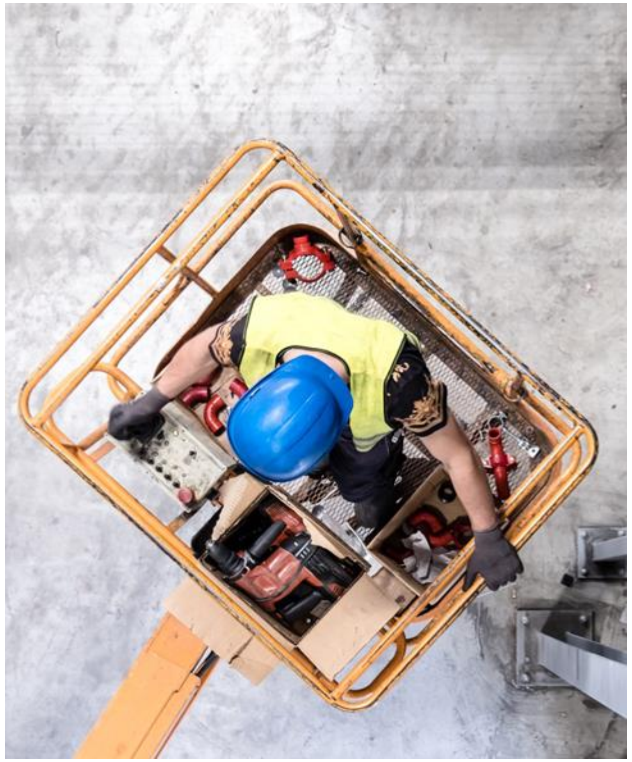
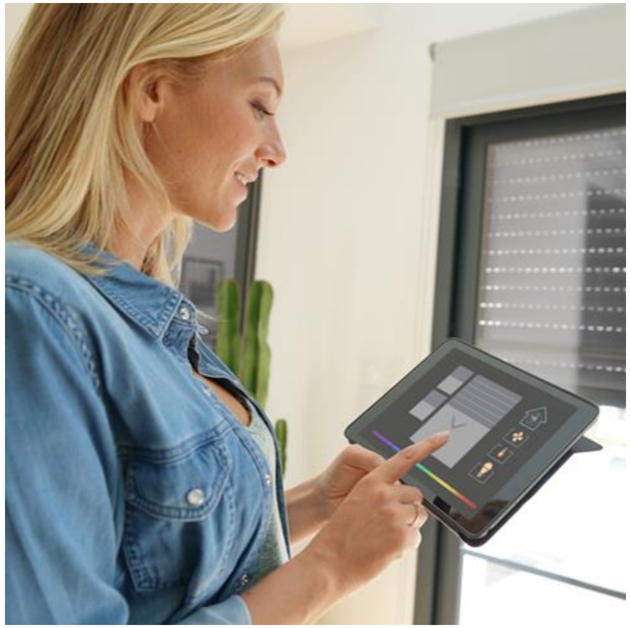
Community Microgrid Resilience Solutions for Natural Disasters

NARUC NASEO MG Working Group
May 20 2020

Clean + Modern Grid

Utility Business Models | Regulatory Innovation | Grid Integration | Transportation Electrification





Who Are We?

Smart Electric Power Alliance

- A membership organization
- Staff of ~50 Budget of ~$10M
- Based in Washington, D.C.
- No Advocacy – 501c3
- Founded in 1992
- Research, Education, Collaboration & Standards
- Unbiased
- Technology Agnostic

Smart Electric Power Alliance

SEPA Research & Education

- Custom Projects
- Workshops
- Research Reports
- Webinars
- Regional Conferences

UTILITY CONFERENCE SEPA

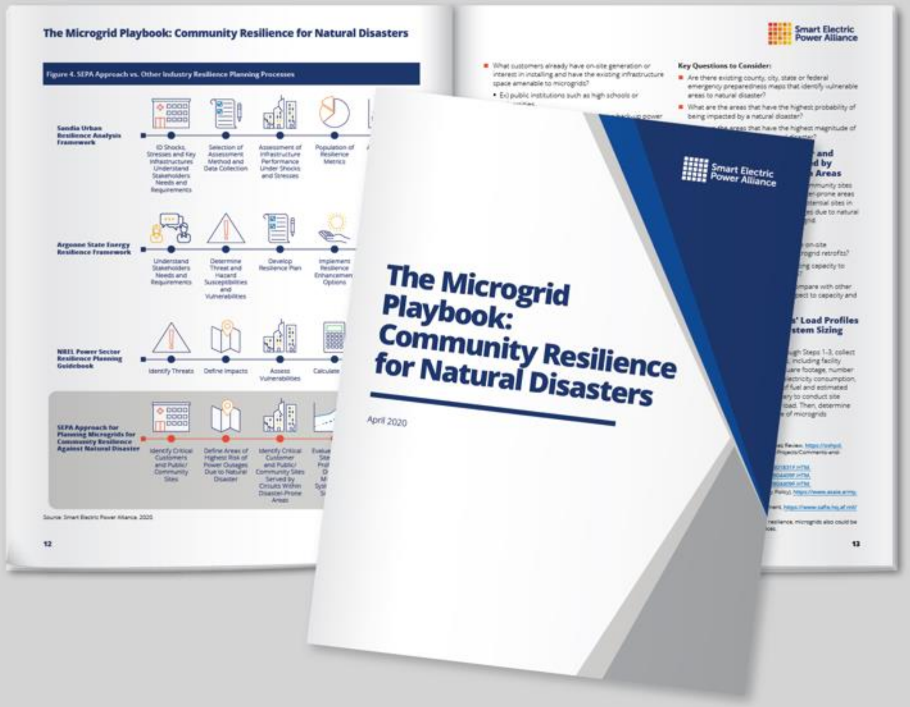
GRID EVOLUTION SUMMIT SEPA

EXECUTIVE FACT FINDING MISSION SEPA

NORTH AMERICA SMART ENERGY WEEK

SEPA POWER PLAYERS

SEPA Utility Transformation CHALLENGE



Smart Electric Power Alliance

Overview

Information in this presentation comes from The Microgrid Playbook: Community Resilience for Natural Disasters.

As seen in California's wildfires, grid resilience is critical to maintaining vital services and structures. Many utilities are exploring microgrids as a great tool to ready the grid and its communities for natural disasters.

Defining Key Terms

Smart Electric Power Alliance

Microgrid

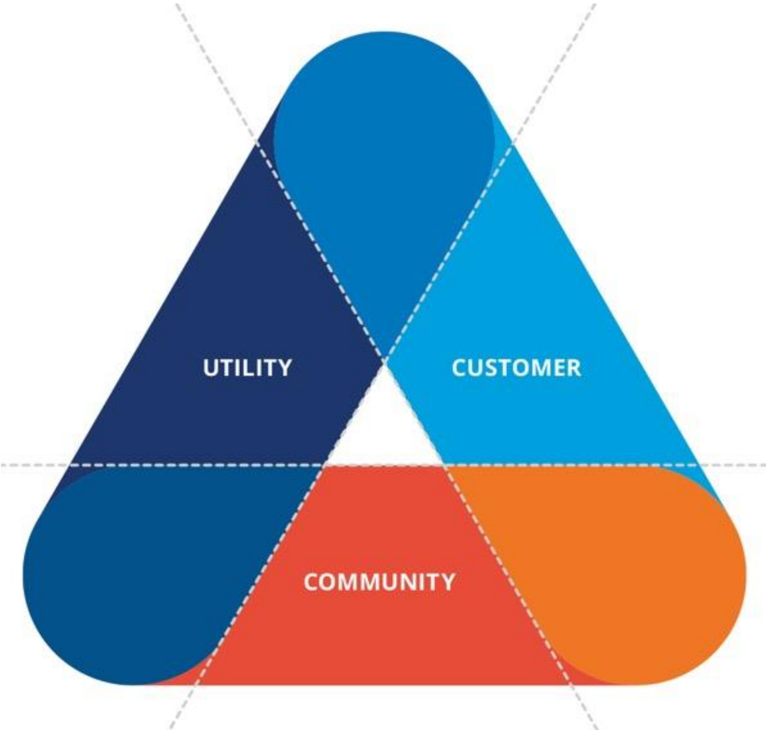
interconnected loads | distributed energy resources | defined electrical boundaries | single controllable entity | grid-connected or islanded mode

Resilience

resist | absorb | recover | adapt | change in conditions

Differing Perspectives on Microgrid Value

Reliability | continuity | lower consumption



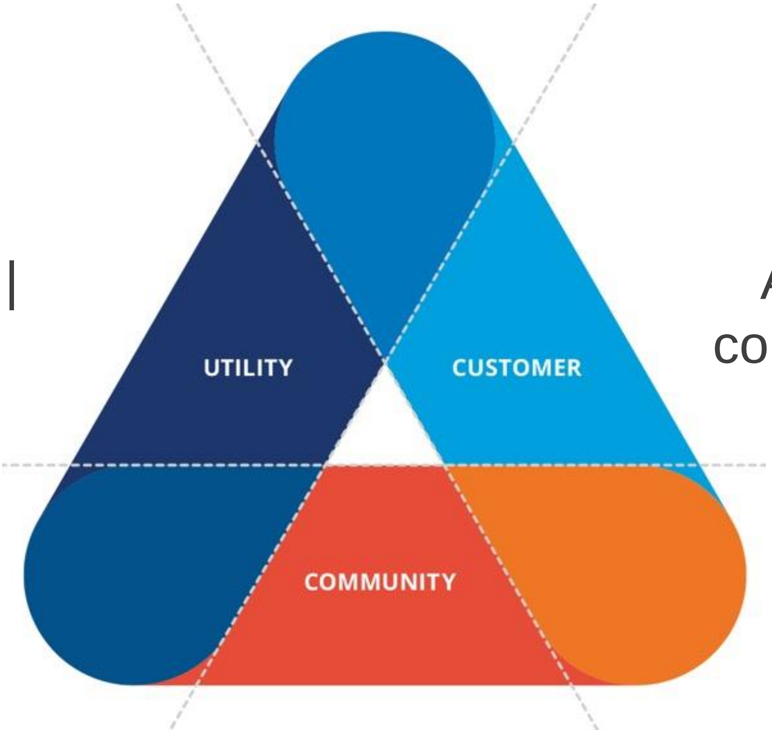
National security | critical infrastructure | public institutions

Public health and safety | emergency preparedness

Microgrids For Resilience Use Cases

Smart Electric Power Alliance

Utility operations | grid reliability | community resiliency



Agriculture | residential | industrial | commercial | higher education | military

Public safety | radio towers | public water | public institutions | healthcare

Use Case: Earthquakes

Smart Electric Power Alliance

Microgrid Hardening:

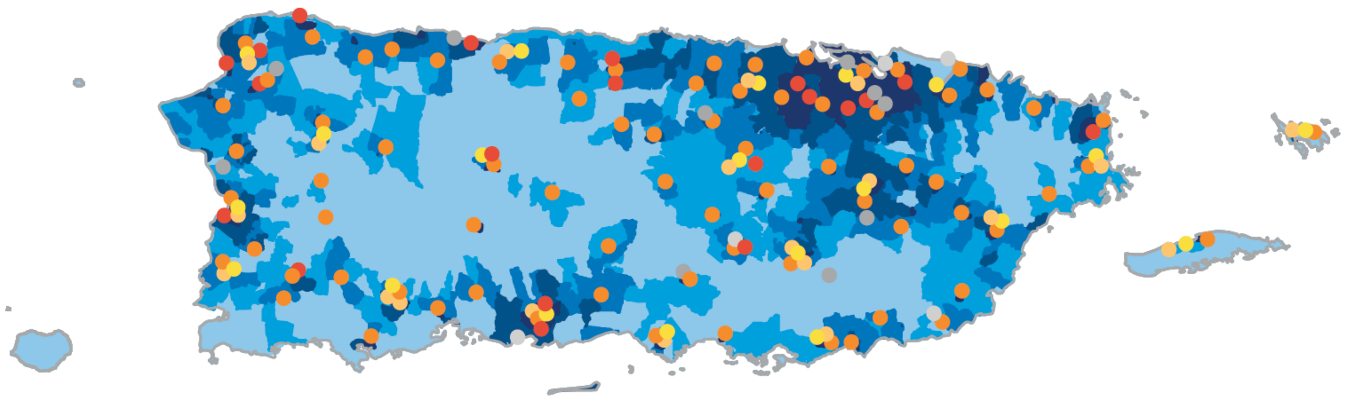
- Onsite fuel storage and seismic rated equipment
- ASCE seismic standards
- Shock mount storage systems

Building Resilience:

- Address geotechnical siting concerns
- Structural and equipment seismic hardening

Use Case: Hurricanes

Smart Electric Power Alliance



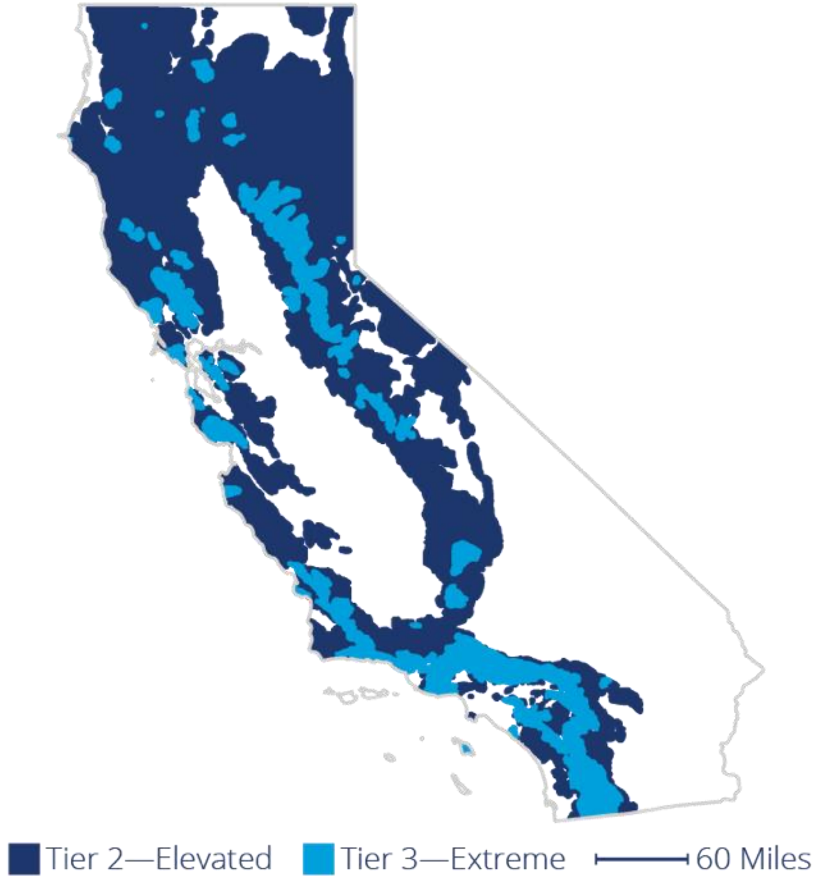
Microgrid Hardening:

- Choose low-risk, high elevation sites
- Use NEMA rate enclosures and ASCE rooftop load standards
- Use flexible solar racking and anchoring and store fuel onsite

Building Resilience:

- Design according to IBC provisions relating to wind, water, and impact damage
- Elevate structures to mitigate flood damage

Use Case: Wildfires



Microgrid Hardening:

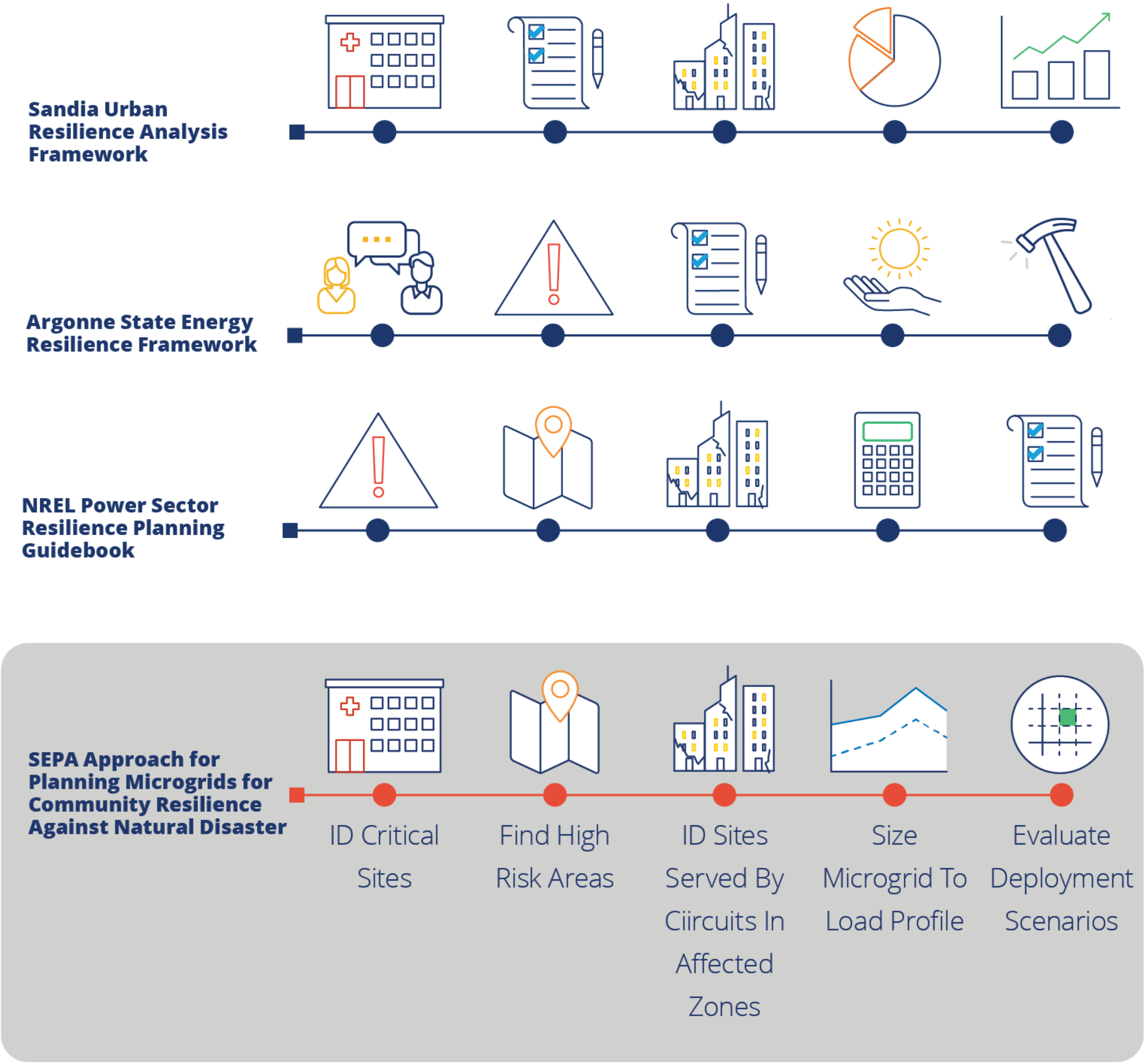
- Bury electrical systems and facilities
- Store fuel for generators onsite
- Follow IBC and IWUIC codes for buildings
- Site solar and storage away from flammables and site with fire suppression systems

Public Safety Power Shuttoff (PSPS) :

- Site near impacted areas using least risk locations.
- Be mindful of how critical facility location impacts PCC for microgrid.

SEPA's Five-Step Approach

A holistic, community-centric approach.



Step One: ID Critical Sites

Smart Electric Power Alliance

Examples:

Hospitals, correctional facilities, (waste)water treatment facilities, schools, fire, police, radio towers, evacuation and shelter sites.

Key Considerations:

- Which critical facilities and customer types are targets for microgrids?
- Which customers have or are interested in onsite generation?
- Which sites have space amenable to microgrids?
- Which customers and facilities get priority?

Step Two: Find High Risk Areas

Smart Electric Power Alliance

Examples:

Flood prone areas, high wind/dry vegetated areas, earthquake shock and liquefaction areas, etc.

Key Considerations:

- Are there public emergency preparedness maps to reference?
- What areas have the highest natural disaster impact risk?
- Where areas will face the harshest impact from a natural disaster?

Step Three: ID Sites Served By Circuits In Affected Zones

Smart Electric Power Alliance

Tools:

Initial map and list of potential microgrid sites for community resilience against natural disasters.

Key Considerations:

- How many sites have onsite generation that can be retrofitted for microgrids?
- Does the local circuit have sufficient hosting capacity for interconnection?
- How do disaster-prone areas line up with capacity and reliability constraints?

Step Four: Size Microgrid to Load Profile

Smart Electric Power Alliance

Tools:

- Preliminary microgrid design and modeling
- Low, moderate, and aggressive-renewable microgrid scenario systems sizing and cost estimations

Key Considerations:

- How much of the load profile should generation assets be sized for?
- How much generation can be renewable?
- What is the necessary size of the microgrid to meet the application?

Step Five: Evaluate Deployment Scenarios

Smart Electric Power Alliance

Tools:

- Inside vs. outside the disruption-prone area
- Site specific vs. transformer-level vs. community level

Key Considerations:

- How should microgrid deployment be prioritized between neighboring cities, communities or neighborhoods?
- Where within the natural disaster risk areas should they be deployed?
- At what level on the electrical distribution system should they be deployed

Conclusion

Smart Electric Power Alliance

- Understand stakeholder perspectives on the value of resilience by evaluating what problem the microgrid is solving and what services it is providing.
- Extracting maximum resilience benefits from microgrids requires early and frequent communication between utilities, customers and their community.
- Community resilience requires holistic microgrid planning and emergency preparedness, and constructing natural disaster resistant microgrid facilities.
- Defining microgrid sites for community resilience requires identifying critical infrastructure, defining vulnerabilities, evaluating load profiles, and various scenarios.

Smart Electric Power Alliance

Jared Leader

Manager, Industry Strategy

jleader@sepapower.org
202.609.8938
SEPAPower.org

Microgrid Planning and Deployment for Community Resilience

NASEO NARUC Webinar

May 20, 2020

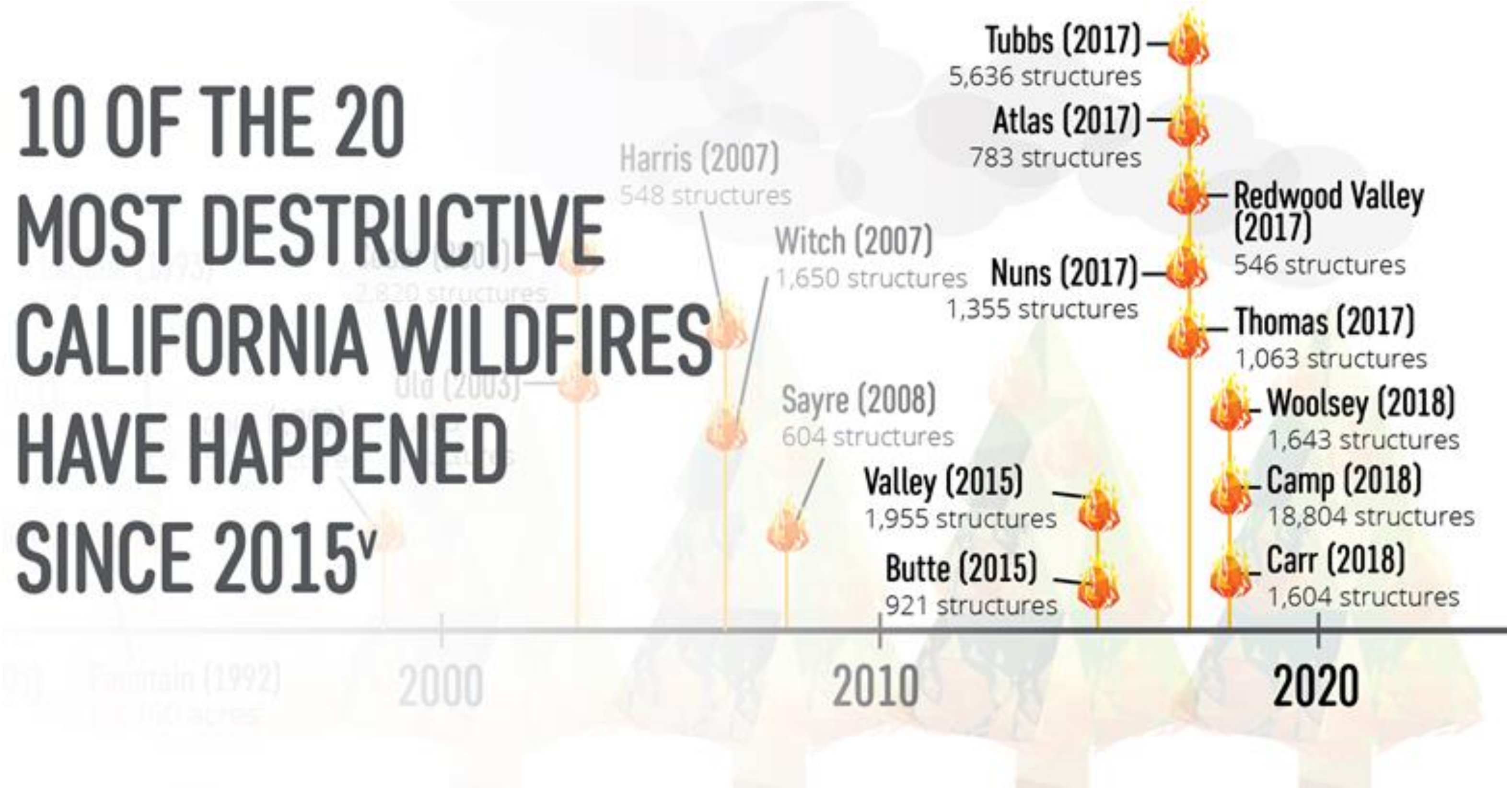
Russell Ragsdale

Director, Asset & Engineering Strategy

Southern California Edison

SOUTHERN CALIFORNIA EDISON®

We're responding to the greatest societal challenge of our time—climate change and its impacts, including wildfires



About a quarter of SCE's service area is designated as a high fire risk area

Source: http://www.fire.ca.gov

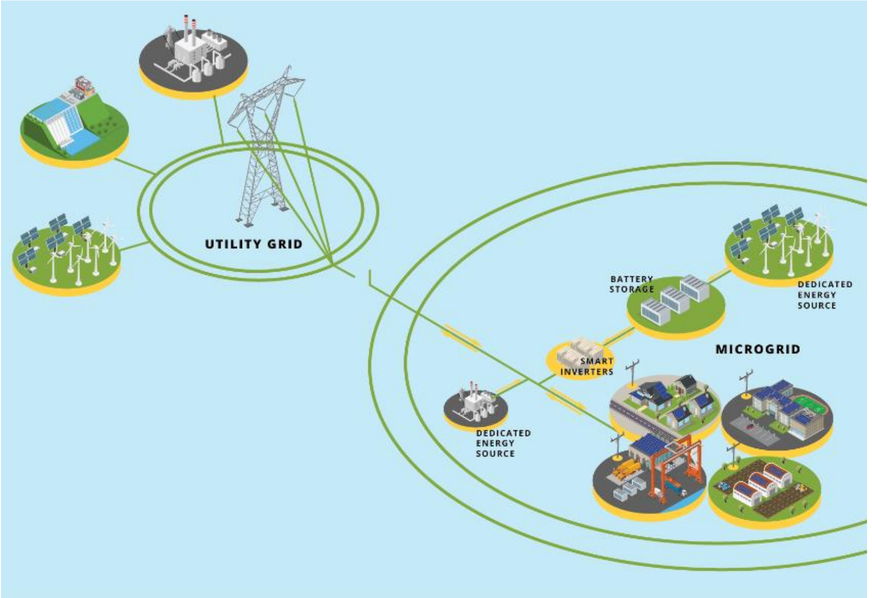
SCE is mitigating wildfire risk with infrastructure, situational awareness, and operational efforts

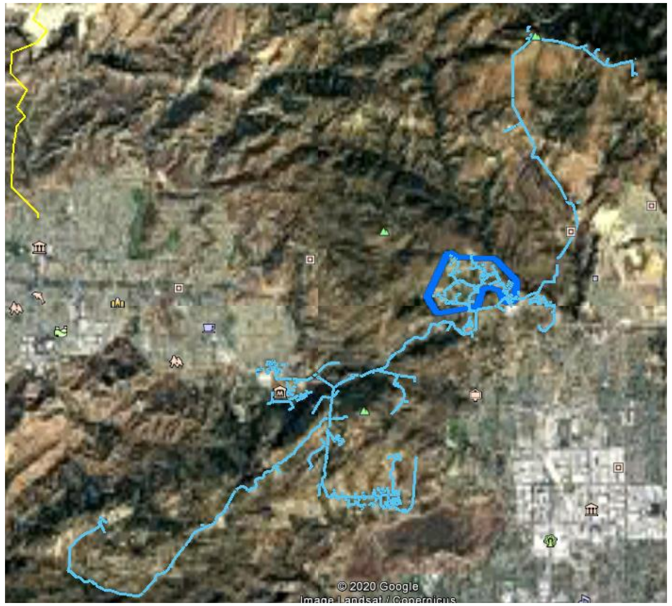
Infrastructure	**Covered Conductor**	• Install covered conductor in high fire risk areas (HFRA)
	Other Infrastructure Mitigations	• Complete various system hardening activities (e.g., composite poles, current limiting fuses (CLFs), remote automatic reclosers (RARs), fast-curve settings) • Conduct studies, evaluations and pilots of alternative technologies
	Undergrounding	• Perform evaluation of targeted undergrounding in HFRA
Situational Awareness	**Weather Sensors, Monitoring, and Modeling Capabilities**	• Install weather stations and high-definition (HD) cameras • Build high performance weather modeling and predictive capabilities
Operational	**Inspections**	• Perform enhanced inspections on trans. and dist. structures in HFRA • Perform inspections on specific equipment (e.g. poles, switches, circuits, relays) • Perform infrared and corona scanning to obtain HD imagery of equipment
	Vegetation Management	• Perform vegetation removal at poles • Perform hazard tree removal • Conduct LiDAR surveying for transmission, supplemental to inspections in HFRA
	Public Safety Power Shutoff	• Reduce ignition risk while minimizing impact to customers and communities

Microgrids are one potential solution to reduce the impacts of public safety power shutoffs (PSPS)

SCE 2019 PSPS Data

- 537 circuits on watchlist
- 138 circuits affected during 9 PSPS events
- Approximately 122,000 customers impacted
- 27 hours average duration

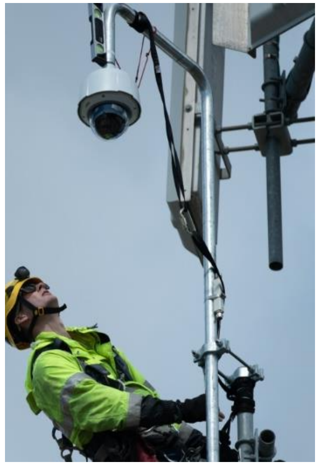


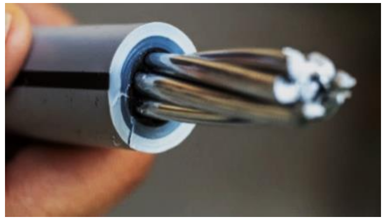


There are multiple solutions to address PSPS resiliency in addition to microgrids

Other resiliency solutions:

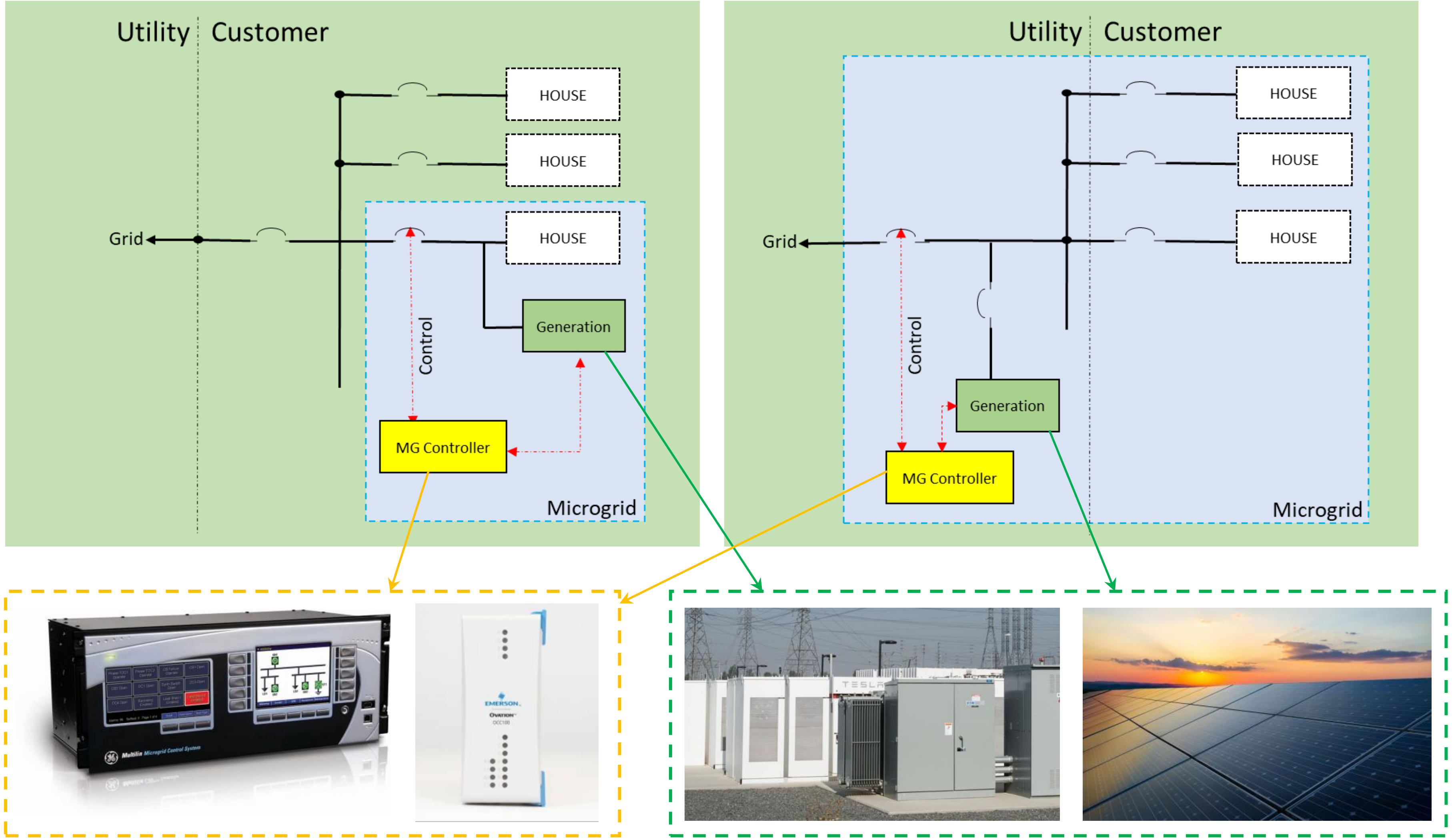
- Installing switches and sectionalizing capability
- Building playbooks to decrease outage size
- Accelerating covered conductor work
- Deploying customer resource centers
- Installing additional weather stations





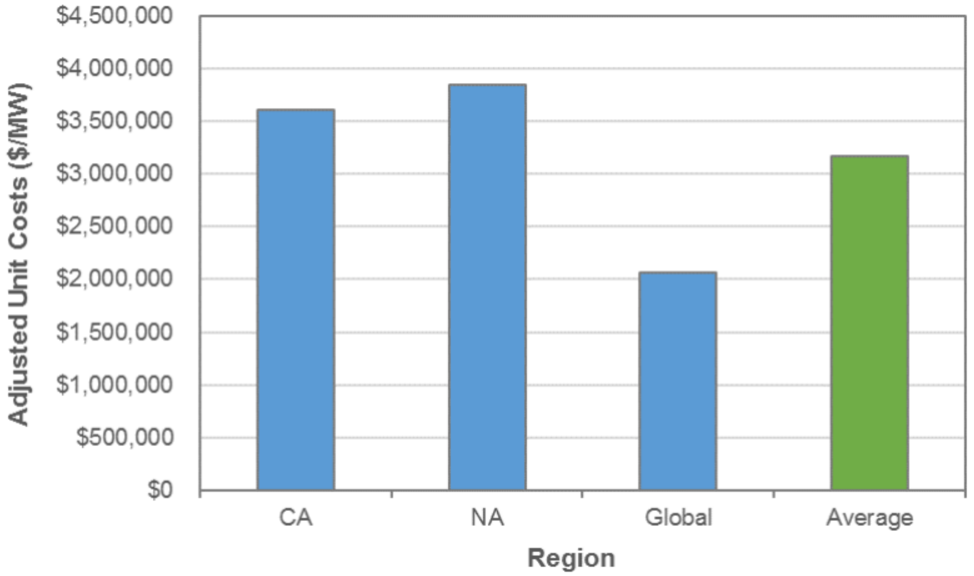
Microgrids vary by size, ownership, and type

Behind-the-Meter (BTM) Microgrid | **Front-of-the-Meter (FTM) Microgrid**



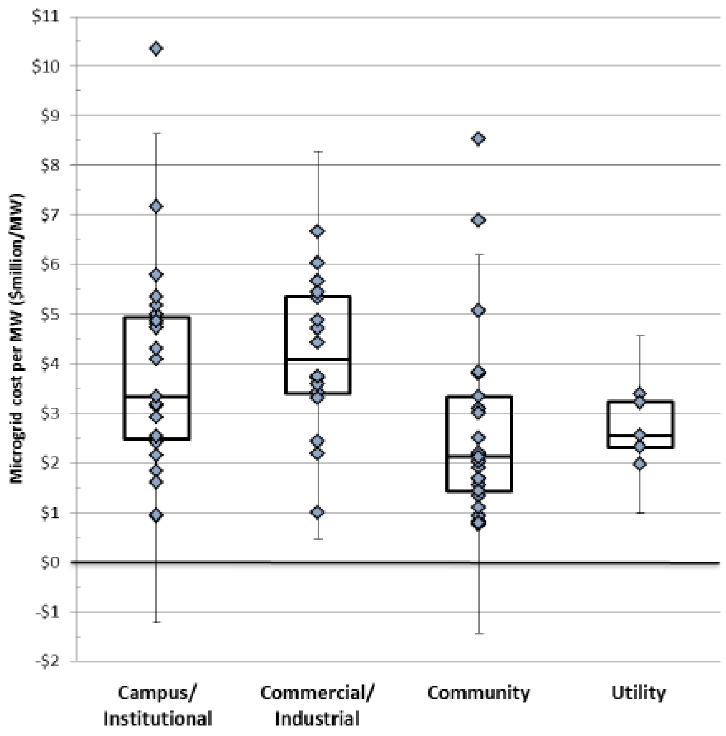
Microgrid costs vary greatly depending upon size, DER resource mix, region and market segments

Average microgrid unit costs, by region[1]



- California is focused on smaller, smart-inverter based projects (reduces control costs) that have relatively high upfront capital costs from solar PV and energy storage (expected to experience additional price decreases)
- North America's costs are higher due to greater emphasis on resilience on the East Coast, requiring larger and more complex systems than would otherwise be considered cost-effective

Normalized microgrid costs by market segment[2]



- Individual project costs are represented with diamonds
- The community microgrid market has the lowest mean, followed by the utility and campus markets
- The commercial market has the highest average cost

Realizing market value streams (e.g. ISO, utility, customer) can make microgrids more cost effective

1. California Energy Commission, Microgrid Analysis and Case Studies Report, 8/2018
2. NREL Phase I Microgrid Cost Study: Data Collection and Analysis of Microgrid Costs in the United States 10/2018

When selecting locations for microgrids, customer classes and locations are key considerations

- Have existing or planned DERs that could be coordinated into a Microgrid
- Have essential facilities in close proximity on the same circuit
- Have Disadvantaged Communities (DAC) per CalEnviroScreen
- Are served by circuits subject to Public Safety Power Shutoff (PSPS) and are undergrounded
- Are in HFRAs and/or high wind zones
- Are served by SCE circuits that have relatively lower reliability

Q&A

Oregon
Department of
ENERGY

Community Energy Resilience in Oregon

Adam Schultz
May 20, 2020

NASEO-NARUC Microgrids Working Group Webinar:
Microgrid Planning and Deployment for Community Resilience

OREGON DEPARTMENT OF ENERGY

Overview of ODOE

Site Visit to Boardman, Oregon

OREGON DEPARTMENT OF ENERGY

Oregon Department of Energy

Northwest Power and Conservation Council

Oregon Global Warming Commission

Nuclear Safety & Emergency Prep

Energy Facility Siting

Energy Planning & Innovation

Administrative Services

Energy Development Services

Energy Facility Siting Council

Oregon Hanford Cleanup Board

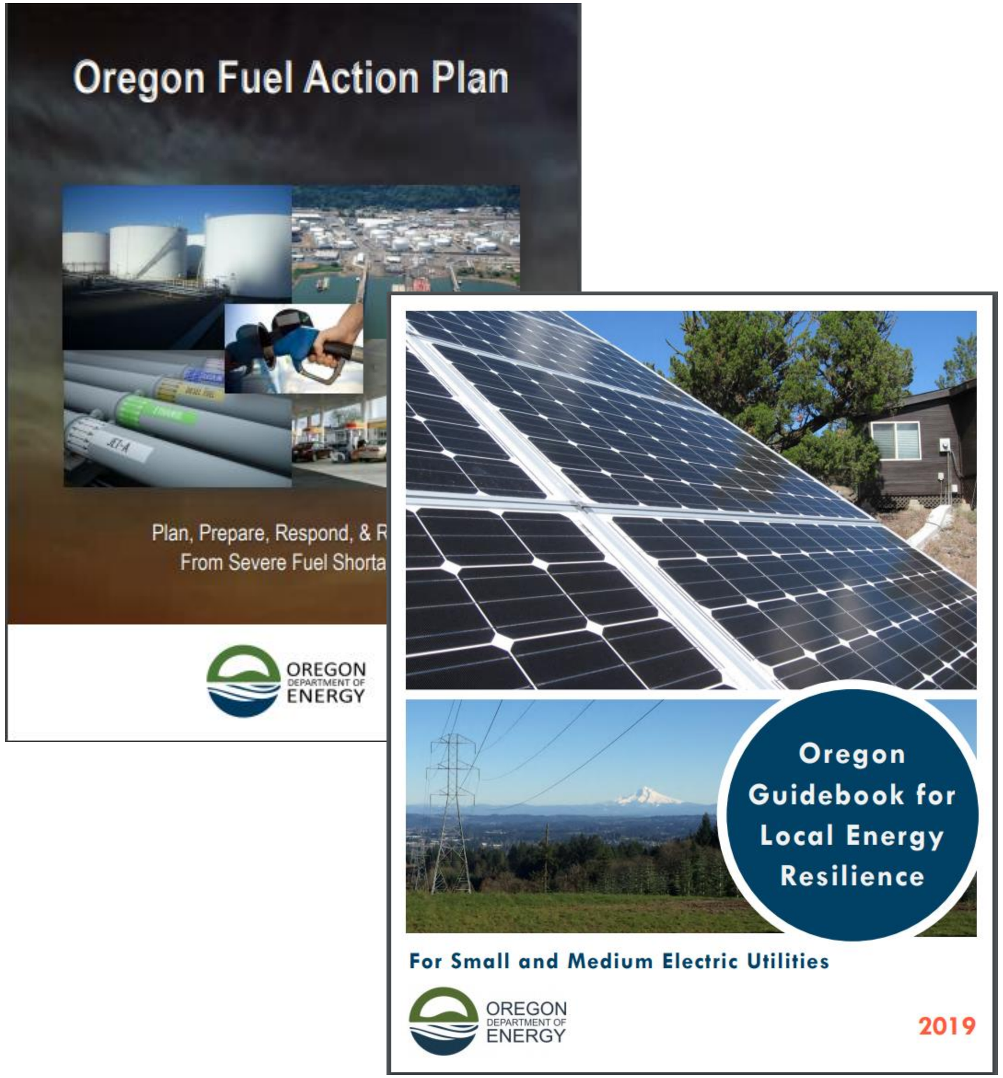
Energy Advisory Work Group

ODOE's Role: Energy Resilience

ESF 12: Lead for the petroleum sector

Oregon Fuel Action Plan: Response plan for severe shortages of liquid fuels

Resilience Guidebook: Focused on improving community energy resilience

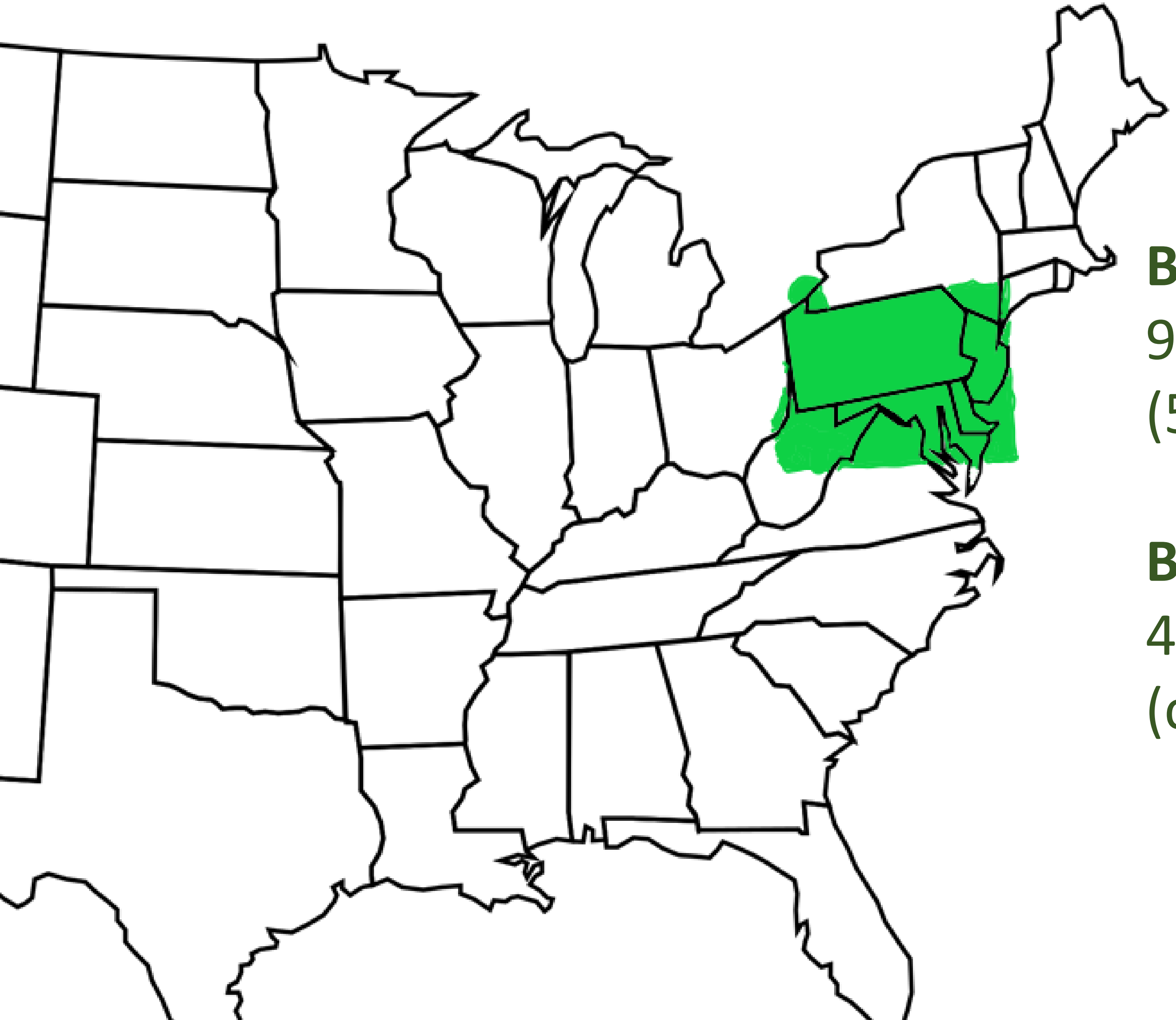


OREGON DEPARTMENT OF ENERGY

Oregon Overview

Farm west of Salem, Oregon

Oregon is big…

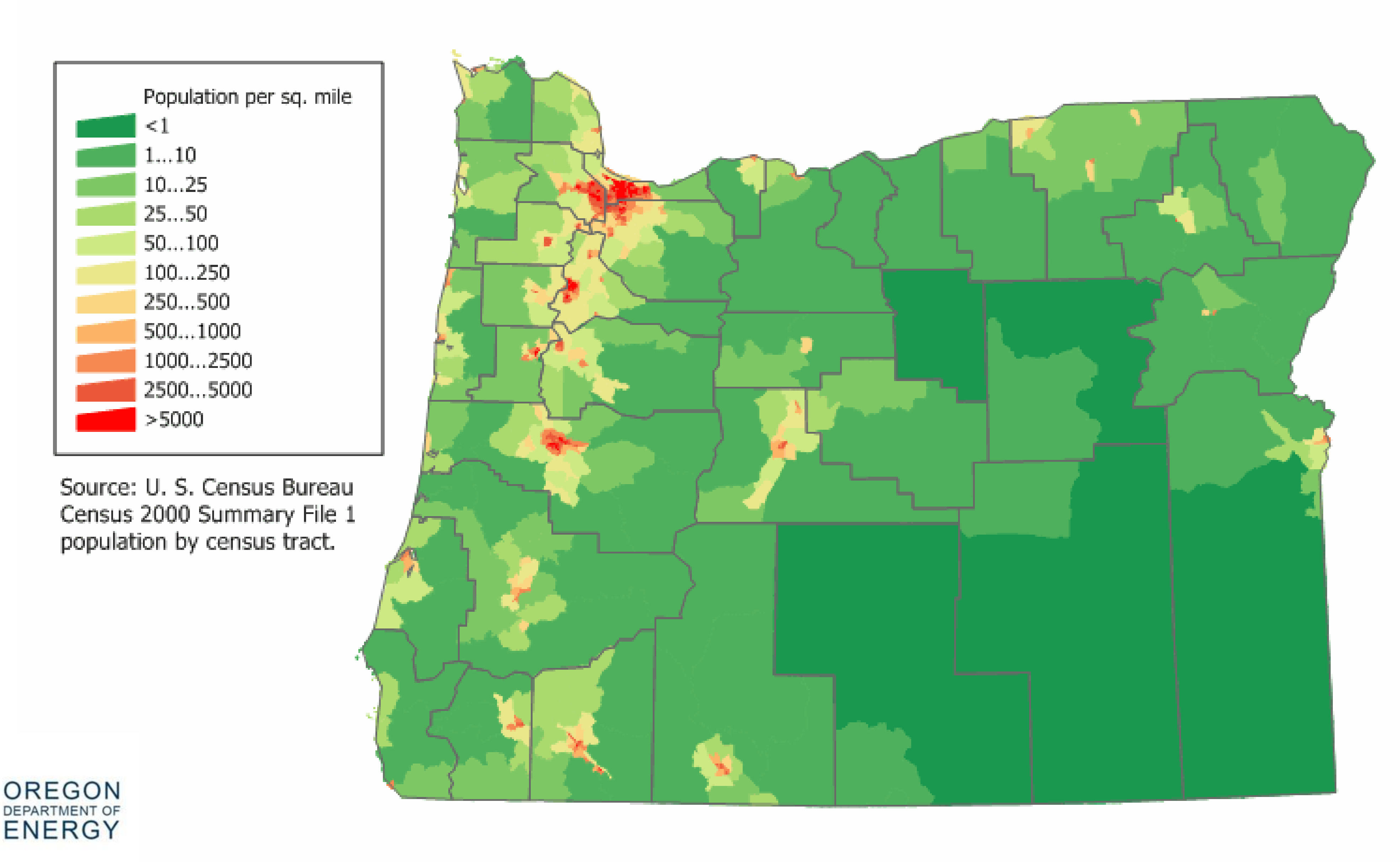


By Land Area:
98,000 sq. miles
(5% larger than PA+NJ+MD+DE+WV)

By Population:
4.2 million people
(compared to 30.4 million—7x more)

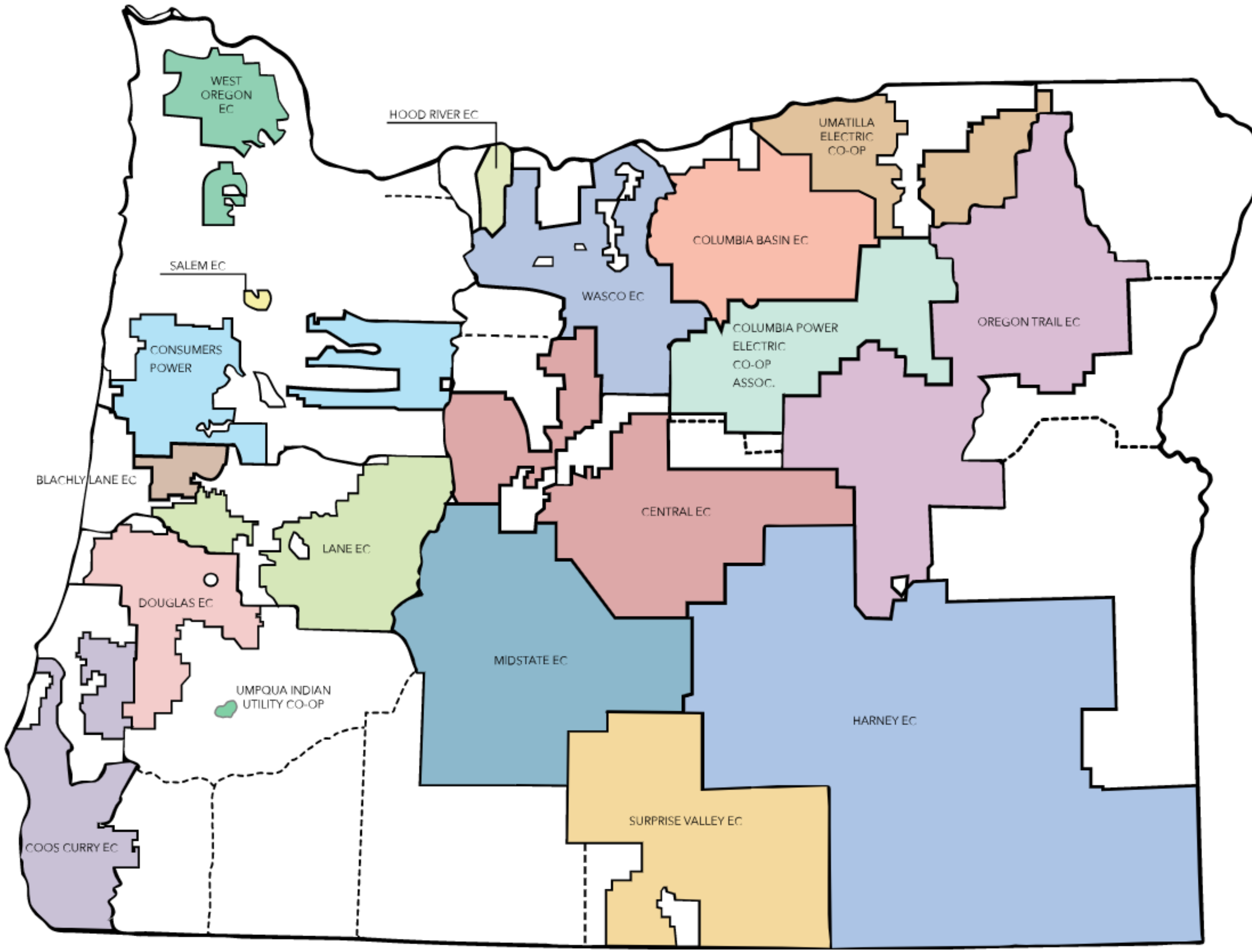
OREGON DEPARTMENT OF ENERGY

…and most of Oregon is rural



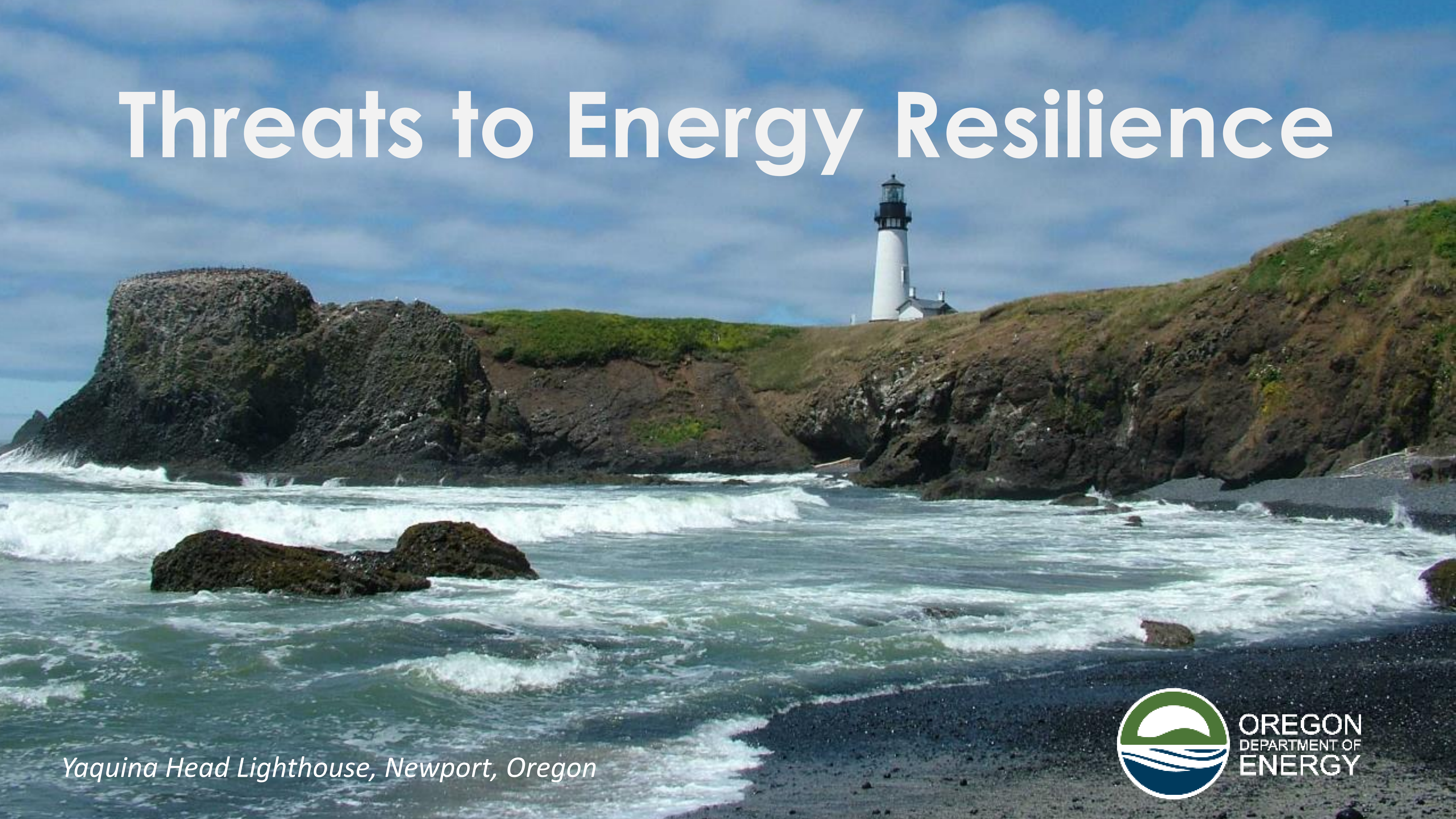
Rural Electric Cooperatives in Oregon

- 18 rural electric cooperatives serve 210,000 customers (~10% of state)
  - Average = 11,500 customers
  - Half serve < 5,000



OREGON DEPARTMENT OF ENERGY

Threats to Energy Resilience



Yaquina Head Lighthouse, Newport, Oregon

Why resilience?

statesman journal

PART OF THE USA TODAY NETWORK

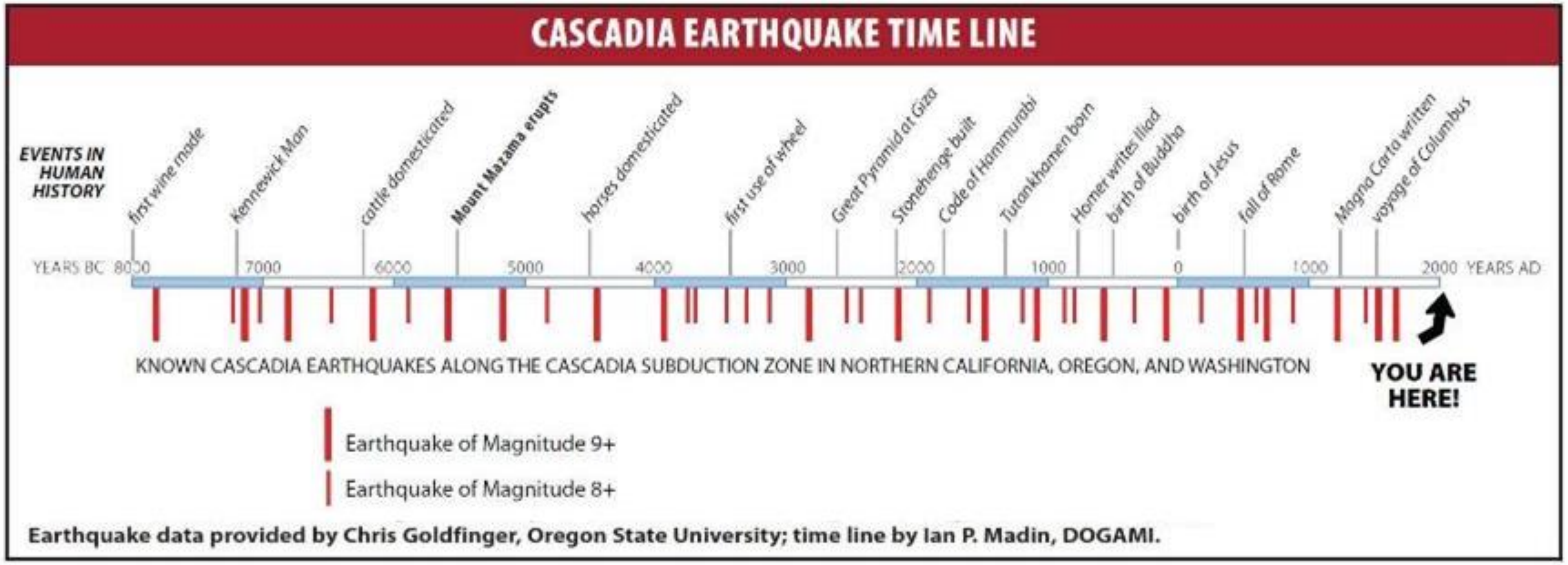
Jun 14, 2019 | Pacific Power will consider shutting off power in Oregon to avoid wildfires in 'extreme weather'

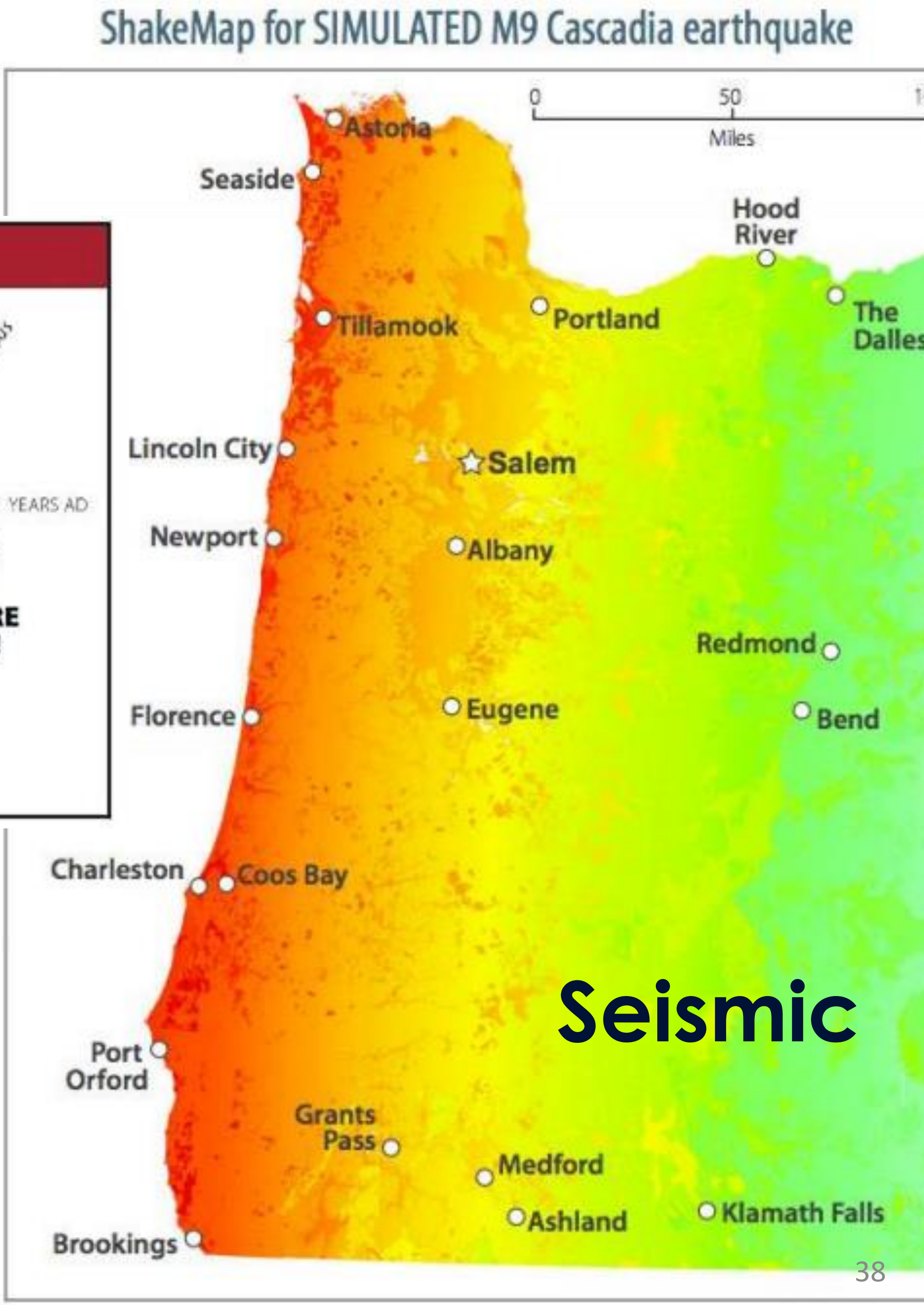
OPB

Mar 7, 2019 | When Disaster Struck, This Tiny Oregon Town Was Out On Its Own

“. . .it will take millions of dollars to repair the sewer and water systems for this town [Elkton] of 200 people. And the local utility company, Douglas Electric Cooperative, is looking at about $6 million in damages. Nine days after the storm, about 4,600 of its customers didn’t have electricity. . .”

Why resilience?



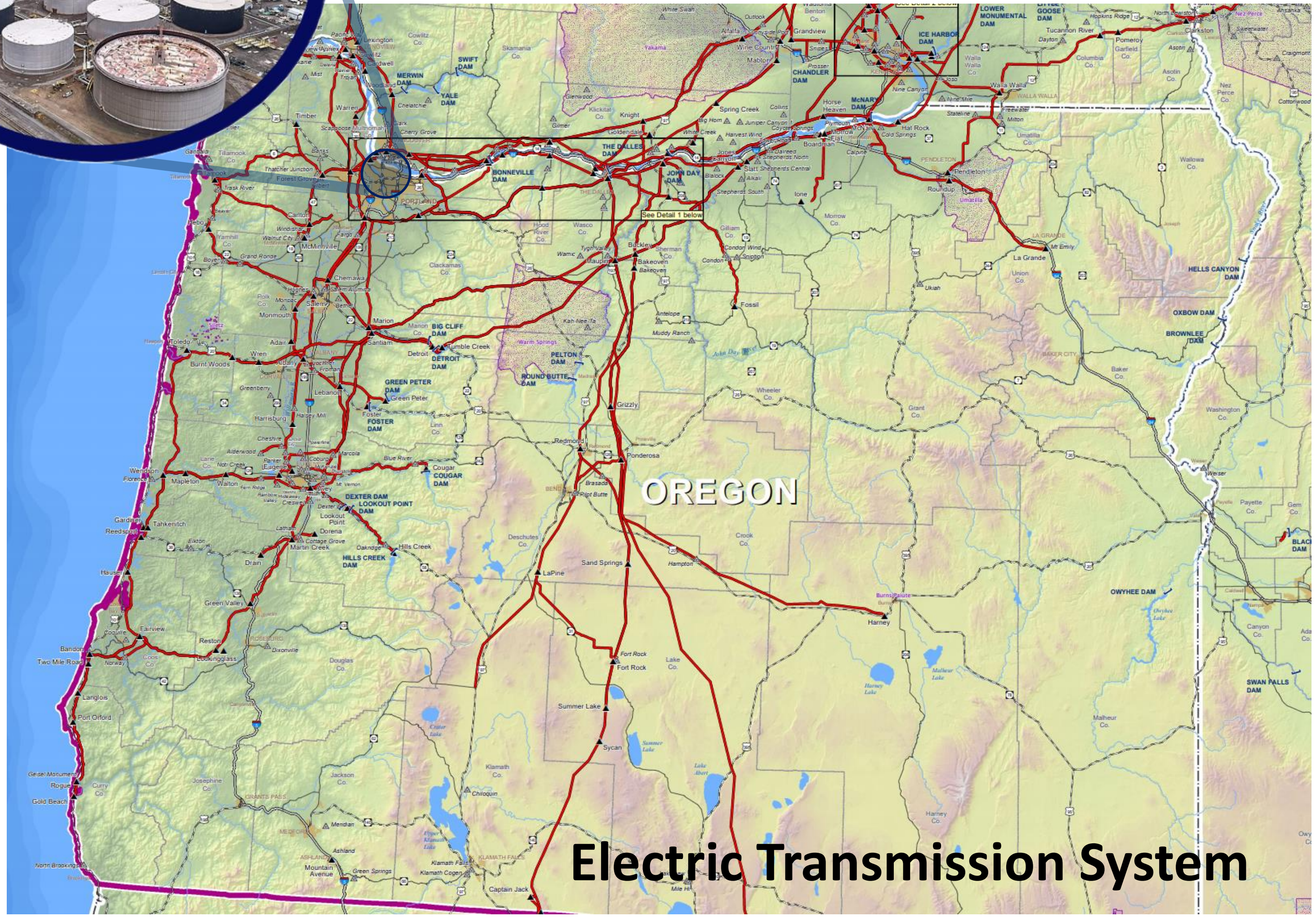


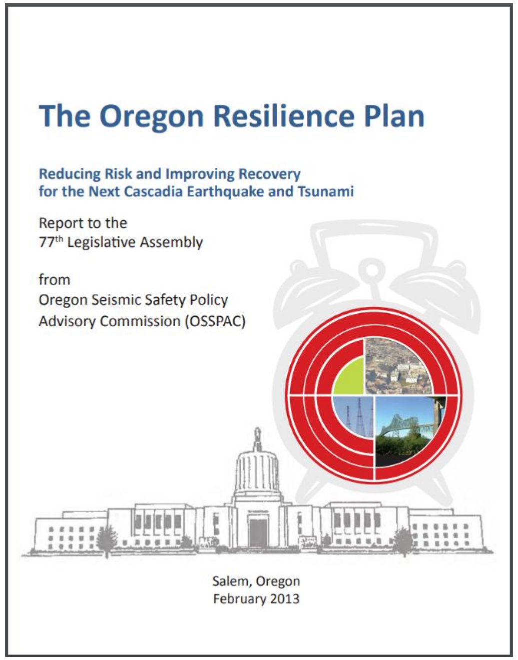
Seismic

Sep 15, 2016 | Unprepared: Will we be ready for the megaquake in Oregon? (video)

OREGON DEPARTMENT OF ENERGY

Why resilience?




The Oregon Resilience Plan

Reducing Risk and Improving Recovery
for the Next Cascadia Earthquake and Tsunami

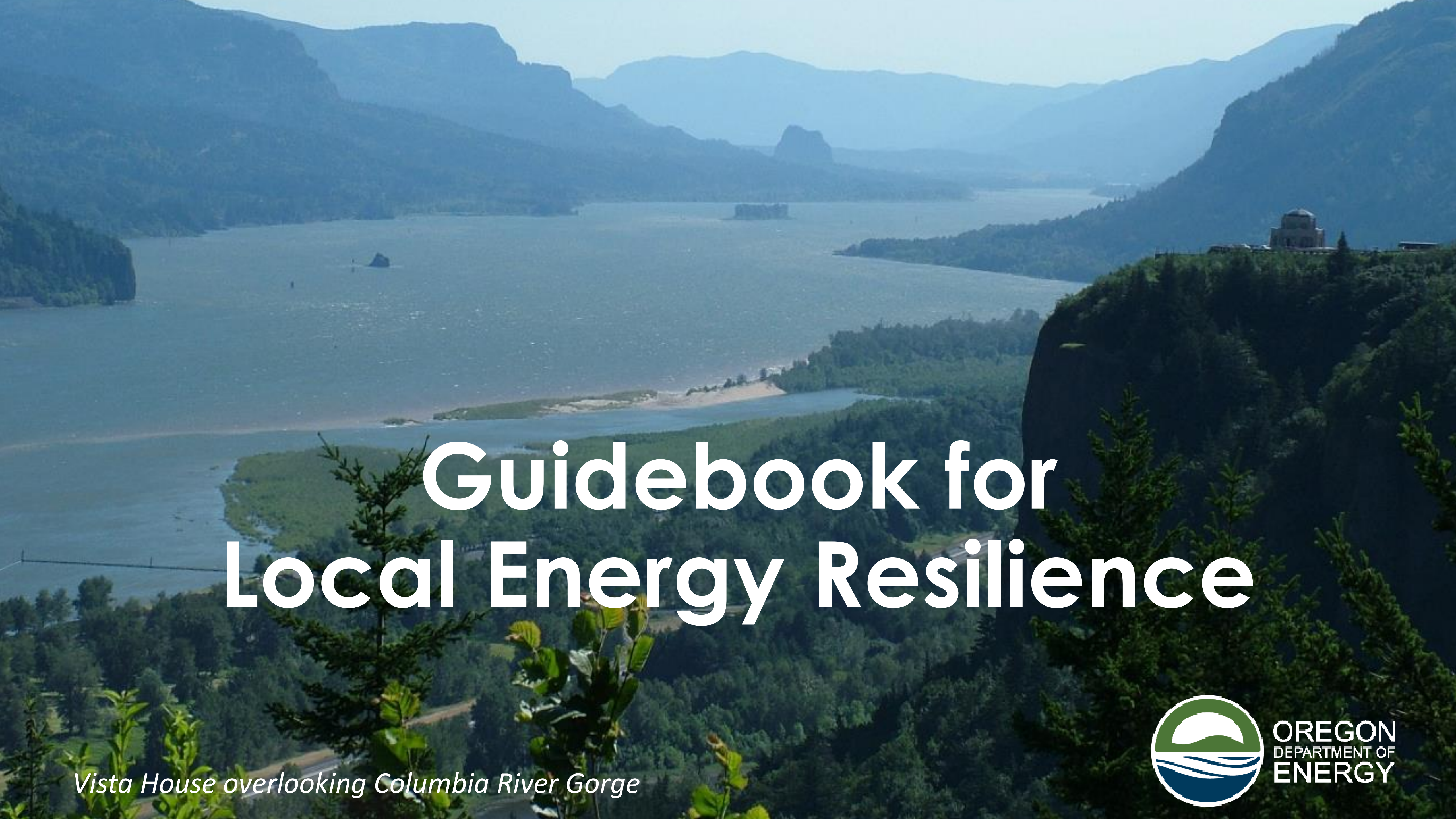
Report to the
77th Legislative Assembly

from
Oregon Seismic Safety Policy
Advisory Commission (OSSPAC)

Salem, Oregon
February 2013

- **Coast:** 6 months to a year to restore to 90% operation
- **Willamette Valley:** Up to 3 months to restore to 90%

Guidebook for Local Energy Resilience



Vista House overlooking Columbia River Gorge

Oregon Guidebook for Local Energy Resilience

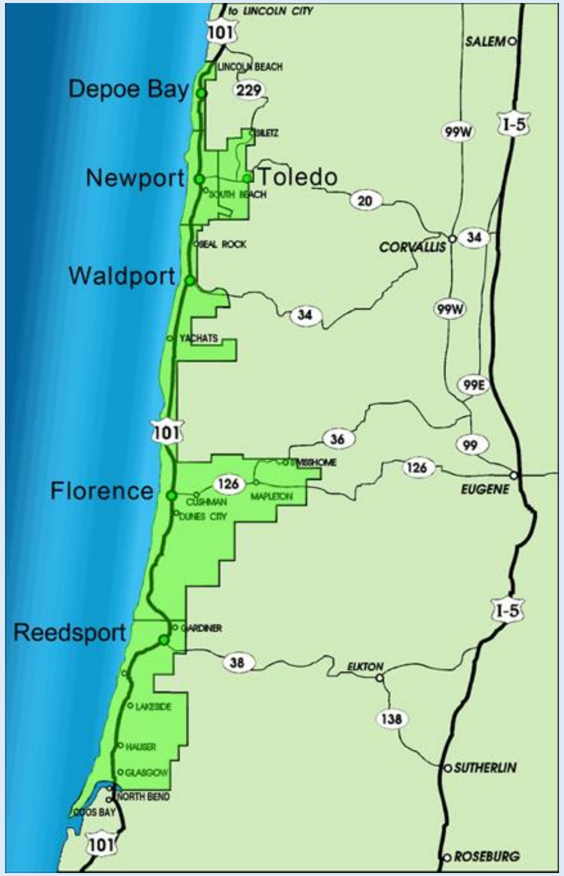
- NGA sponsored Policy Academy 2017-18
- Developed in partnership with a public utility on Oregon's central coast

NGA
NATIONAL GOVERNORS ASSOCIATION

STATE OF OREGON 1859

OREGON DEPARTMENT OF ENERGY

CENTRAL LINCOLN
A COMMUNITY-OWNED ELECTRIC UTILITY



Yaquina Bay Bridge, Newport, OR

Guidebook for Local Energy Resilience

1. Business Continuity Planning
2. Community Energy Resilience
3. Federal & State Emergency Planning

Utility Checklists: Local Energy Resilience Planning

These checklists can be used as quick reference guides for consumer-owned utility staff who are developing local energy resilience plans. As noted in the introduction to this guidebook, these are only recommendations and suggestions to help utilities improve local energy resilience.

Take Action

Preparation

Assessment of Resilience Threats

- ☐ Identify specific resilience threats in the utility's service territory
- ☐ Evaluate the likelihood of occurrence of potential resilience threats
- ☐ Identify impacts expected to the utility and local communities, including severity and duration
- ☐ Assess dependency of the utility and local communities on the state's bulk energy systems and how impacts could have local effects

Evaluate Local Resources

- ☐ Identify utility-owned local generation sources and whether those sources can "blackstart"
- ☐ Identify which of the utility's customers already have on-site generation capabilities
- ☐ Develop a technical assessment of the potential for new distributed generation resources
- ☐ Identify existing energy storage capabilities within the utility's service territory and the potential to develop more
- ☐ Conduct technical assessment to identify necessary investments required to segment or island portions of the distribution system

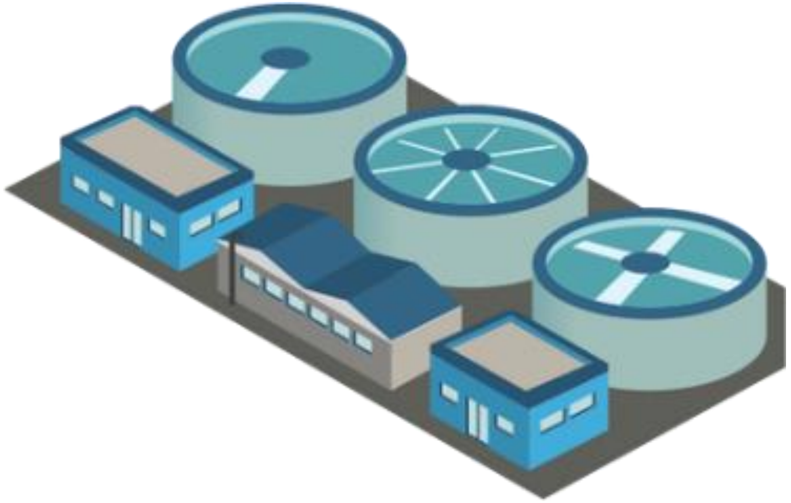
OREGON DEPARTMENT OF ENERGY

2

Community Energy Resilience

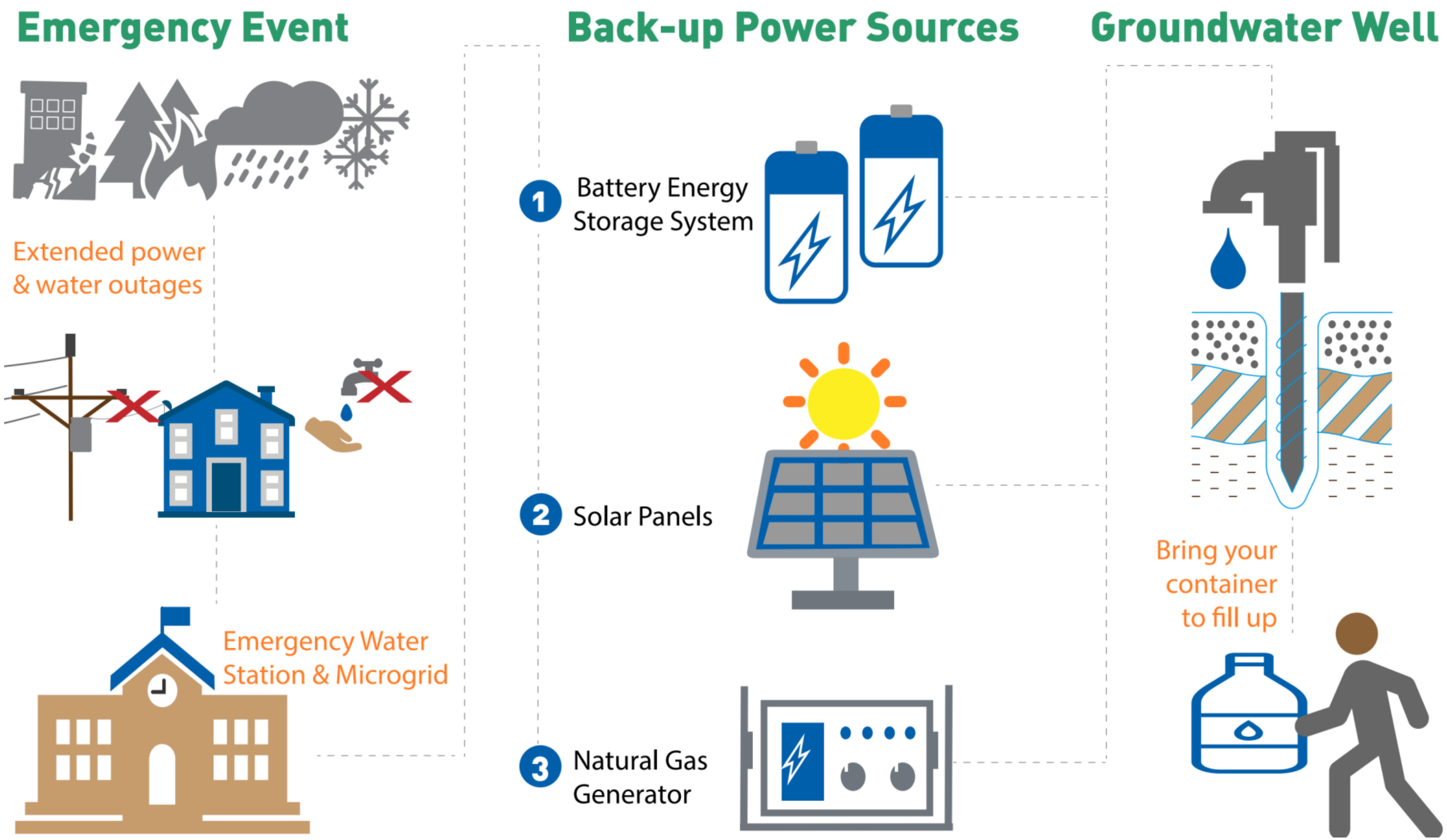
“The ability of a specific community **to maintain the availability of energy needed to support the provision of energy-dependent critical public services** to the community following non-routine disruptions of severe impact or duration to the state’s broader energy systems.”

2 Community Energy Resilience



OREGON
DEPARTMENT OF
ENERGY

2 Community Energy Resilience

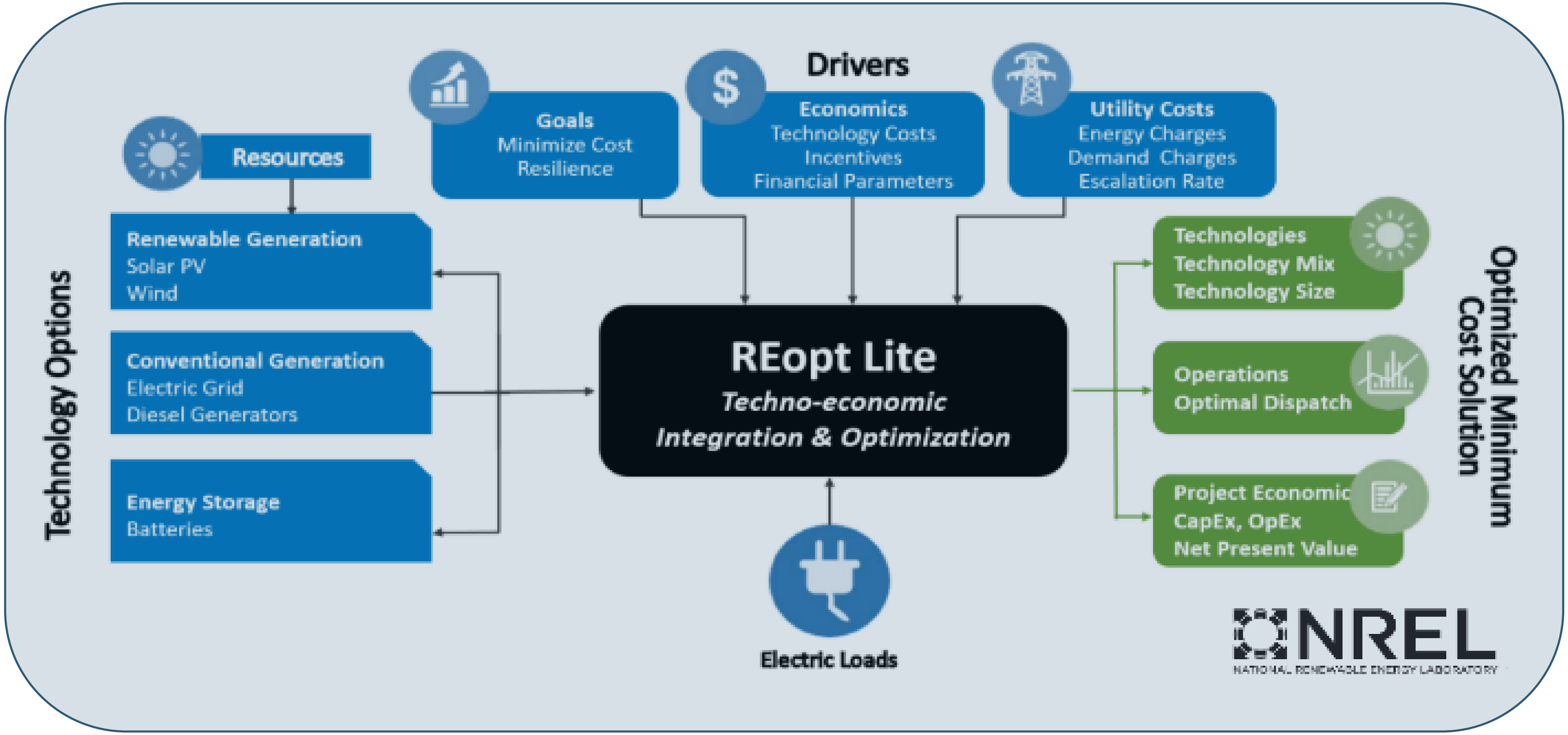


EWEB

Emergency Water Station & Microgrid (Howard Elementary)

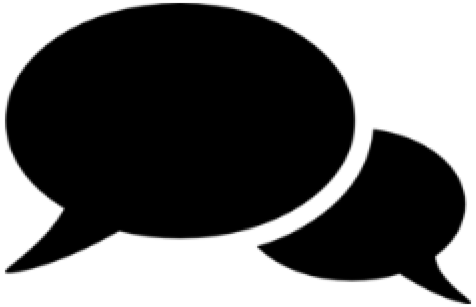
2 Community Energy Resilience

Free Tools Available from National Labs:



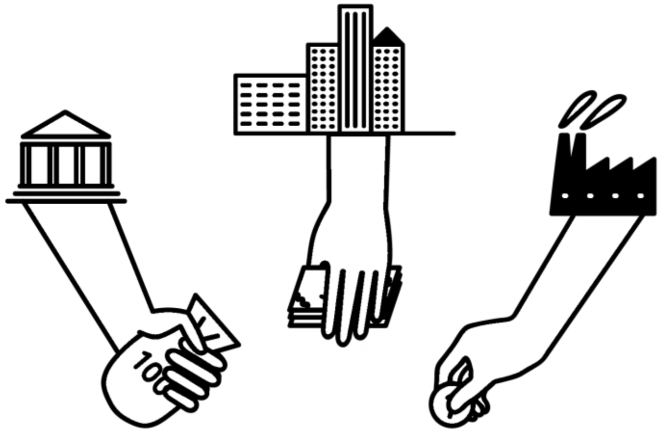
OREGON DEPARTMENT OF ENERGY

Next Steps



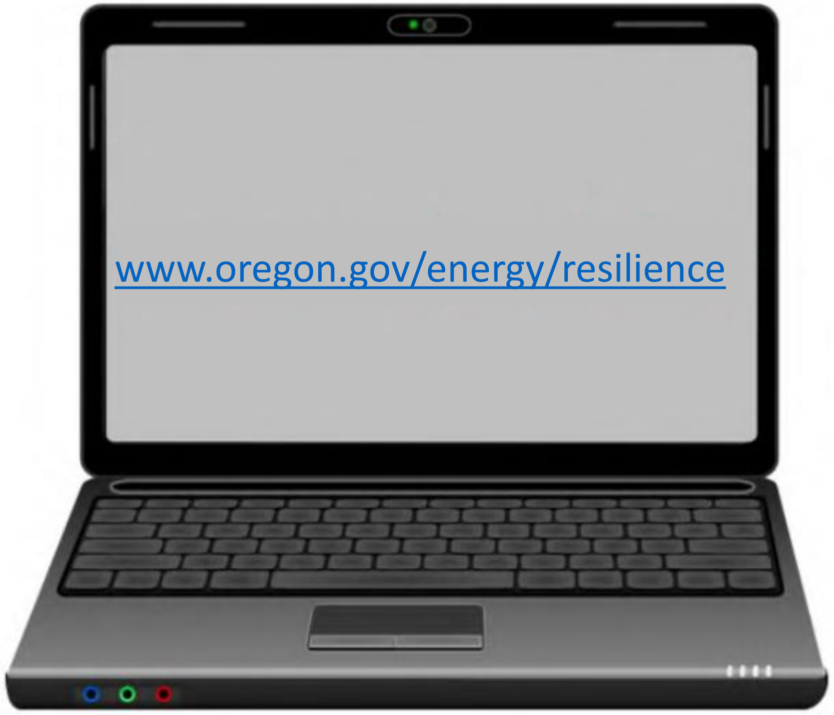
Continuing the Conversation: Expand the conversation with more utilities and local governments

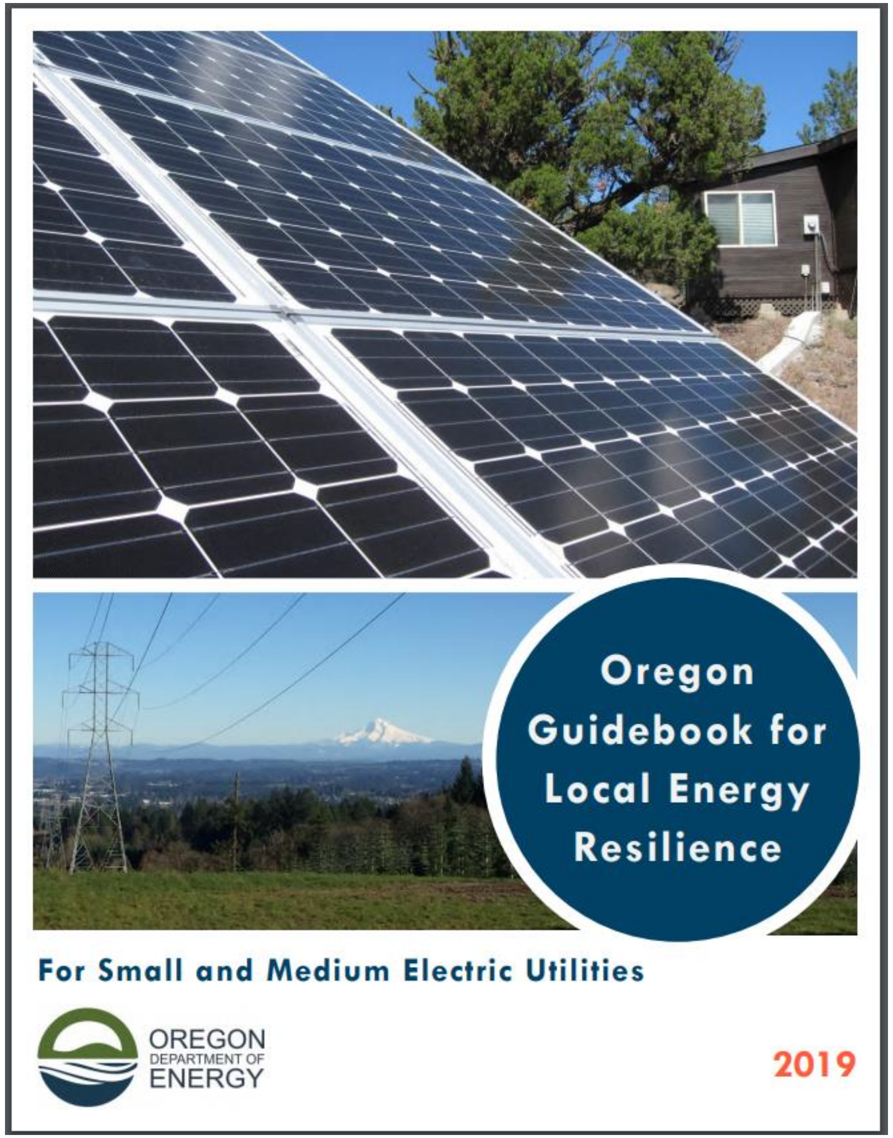
Valuation Framework: Technical assistance to develop a framework for quantifying the value of resilience benefits



Funding Mechanisms: Identify multiple funding streams to allocate the costs of diverse resilience benefits

Guidebook Available Online





OREGON
DEPARTMENT OF
ENERGY

Thank you!

Adam Schultz

Senior Policy Analyst

Oregon Department of Energy

adam.schultz@oregon.gov

(503) 580-1398

Harney County, Oregon

OREGON DEPARTMENT OF ENERGY