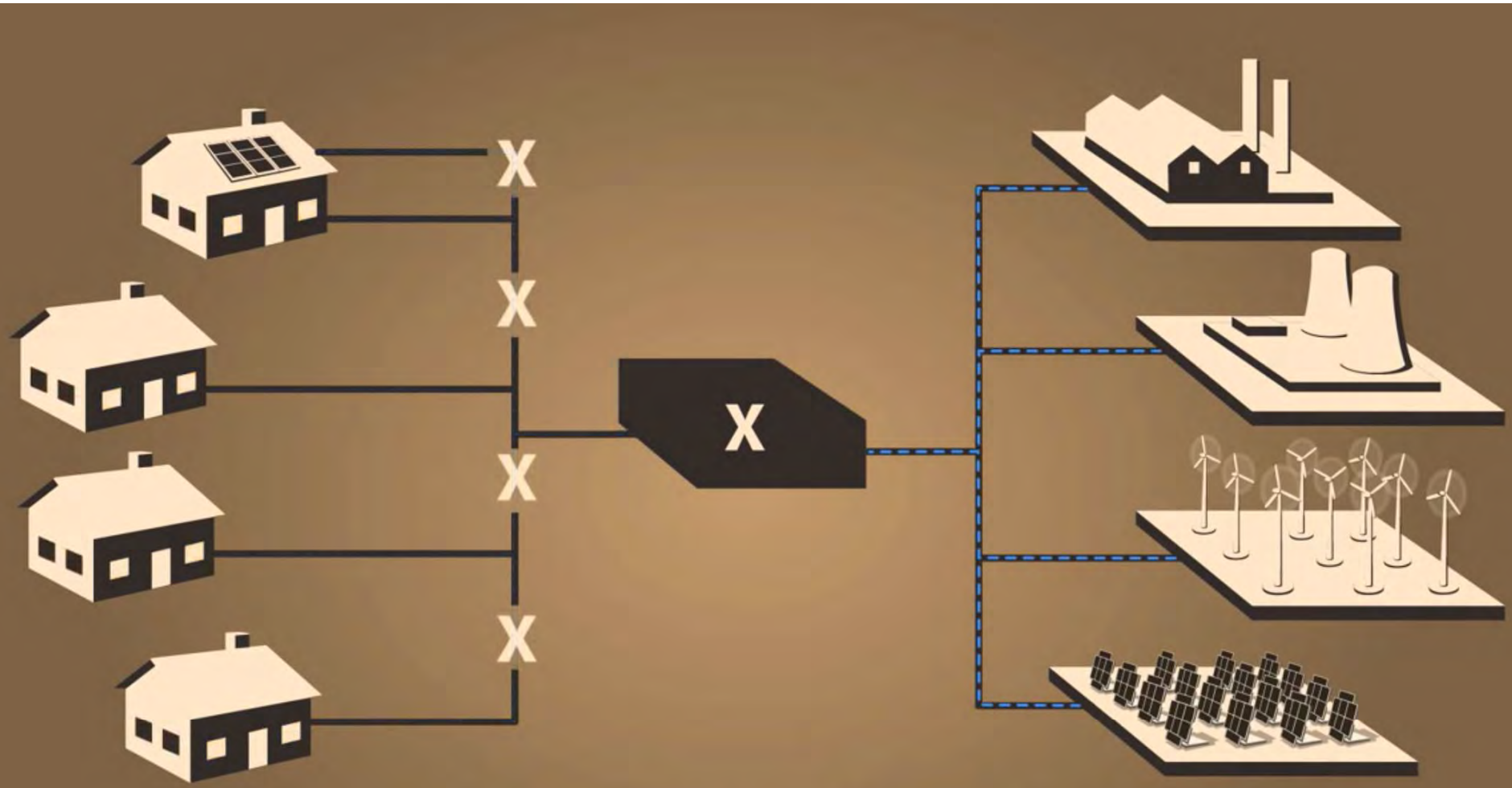
Spark Northwest

MZ Solar Consulting

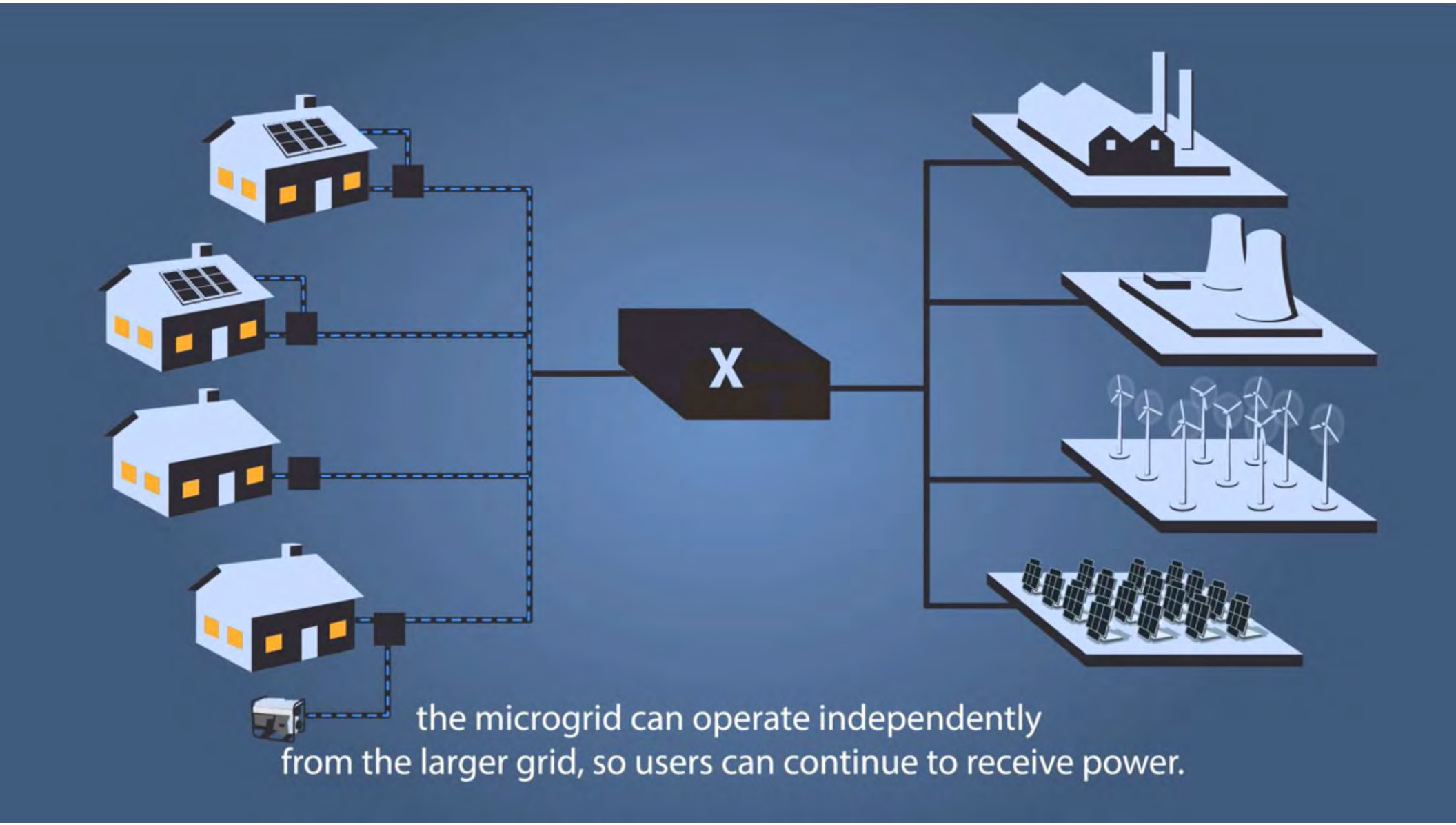
Microgrid System and Technology Overview

"A microgrid is a group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the grid. It can connect and disconnect from the grid to operate in grid-connected or island mode. Microgrids can improve customer reliability and resilience to grid disturbances."

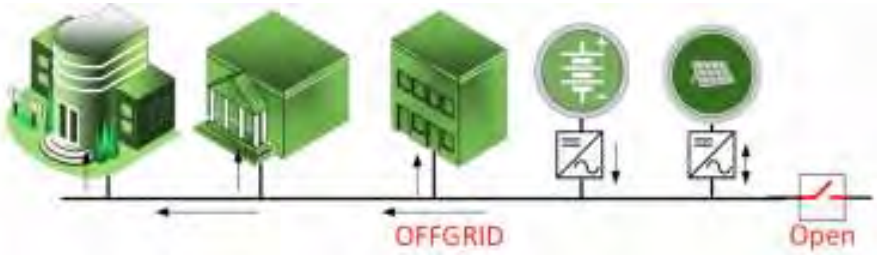
- National Renewable Energy Laboratory (NREL)

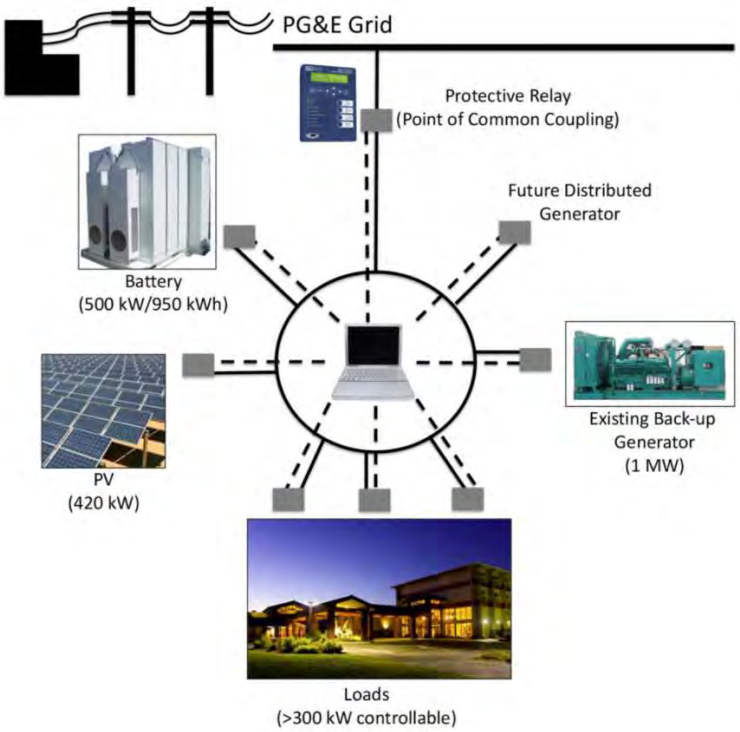


In a conventional power grid, a blackout at the utility company's substation would cause all users to lose power.

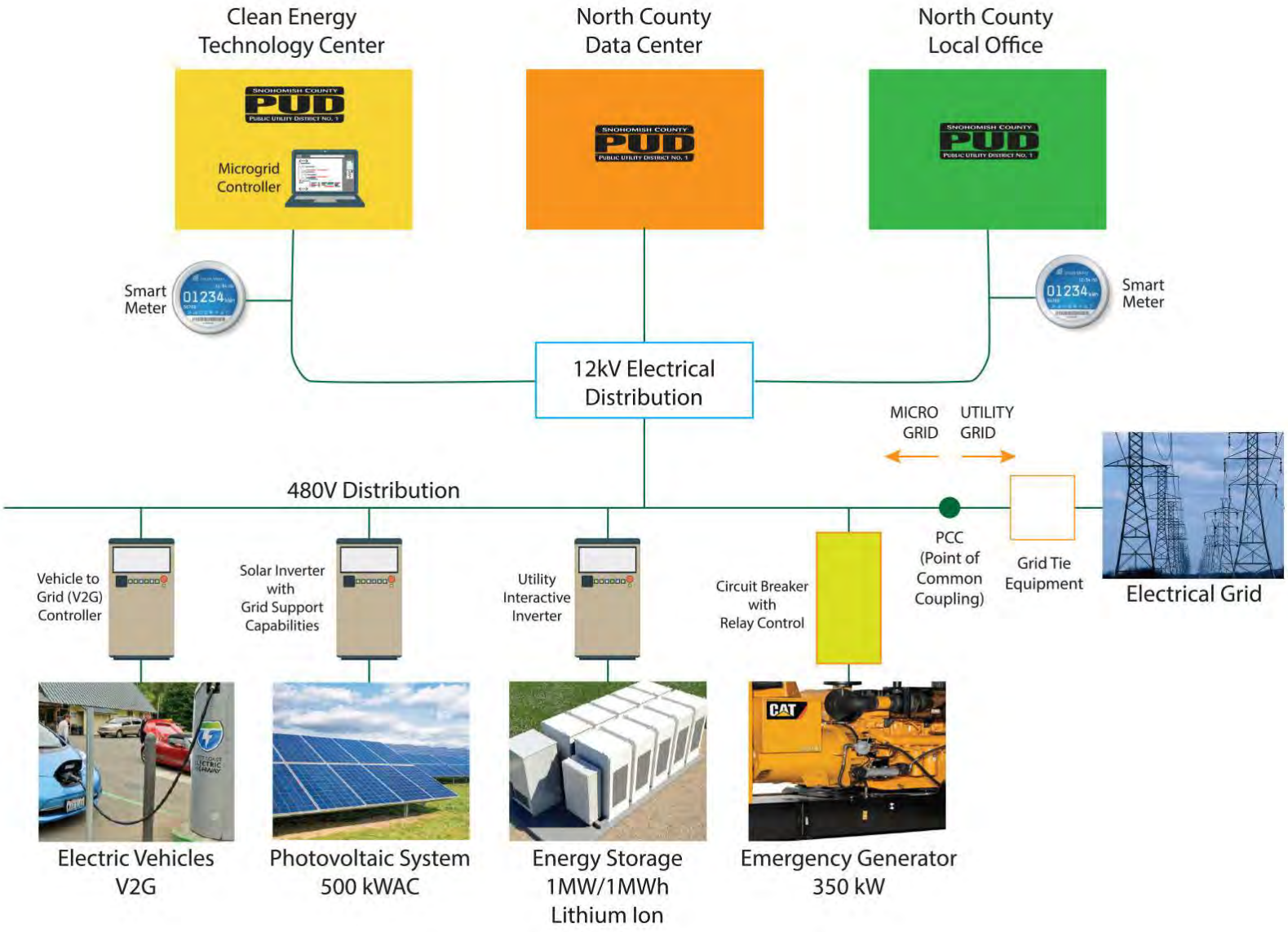

X
the microgrid can operate independently
from the larger grid, so users can continue to receive power.

Microgrid System and Technology Overview

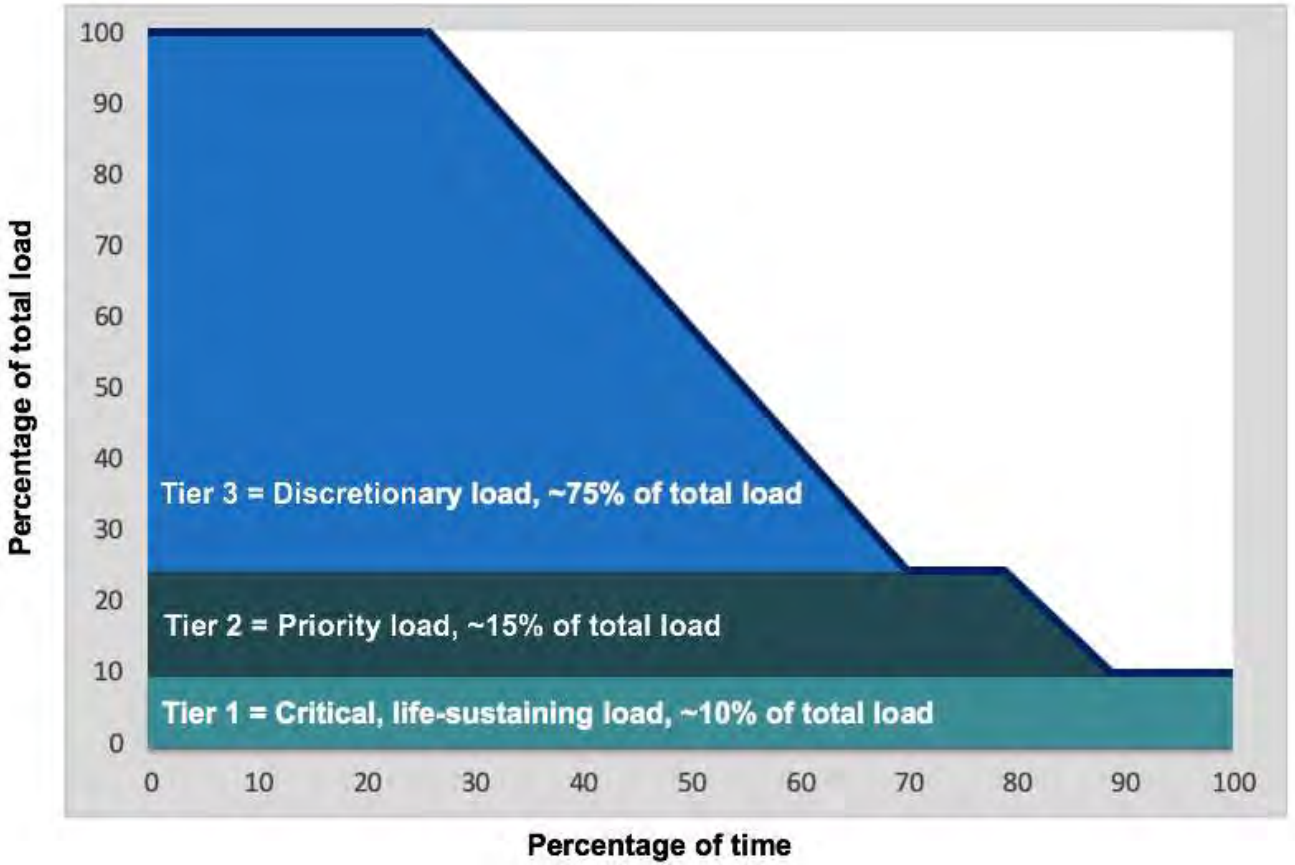




Blue Lake Rancheria Microgrid Example


Clean Energy Technology Center
North County Data Center
North County Local Office
SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT NO. 1
Microgrid Controller
Smart Meter
01234
12kV Electrical Distribution
MICRO GRID
UTILITY GRID
480V Distribution
PCC (Point of Common Coupling)
Grid Tie Equipment
Electrical Grid
Vehicle to Grid (V2G) Controller
Solar Inverter with Grid Support Capabilities
Utility Interactive Inverter
Circuit Breaker with Relay Control
CAT
Electric Vehicles V2G
Photovoltaic System 500 kWAC
Energy Storage 1MW/1MWh Lithium Ion
Emergency Generator 350 kW

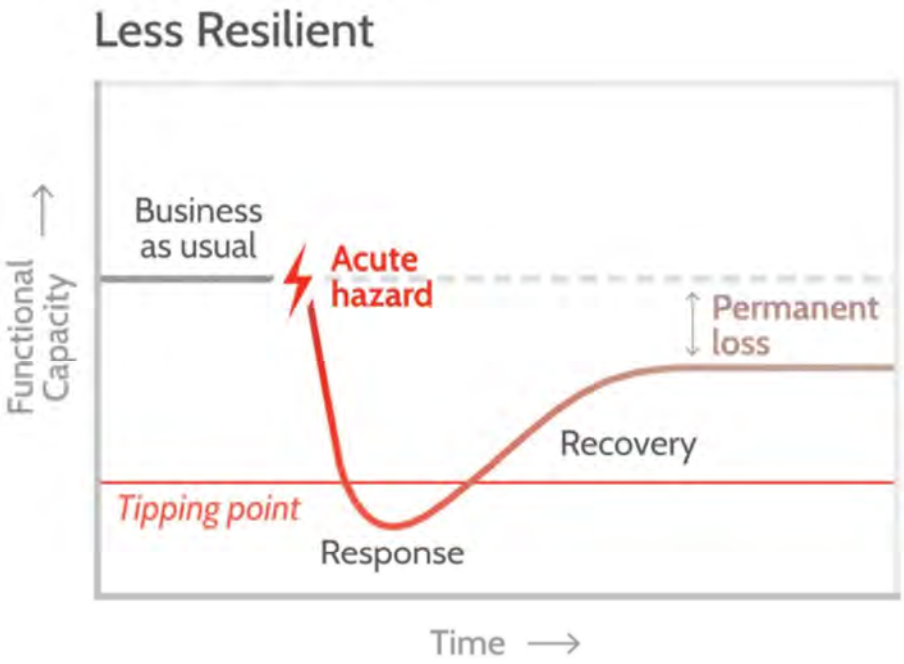
Microgrid System and Technology Overview



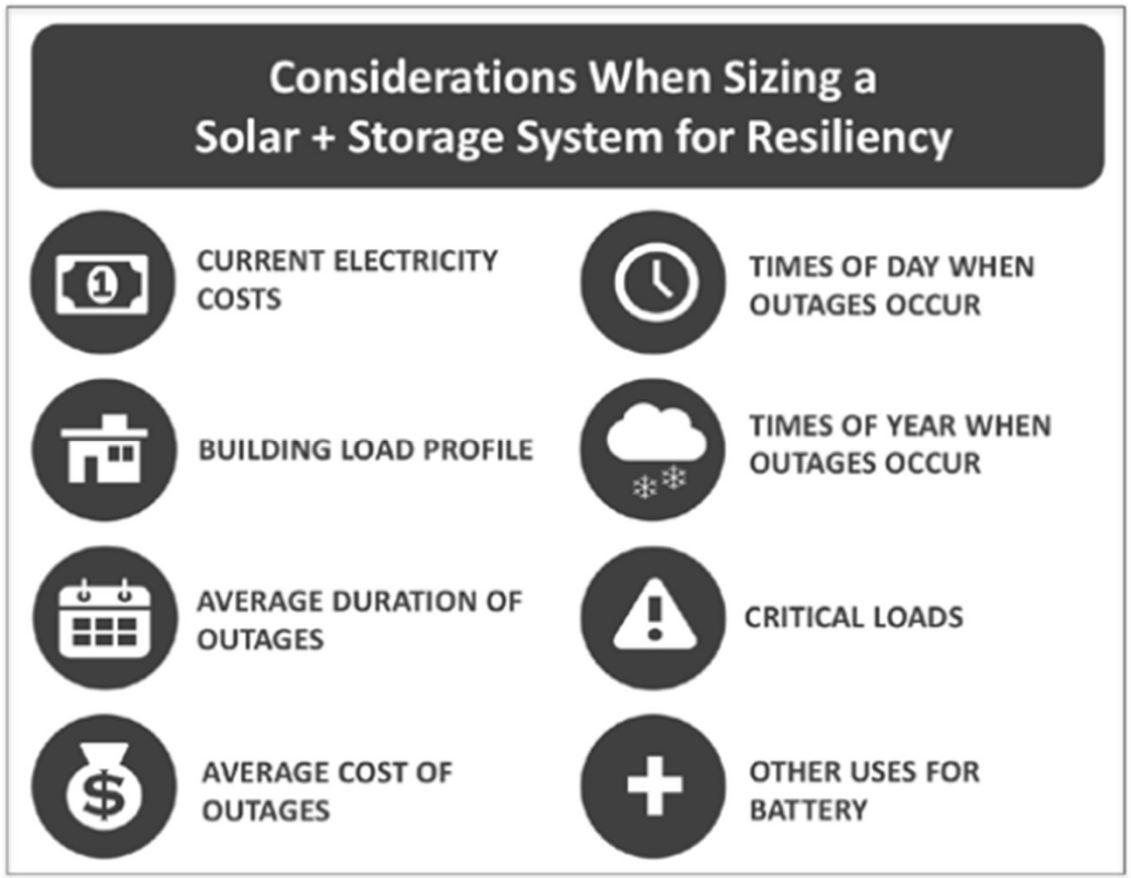
Critical Load Tiering Approach from Clean Coalition

What is Resilience?

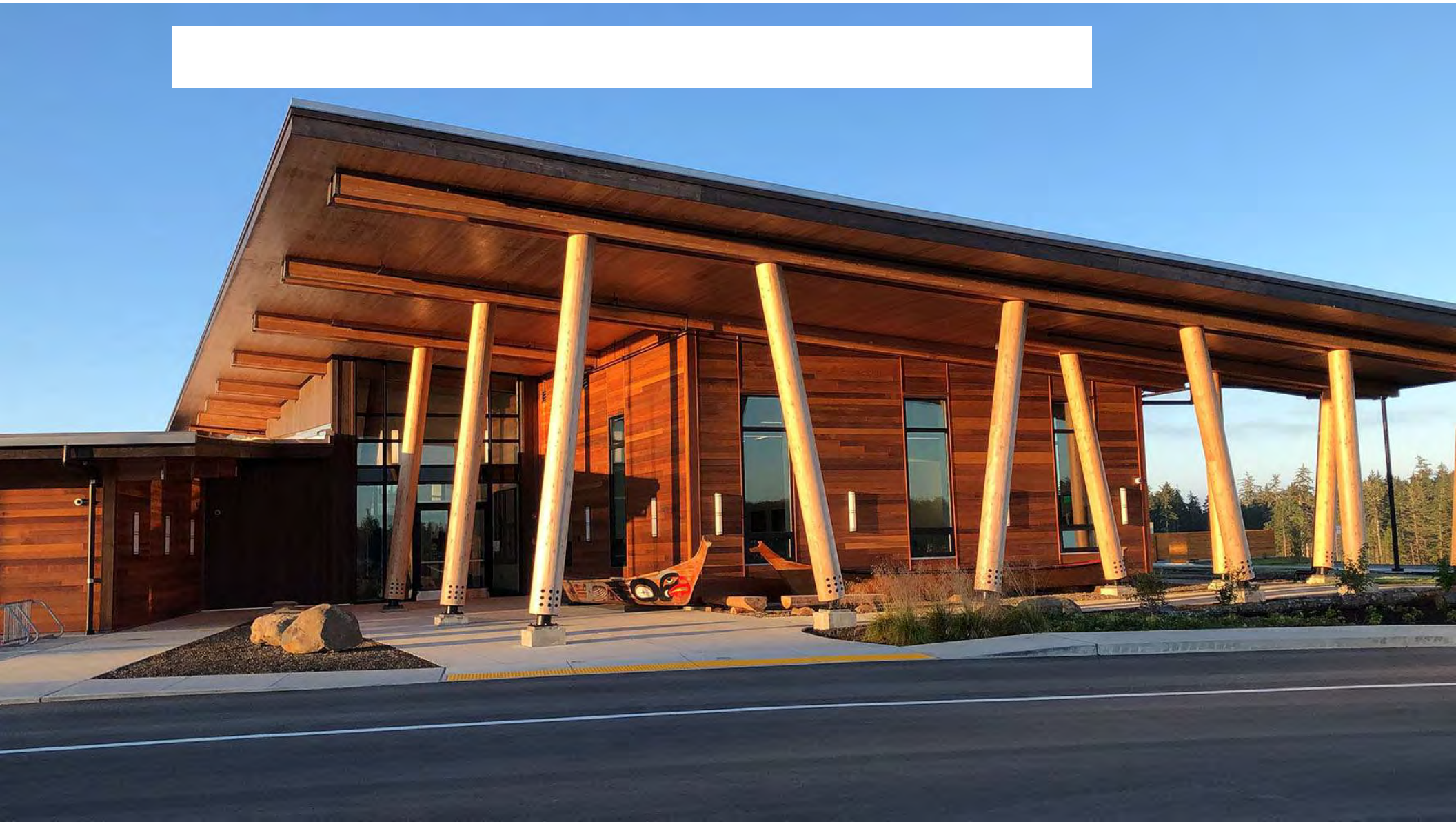
Resilience is the capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.



Microgrid System and Technology Overview




ENERGY DEMOCRACY
Reparation | Regeneration | Reinvestment



Microgrid System and Technology Overview

ELM Microgrid – Battery Energy Storage System Example

Microgrid System and Technology Overview

San Diego goes big on microgrids

The city of San Diego is about to install the first of eight microgrid projects in various areas that will use solar power and operate independently of the electric grid. Operated by Gridscape, the first project will be located at the Southcrest Recreation Center. (Rob Nikolewski/The San Diego Union-Tribune)

By the time the project's eight microgrids are operational, the city expects to save taxpayers $6 million over 25 years

City of Cordova and U.S. Department of Energy Push Envelope of Microgrid Design

Researchers Use Real-Time Digital Twin To Deploy Advanced Microgrid

Aug. 10, 2023 | By Connor O'Neil | Contact media relations

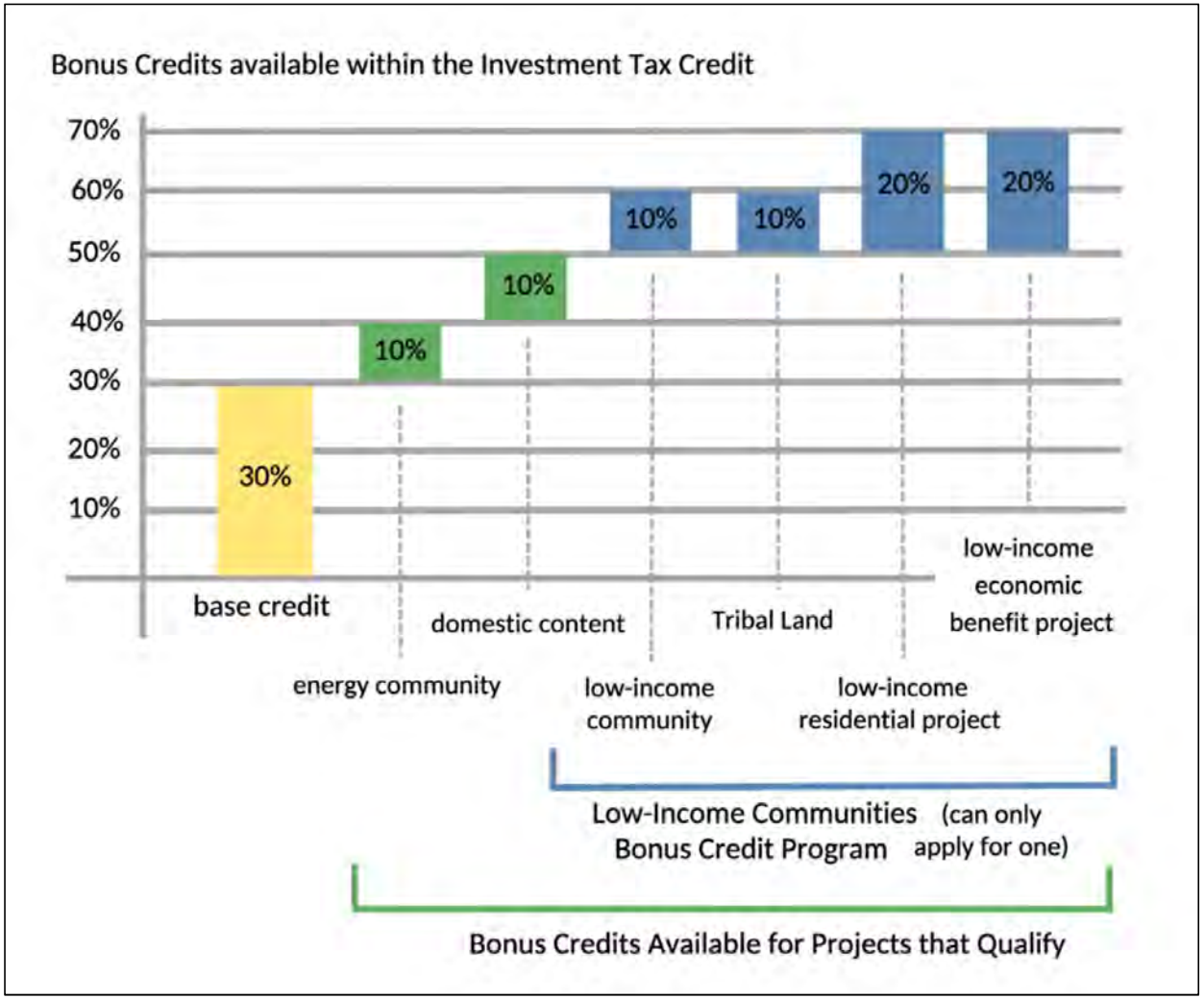
Share

An aerial view of Cordova, Alaska. *Photo by USDA Forest Service Alaska Region*

grid innovation for both research and deployment.

The Advanced Research on Integrated Energy Systems (ARIES) capability at NREL is fully equipped to emulate energy systems of any design. ARIES enabled NREL to replicate and receive real-time data from the electrical system of Cordova, Alaska, to develop resilience and advanced grid visibility applications. *Photo by NREL*

Microgrid Feasibility Study – Funding Resources



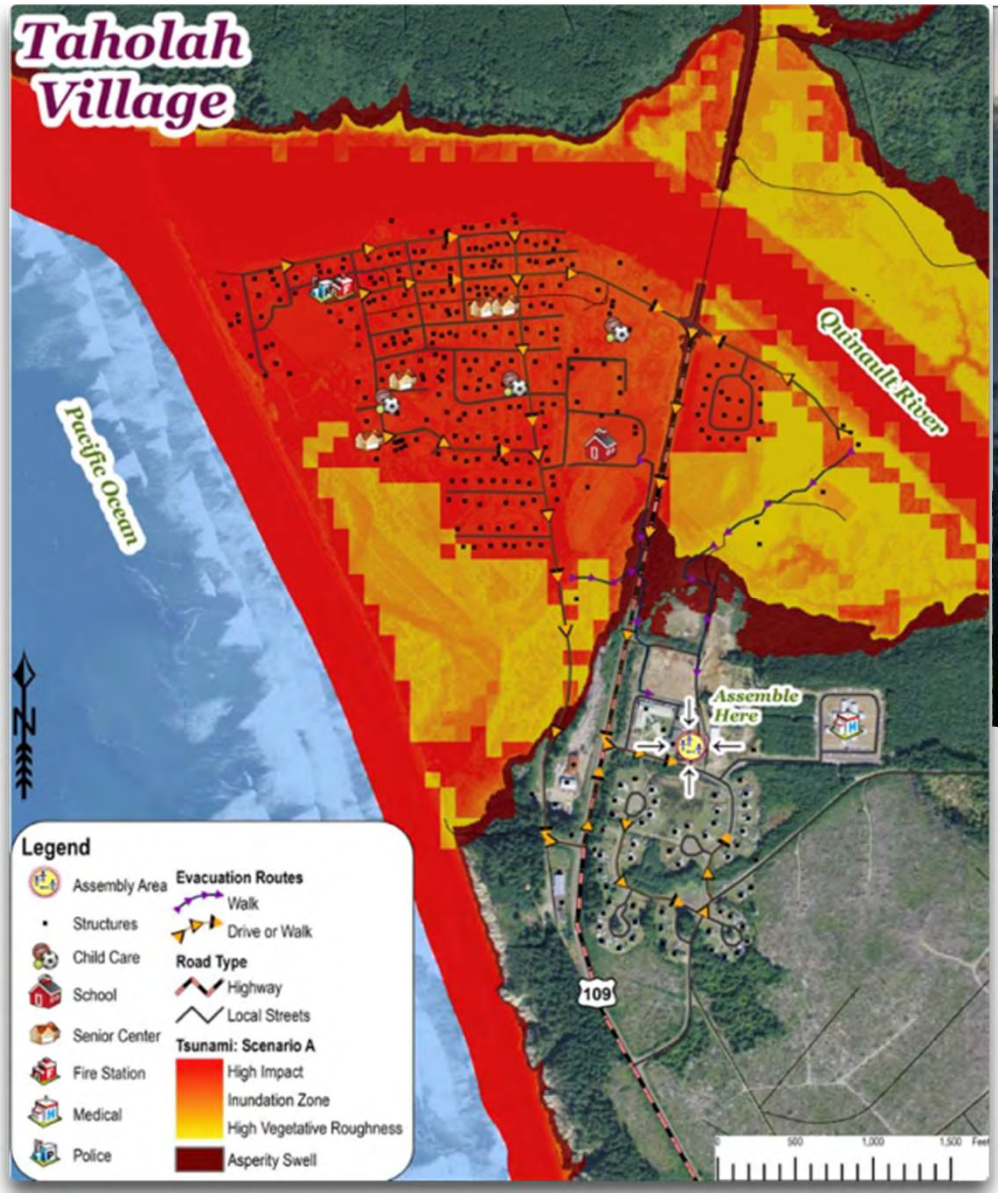
Microgrid Feasibility Study Process Overview

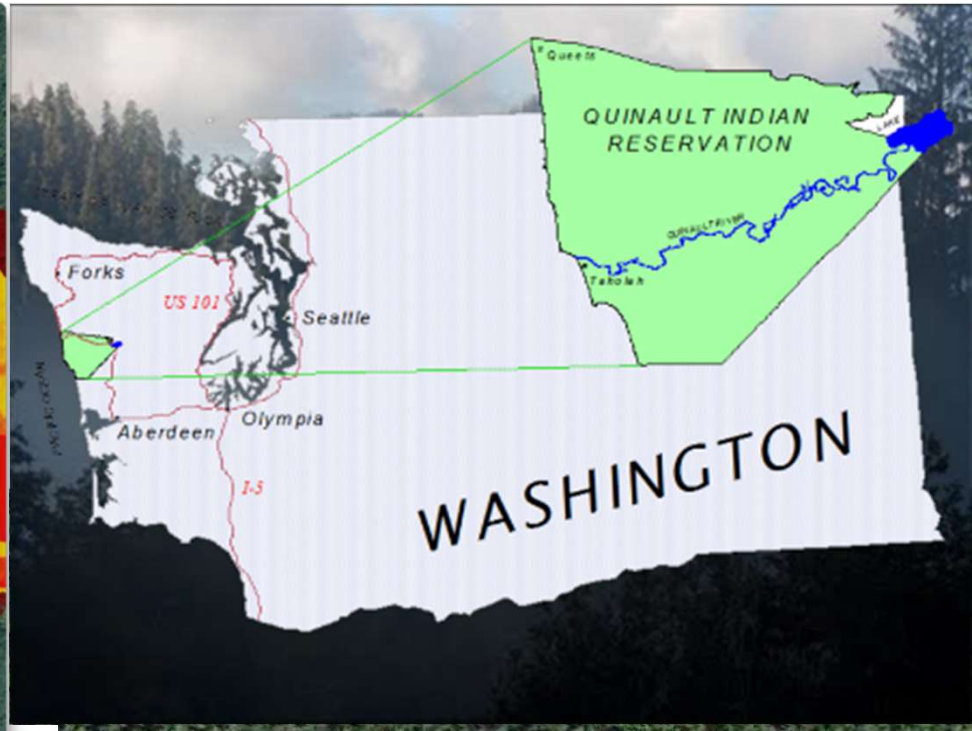
1. Facilitate Kick-off Meeting: Identify Evaluation Criteria
2. Determine Locations For Solar+Storage Development
3. Assess Baseline and Future Energy Consumption
4. Conduct Modeling and Performance Estimates
5. Develop Cost Workbooks for Each System Option
6. Prepare Resilience Analysis for Return on Investment
7. Funding Overview, System Diagrams, Grant Materials
8. Report Development, Presentation, Working Session

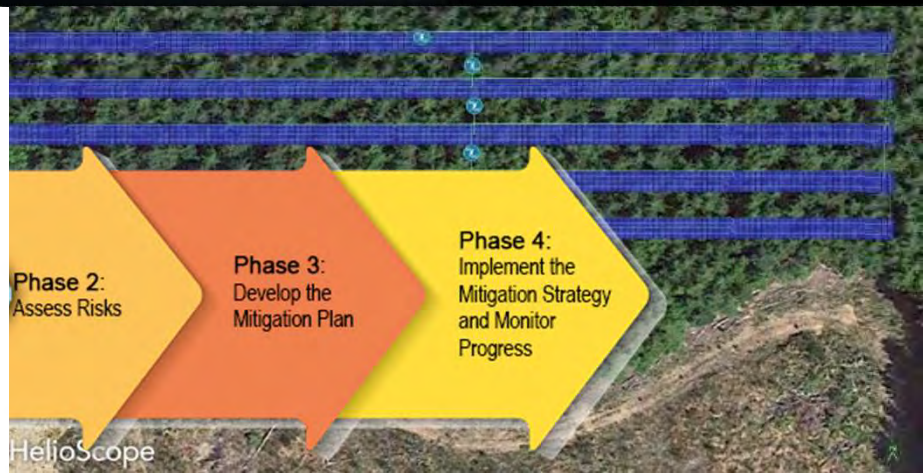
QIN Microgrid – Project Background

QIN Microgrid – Project Background

QIN Microgrid – Project Background


Taholah Village
Pacific Ocean
Quinault River
Assemble Here
109
Legend
Assembly Area
Structures
Child Care
School
Senior Center
Fire Station
Medical
Police
Evacuation Routes
Walk
Drive or Walk
Road Type
Highway
Local Streets
Tsunami: Scenario A
High Impact
Inundation Zone
High Vegetative Roughness
Asperity Swell


QUINAULT INDIAN RESERVATION
Forks
US 101
Seattle
Aberdeen
Olympia
I-5
WASHINGTON


Phase 2: Assess Risks
Phase 3: Develop the Mitigation Plan
Phase 4: Implement the Mitigation Strategy and Monitor Progress
HelioScope

Cayuse Mountain Fire

(August 2016)

- In 2016 The Cayuse Mt. Fire left its devastating mark on the Spokane reservation causing much damage to local wildlife and land. In recent history this was the first time a fire of this scale had effected the Spokane tribal government, community and local first responders. The Cayuse wild fire awoke the consciousness of the Spokane tribe and (SIHA) that the severity of wild fires due to environmental change will not stop and we must be prepared for the worst scenario.

SIHA Microgrid – Resilience & Preparedness

- Wildfires, Climate Change, Emergency Preparedness
- Identification of Critical Facilities for Disaster Response
- One Week of Energy Resilience to Maintain Operations

U.S. Climate Resilience Toolkit

Steps to Resilience

This content supports the highlighted step.

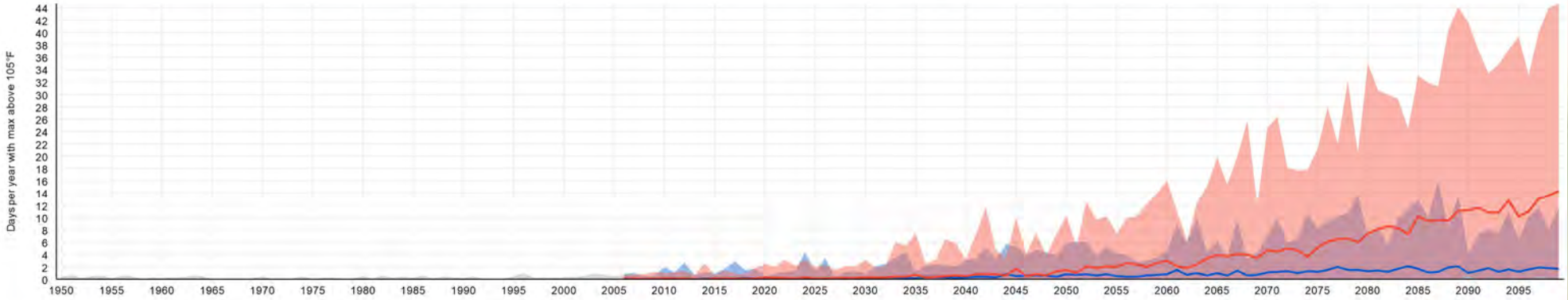
1. Explore Hazards
2. Assess Vulnerability & Risks
3. Investigate Options
4. Prioritize & Plan
5. Take Action

The Climate Explorer

Wellpinit, WA

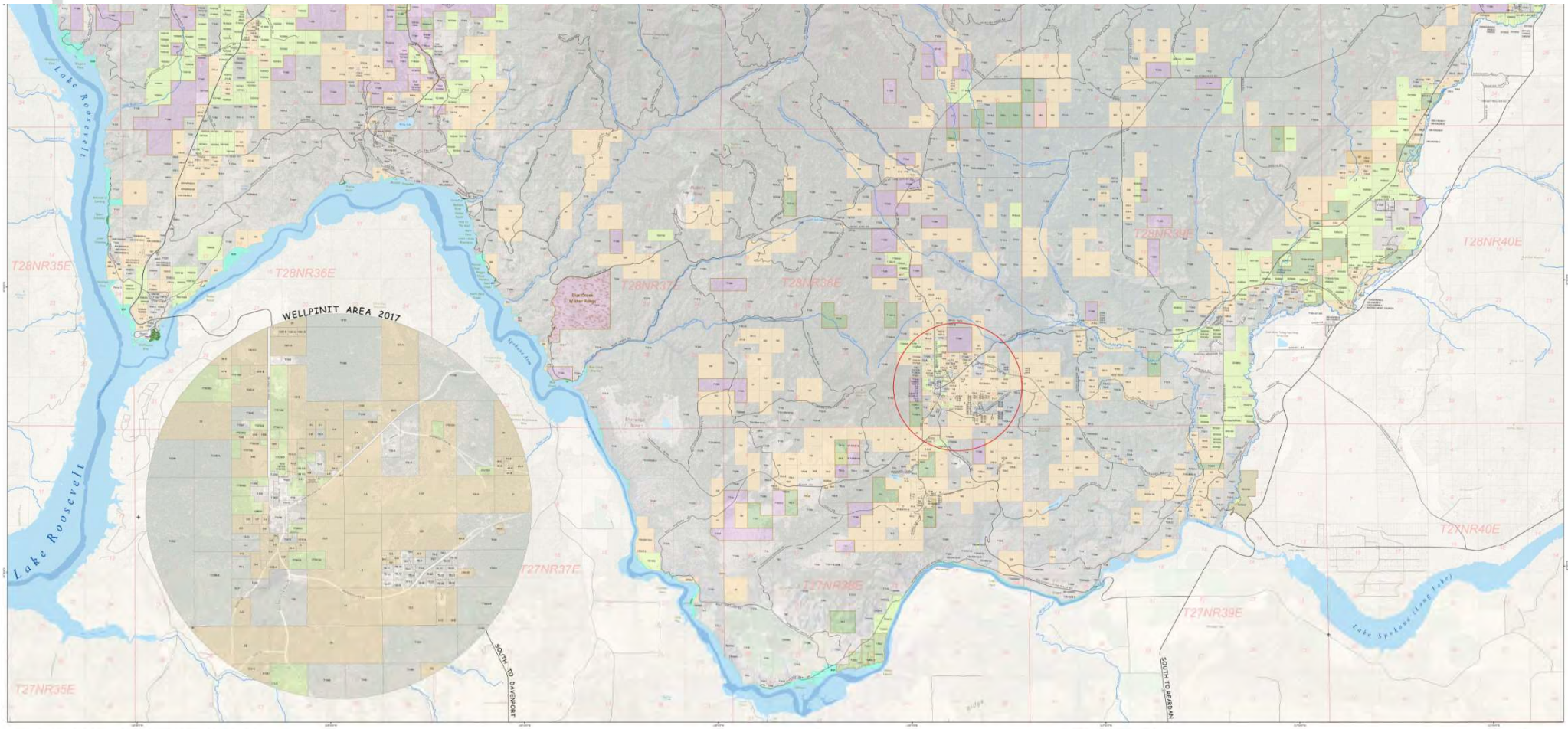
Wellpinit, WA in Stevens County - Days w/ max > 105°F

Days w/ max > 105°F | Chart | Map | Annual | Monthly



1950 — 2099

Historical Observed | Historical Modeled | Lower Emissions | Higher Emissions



LAND OWNERSHIP MAP 2020 WITH WILDLIFE AREAS

Originally created in 2011, this 2020 version of the Spokane Tribe (Tribe) Land Ownership Map is used to summarize overall surface land ownership on the reservation. The map represents a substantial upgrade from legacy maps of a similar theme. Parcels, allotments and other features have been adjusted to be consistent with the US Bureau of Land Management (BLM), Geographic Coordinate Database (GCDB). Most of the attribute information was carried forward from a legacy dataset (2008, Land Status Tribe). Though properties can extend into lakes and rivers, they are generalized for clarity to match the shoreline representation.

In 2010 through 2011 underlying base layers were upgraded to the state plane coordinate system; ownership lines were adjusted to be consistent with the GCDB's representation of trust parcels and the Public Land Survey Sections (PLSS). Since 2011 allotments, tracts and parcels have been updated on an "as needed" basis, some directly from land survey information utilizing coordinate geometry – a preferred method. In 2015, a significant number of wildlife associated fee properties were transferred to tribal trust and most fee simple properties on the reservation were included in the property database along with their Stevens County parcel identifier.

Most land is held in trust by the US Government for the Tribe (Tribal Trust) at about 77.2% or 118,060 acres and for families (Individual Indian Trust) at about 16% or 24,410 acres; other land is owned by the Tribe as fee simple (Tribal Fee Simple) at about .1% or 200 acres or by others (Fee Simple) at about 6.1% or 9,290 acres.* These acreages may differ from past maps of a similar theme reflecting changes to geometry via the adjustment to the GCDB and land transaction updates. Wildlife areas identified by Spokane Tribe DNR's Wildlife Program were included on the map. Please consult with DNR/Wildlife Program for more information about these areas.

The purpose of this map and displayed information is to summarize the current status of surface land ownership. Land transactions may occur at any time, for example a fee parcel may be processed into trust; the change will be reflected on the next version of the printed map. Similarly, errors may be discovered that are subsequently fixed. If accurate determinations are needed please visit the Spokane Tribe Realty Office for more detailed information.

* Reported acreages are approximations to the nearest 10 acres for summarizing land ownership areas.

Ownership

- TRIBAL TRUST
- TRIBAL FEE SIMPLE
- INDIVIDUAL TRUST
- PRIVATE FEE SIMPLE
- BUREAU OF RECLAMATION TRUST

Scale 1:28,000

0 0.5 1 2 3 4 5 km

0 0.5 1 2 3 4 5 mi

This map was created with a number of datasets, each qualified by disclaimers of no better than +/- 40 feet consistent with USGS quadrangle source data. Parcel data are shown as a representation based upon legacy tribal data. The primary software used for completion was ArcGIS 10.5, ArcMap software from the Environmental Science Research Institute.

PRE-RELEASE: Version 1.9.2: 13 January, 2020

REFERENCES, SOURCE INFORMATION & ACKNOWLEDGMENTS

Lincoln County. (2016). Lincoln County planning and GIS services. Roads shapefile. (SRC: 2703/4 SPCS N. Datumused: (NA, 4812)).

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Value Orthoimagery Service. Contract #11388. 2017. 1 ft. orthoimagery. Calgary, AB.

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A special thanks go to Robin Arnold and Mandi Munding-Kruse of the Spokane Tribe Realty Office for answering queries and providing legal descriptions of trust properties for verification. I would also like to acknowledge Stevens County and Lincoln County Information Services for providing a wellplace extract and legal descriptions for the properties.

PROPERTY OF SPOKANE TRIBE

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WARNING: This map has been prepared for internal use of the Spokane Tribe government offices. Information contained on this map may not be accurate or current and are provided "as-is" without warranties of any kind. All information and content are disclaimed from assertion with regard to fitness of use. It is the responsibility of the user to ensure fitness of use and verify information. Consult the Spokane Tribe, Realty Office for current land status determinations. Consult a professional land surveyor for accurate property determinations.

THIS REPRESENTS VERSION 1.9.2 OF A NEWLY PRODUCT. THERE MAY BE ERRORS WITH INCORRECT NUMBERS OR OTHER INFORMATION THAT HAVE NOT BEEN DISCOVERED. PLEASE CONTACT IT IS REPORT ERRORS TO TRIBAL GIS AT THE ADDRESS IN MARGIN OR EMAIL EDITED SO THAT CORRECTIONS MAY BE IMPLEMENTED CAN BE INCLUDED IN FUTURE PRINTED VERSION.

Spokane Tribe GIS

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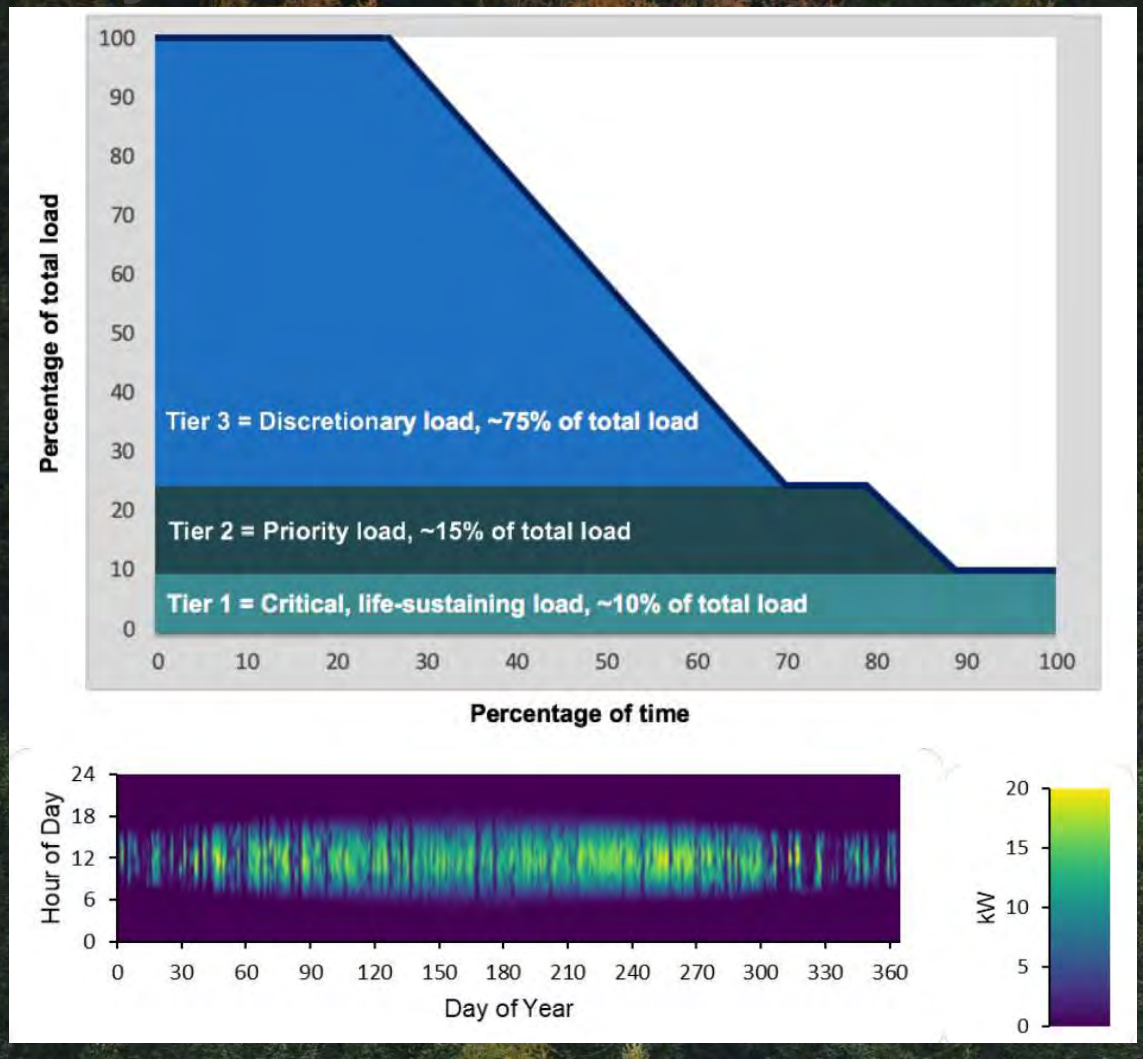
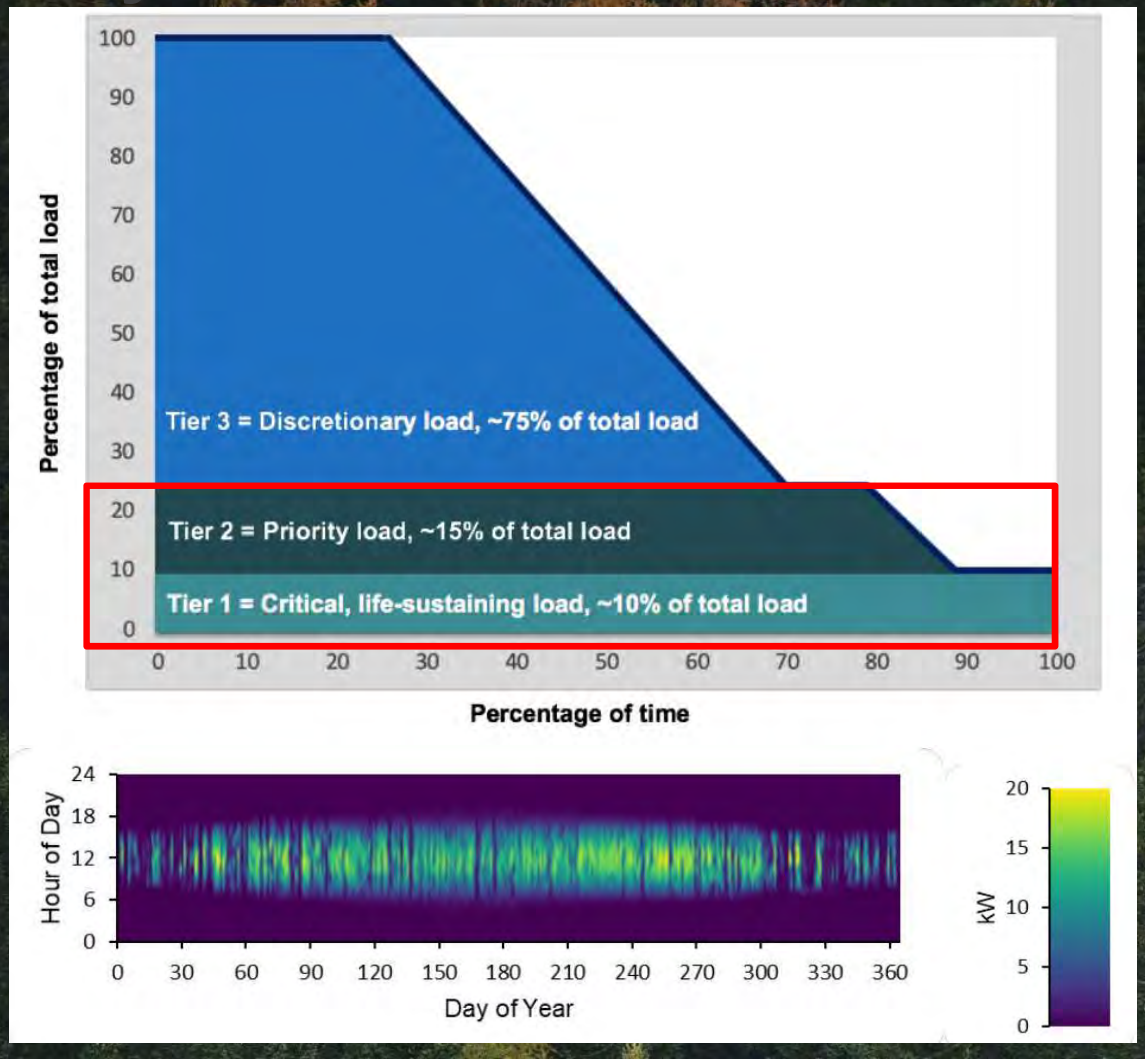
SIHA Microgrid Site Assessment

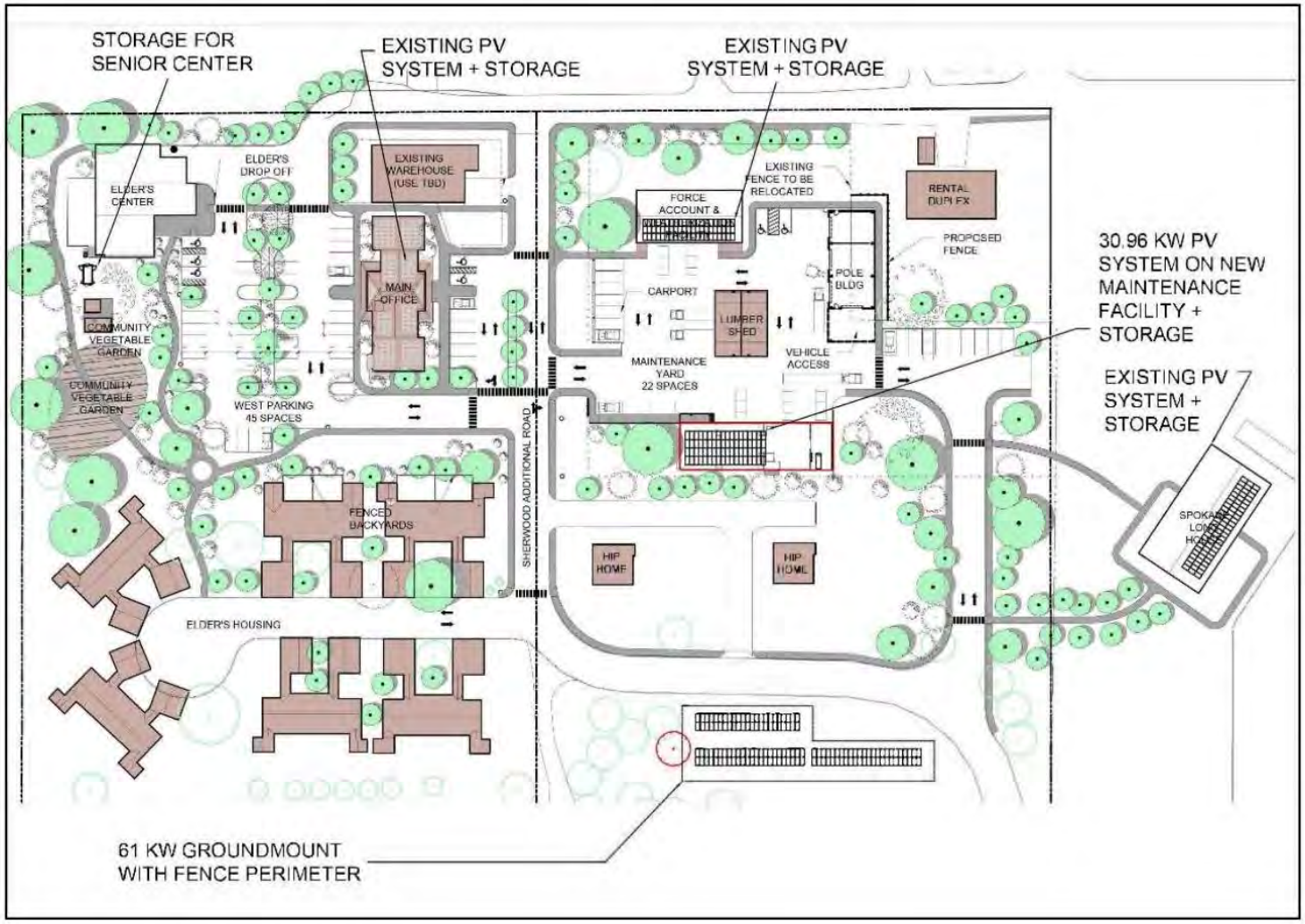
Priority & Critical Load Identification



Priority & Critical Load Identification



SIHA Microgrid Concept 3 Option 1



Microgrid Feasibility Study Process Overview

Project Goals:

1. Emergency Preparedness
2. Carbon Footprint Reduction
3. Self-Sufficient Strategies to Maintain Operations During an Outage or Natural Disaster

Washington State Department of Commerce

Serving Communities | Building Infrastructure

Grid Modernization under the Clean Energy Fund (CEF)

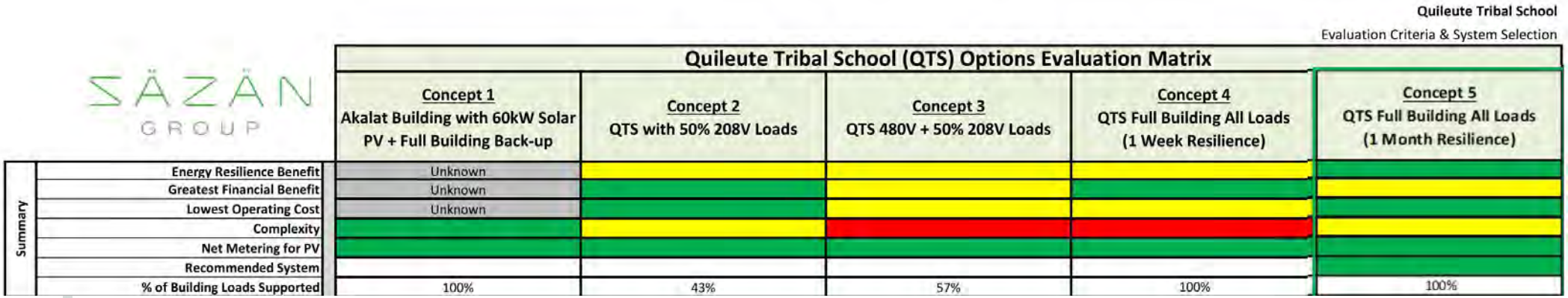
$4.6 million is available in a new round of grant funding.

Microgrid Feasibility Study Process Overview – Site Assessments

Figure 10: Akalat Building Front from Site Assessment

Figure 11: Pump House from Site Assessment

Microgrid Feasibility Study Process Overview – Key Findings



Quileute Tribal School

Evaluation Criteria & System Selection

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	Quileute Tribal School (QTS) Options Evaluation Matrix				
	Concept 1 Akalat Building with 60kW Solar PV + Full Building Back-up	Concept 2 QTS with 50% 208V Loads	Concept 3 QTS 480V + 50% 208V Loads	Concept 4 QTS Full Building All Loads (1 Week Resilience)	Concept 5 QTS Full Building All Loads (1 Month Resilience)
Summary – Energy Resilience Benefit	Unknown				
Summary – Greatest Financial Benefit	Unknown				
Summary – Lowest Operating Cost	Unknown				
Summary – Complexity					
Summary – Net Metering for PV					
Summary – Recommended System					
Summary – % of Building Loads Supported	100%	43%	57%	100%	100%

- Recommended Option Supports 1-Month of Resilience
- All Building Systems Supported by Microgrid System
- 250 kW / 990 kWh Battery Energy Storage System
- 250 kW-DC Solar Photovoltaic (PV) Array
- Total Installed Cost Estimate: $1,800,000
- No major upgrades required for QTS electrical system

Quinault Indian Nation Village Relocation Example

- Taholah Relocation Integrated Energy System
- Supporting the Generations Building
- 2021 DOE Grant Awardee

Microgrid Feasibility Study Process Overview – Energy Analysis

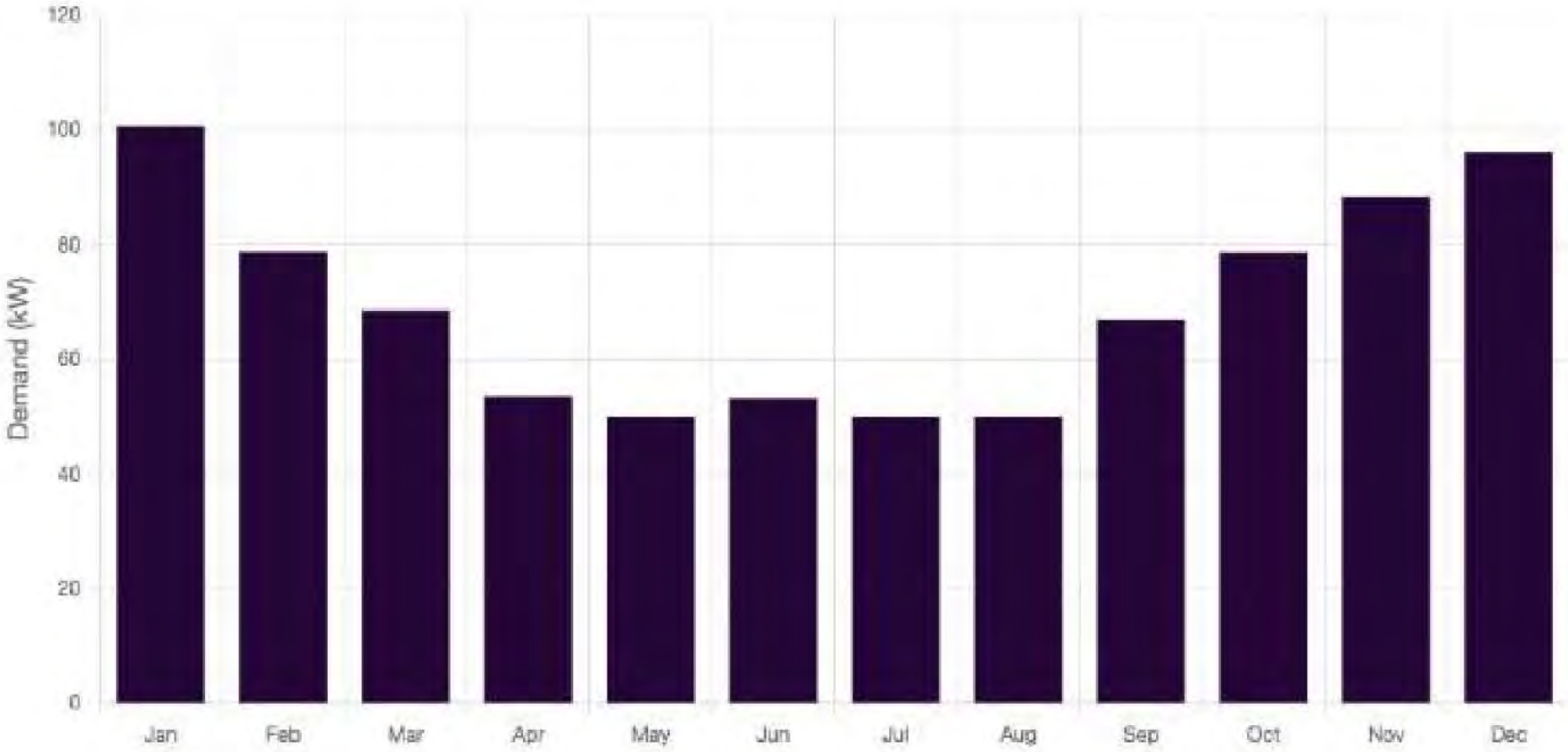

Figure 8: QTS Peak Electric Demand Per Month (as Modeled)

Microgrid Feasibility Study Process Overview – Solar Analysis

Figure 15: QTS Microgrid Concept 5 Site Plan

Microgrid Feasibility Study Process Overview – System Diagram

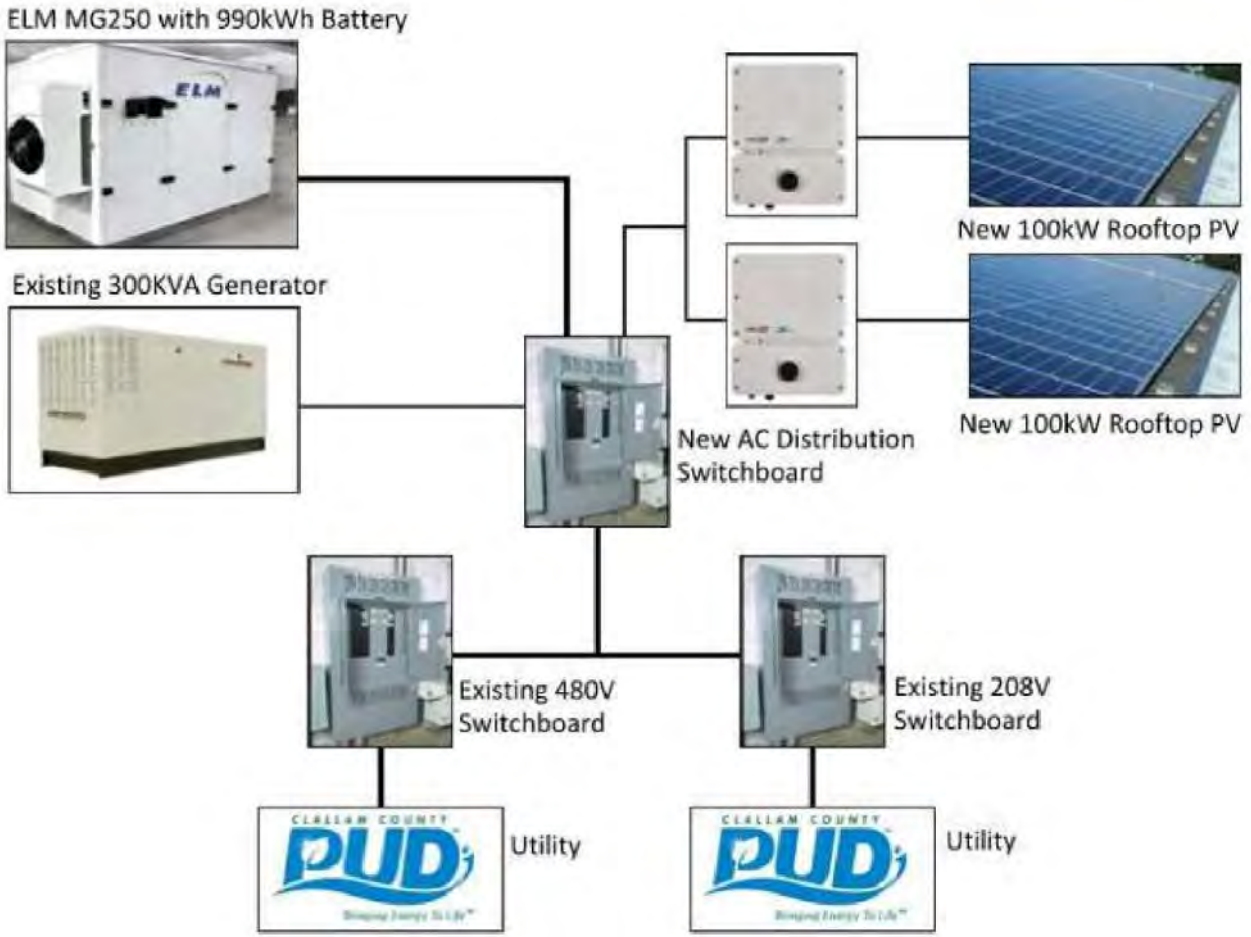

Figure 14: QTS Microgrid Concept 5 Illustration

Thank you!

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