Welcome!

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GridWise Alliance Member's Breakfast Meeting

Karen Wayland
CEO, GridWise Alliance

K. Malaika Walton
Program and Membership Director, GridWise Alliance

Richie O'Neill
Executive Director, GridWise Alliance

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Prosumers Driving Markets – BTM Integration

Al Koeckeritz
Manager Advanced Concepts and Energy Management and Control, Otter Tail Power

Colin Gibbs
VP Energy Services, Sense

Jonathan Staab
Director, Product Management, Landis+Gyr

Danielle Sass Brynett
Director, Center for Partnerships & Innovation, NARUC

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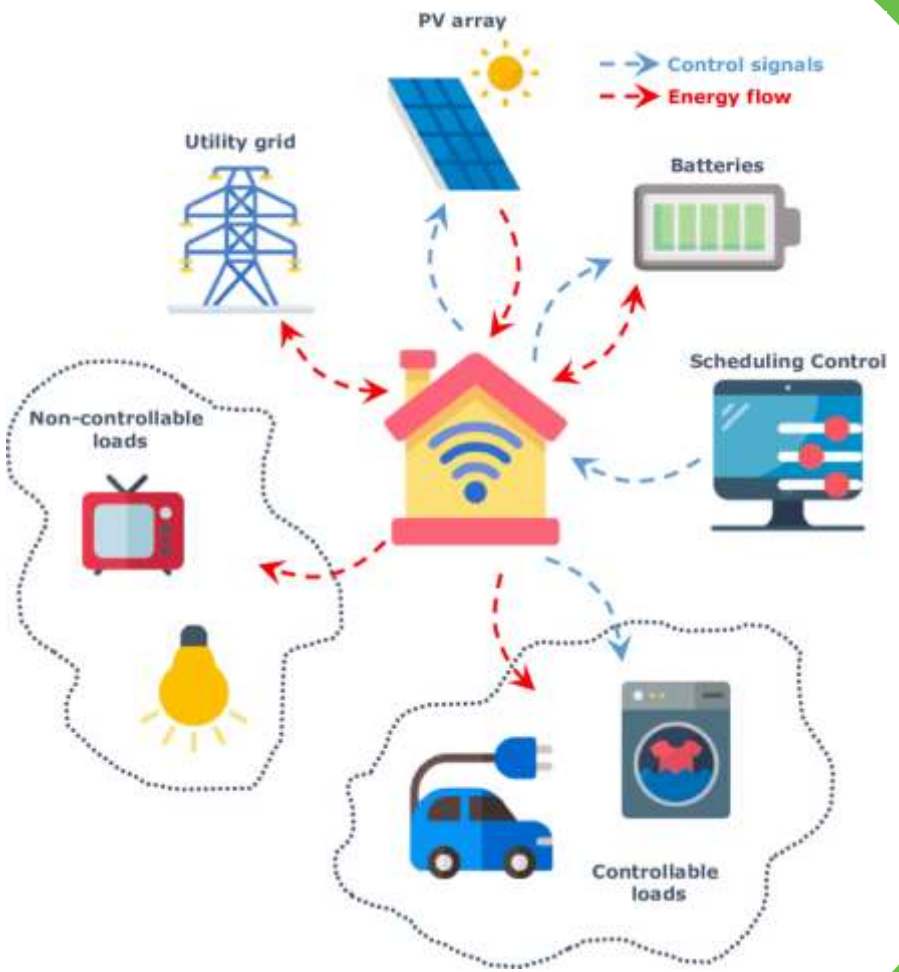


Prosumers driving markets: BTM integration

December 6, 2022

Openin g remarks

Danielle Sass Brynett

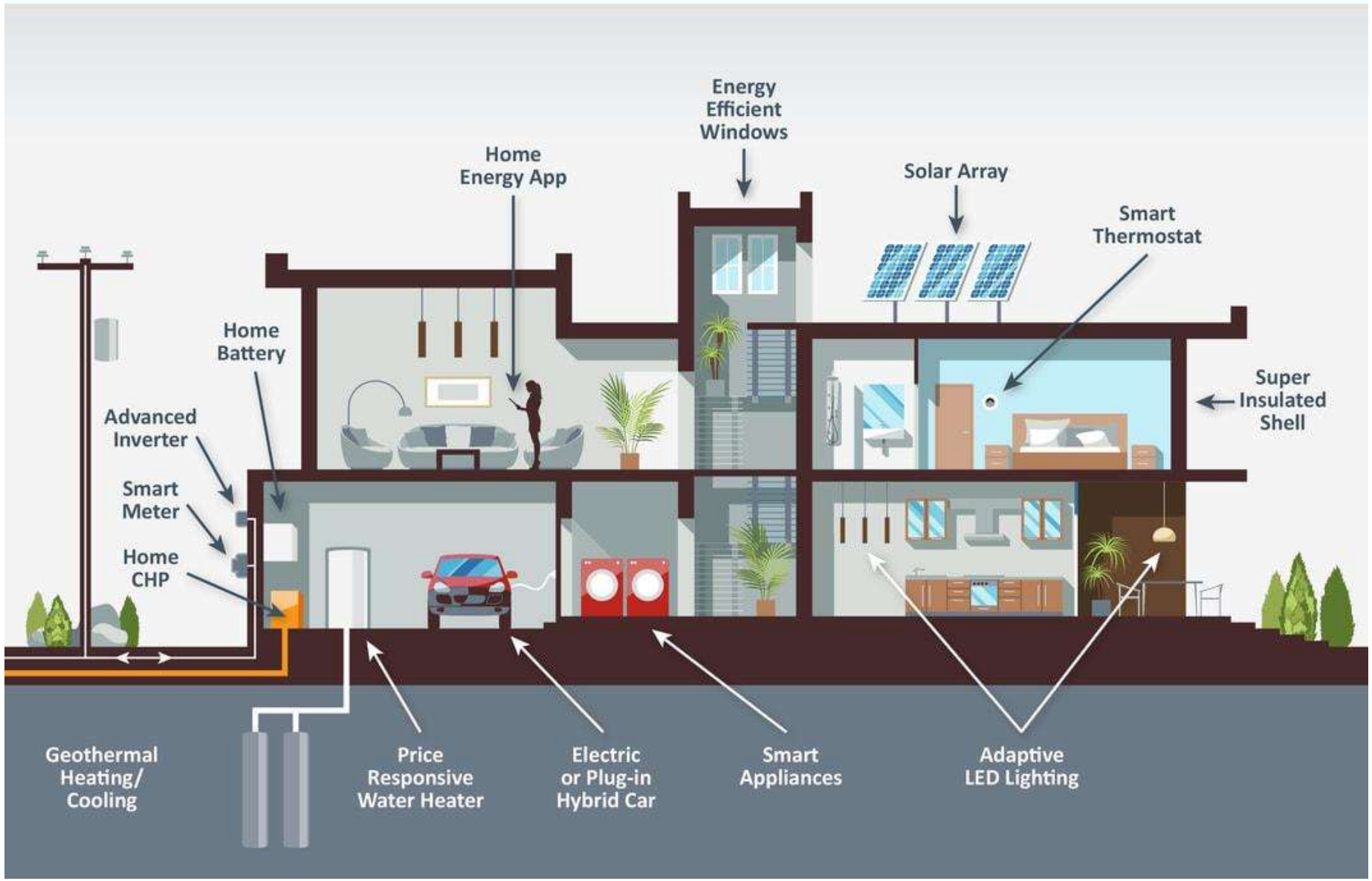
Director, Center for Partnerships & Innovation

NARUC

National Association of Regulatory Utility Commissioners

House of the Future

enerdynamics
The Energy Education Experts



Landis+Gyr

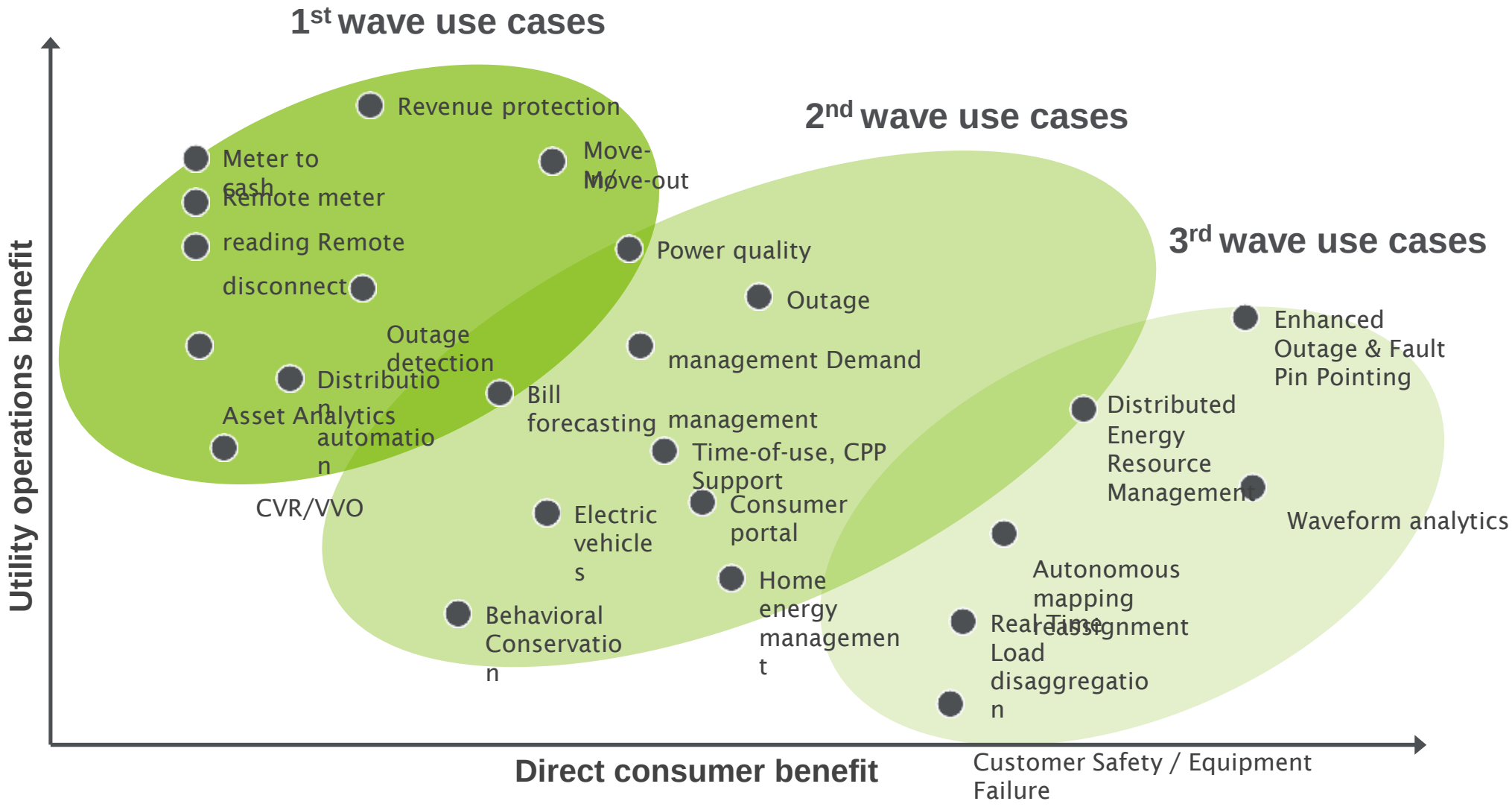
The Prosumer + Energy Management

Evolution of AMI in utility value use cases

AMI use cases now include direct consumer benefits, heavily expanded in the 2nd wave of adoption, in addition to operational benefits from 1st wave.

Intelligence at the grid edge is fundamental to the enablement of these 2nd wave use cases.

Revelo™ is a foundational and unique technology enabling the 3rd wave of use cases and benefits.

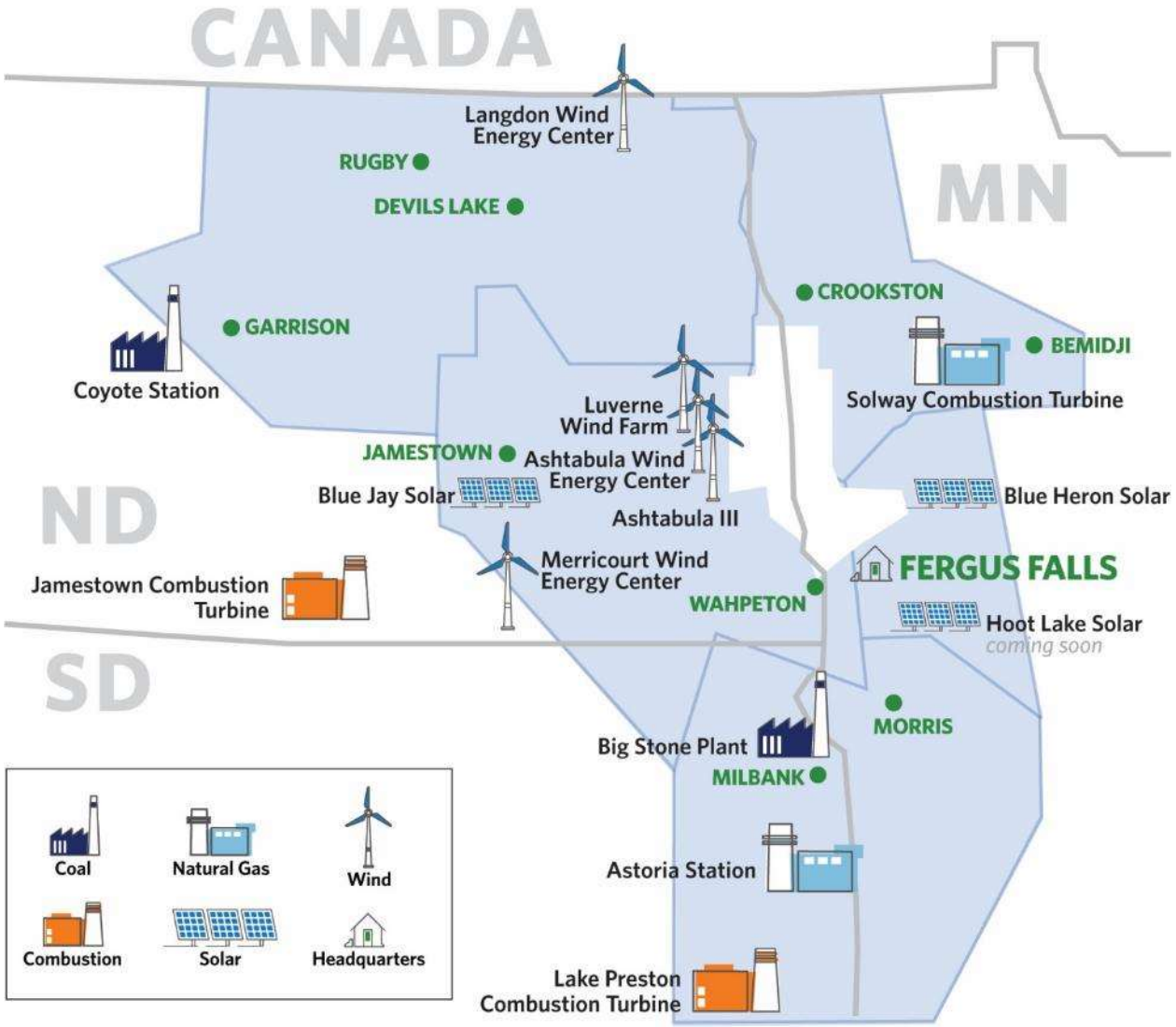


Demonstration
By

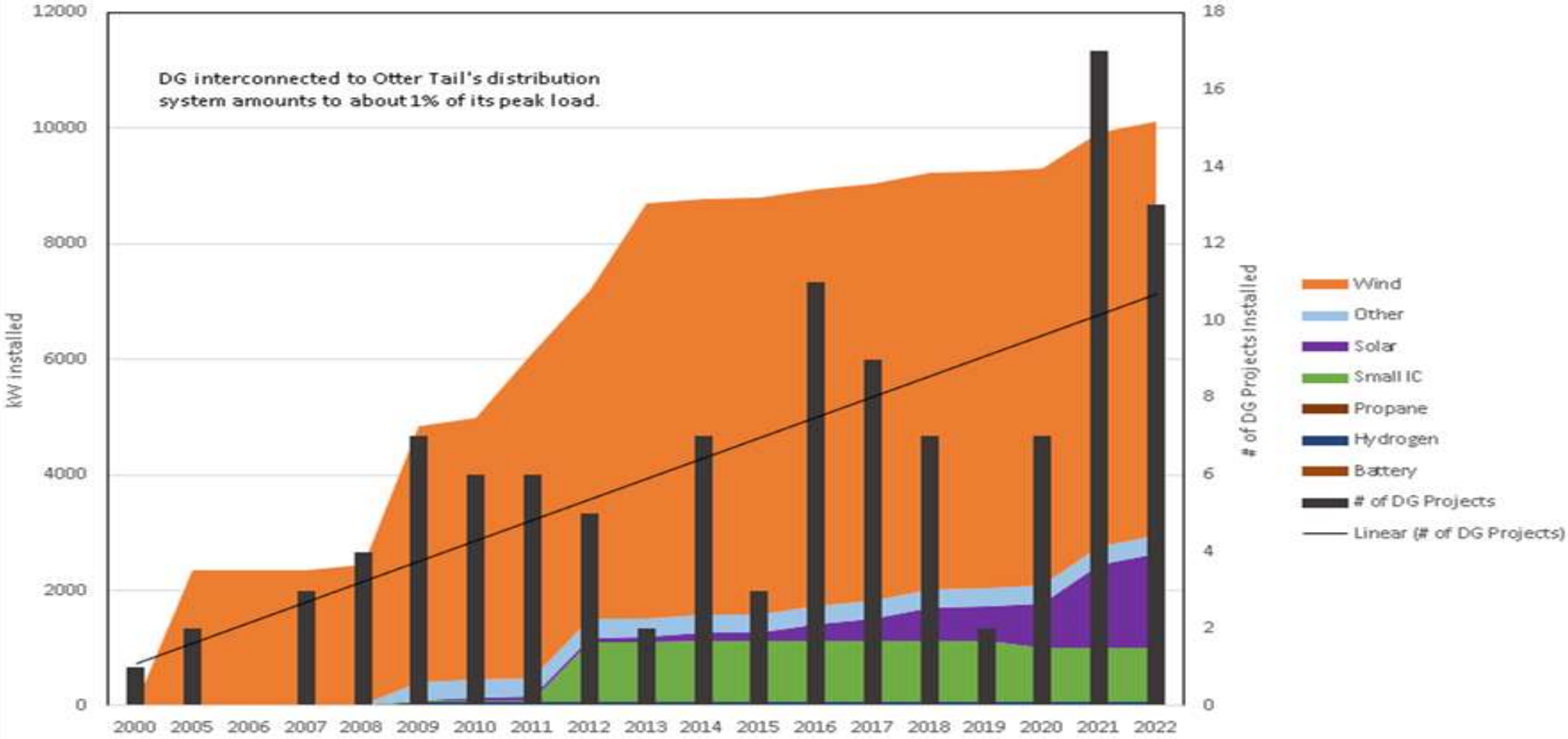
gridCONNEXT 2022

December 2022

OTTER TAIL POWER COMPANY OVERVIEW



OTTER TAIL POWER DISTRIBUTED GENERATION



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Opening Energy Markets – Utility Scale Grid Integration

Hani Alarian
Executive Director of Power Systems Technology Operations, California ISO

Mark Gabriel
President and CEO, United Power

Larry Bekkedahl
SVP Advanced Energy Delivery, Portland General Electric

Ann Moore
Industry Principal, AVEVA

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Challenges and Opportunities in Running the Grid with DER and VER

GridCONNEXT, DC, Dec. 6, 2022

Hani Alarian

Executive Director, Power Systems Technology Operations

California ISO

gridCONNEXT® 2022

California ISO facts

As a federally regulated nonprofit organization, the ISO manages the high-voltage electric grid California and a portion of Nevada.

52,061 MW record peak demand Sept. 6, 2022)

224.8 million megawatt-hours of electricity delivered (2020)

75,747 MW power plant capacity

Source: California Energy Commission

1,119 power plants

Source: California Energy Commission

32 million people served

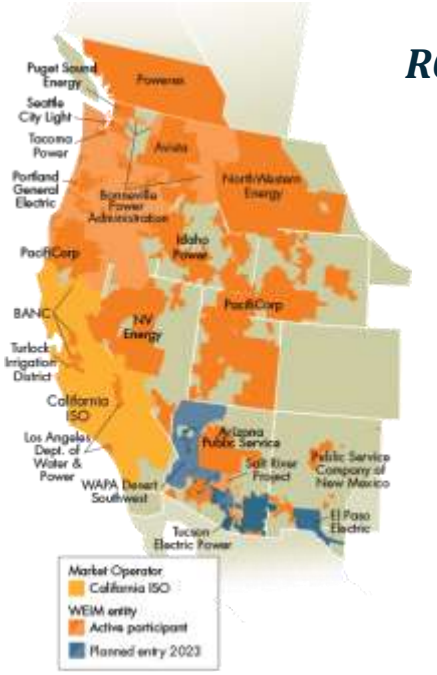
One of **9** ISO/RTOs in North America

What is CAISO?

- A Balancing Area Authority (**BAA**) with ~76,000 MW of power plant capacity (installed capacity), 52,061 MW record peak demand (Sep 6, 2022), 32 million people served
- Western Energy Imbalance Market (**WEIM**) has 20 participants, additional 3 entities planned to join in 2023. More possible in the future.
- Serves as reliability coordinator (**RC West**) for 87% of WECC load (42 entities).

BAA

WEIM



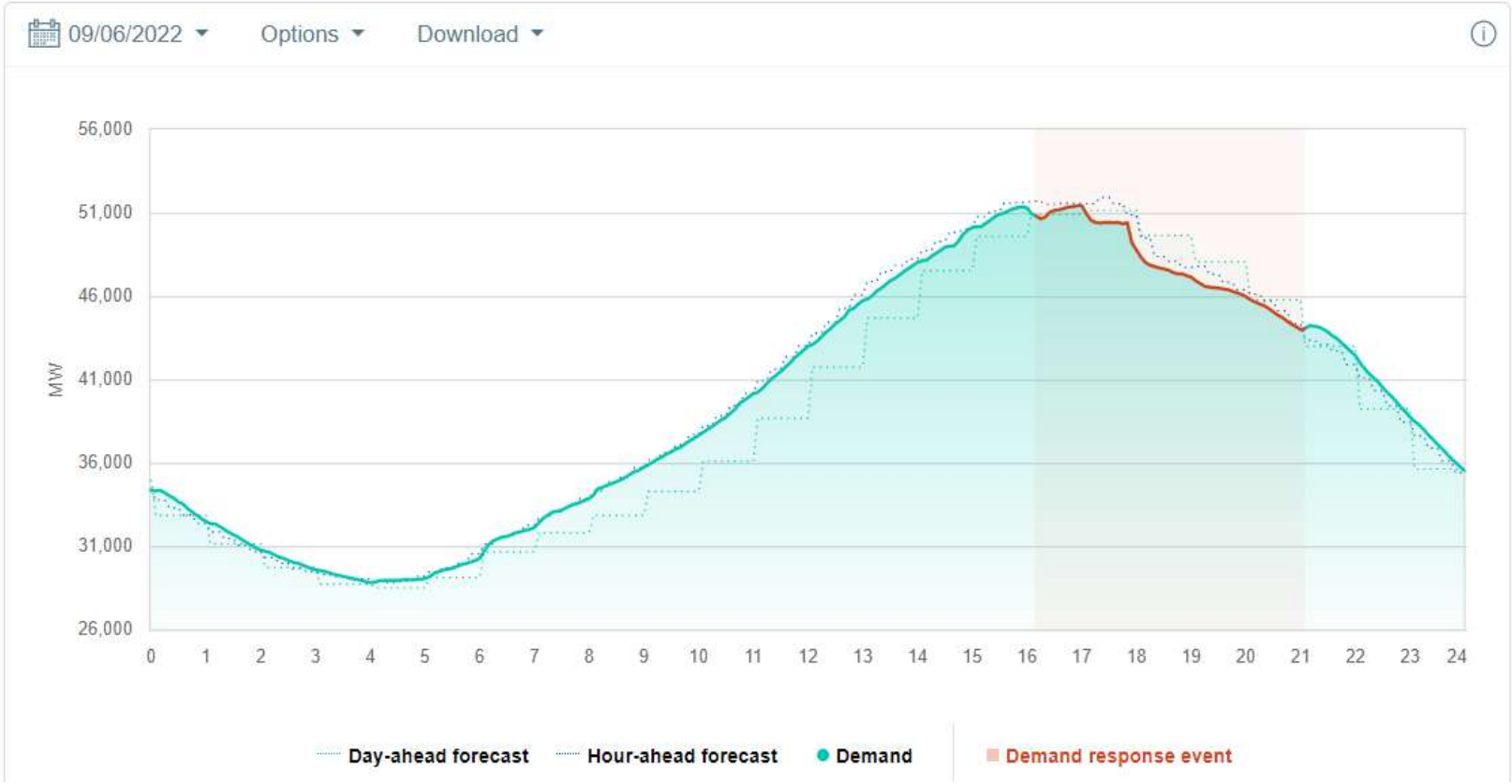
RC West

Managing an evolving grid

- Carbon-free power grid by 2045
- In May 2022, the grid was running on 103.5% renewable energy compared to demand, a record.
- WEIM saved $2.91B and 781,101 MTCO GHG since 2014
- Renewable Generation – Setting new peaks on a weekly base
  - Wind (>6,400 MW peak)
  - Solar (>14,300 MW peak)
  - Photovoltaic (PV) roof tops Behind The Meter (BTM) - 12,000 MW estimate
- Storage Devices (>3,100 MW in 2022 and >4,000 by 2023)
- Steepest ramp in 3 hours 17,660 MW – 100 MW/min average for 3 hours
- Higher expectation of security and reliability
- Amber Alert by the CA Governor worked

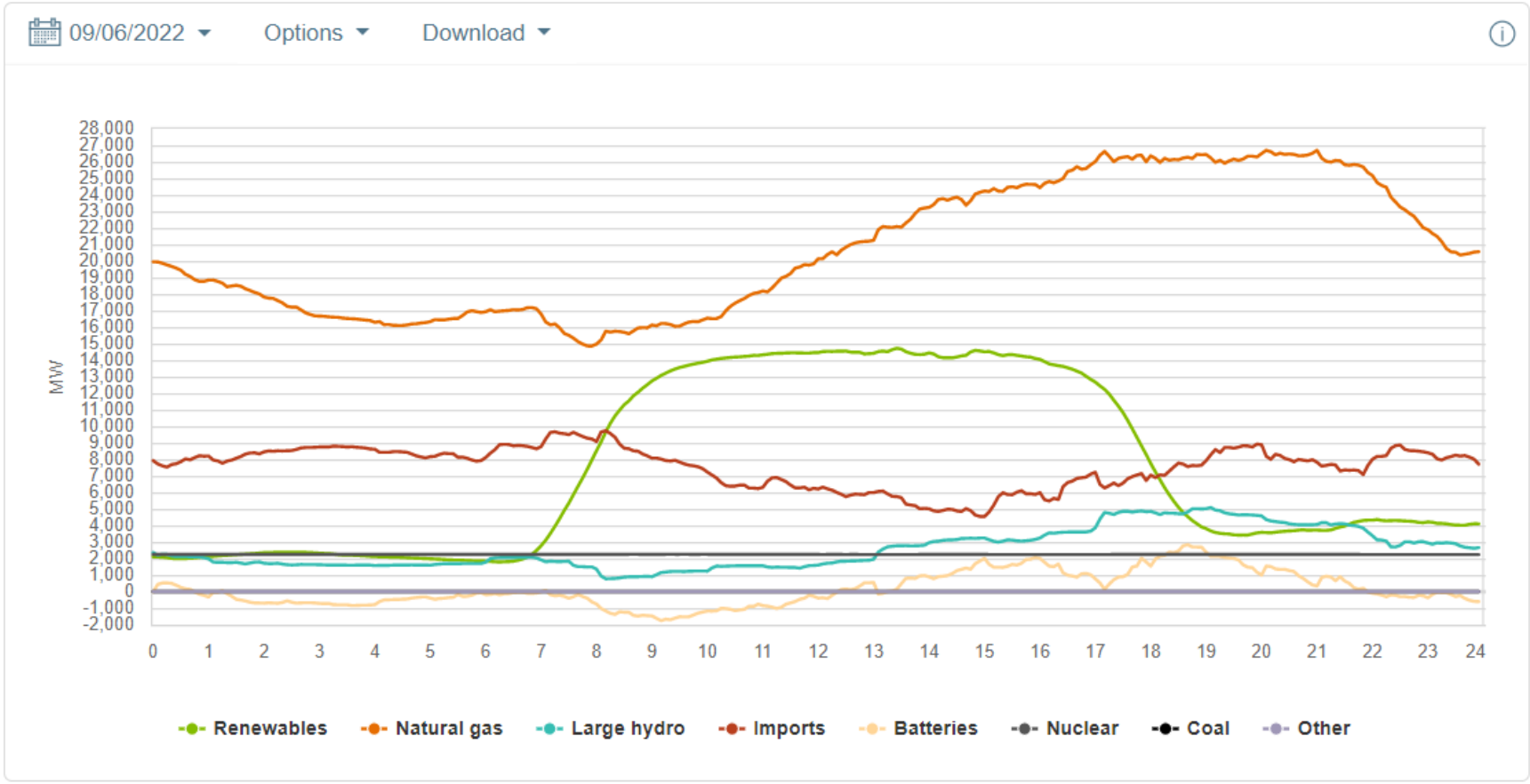
Demand trend

System demand, in megawatts, compared to the forecasted demand in 5-minute increments.



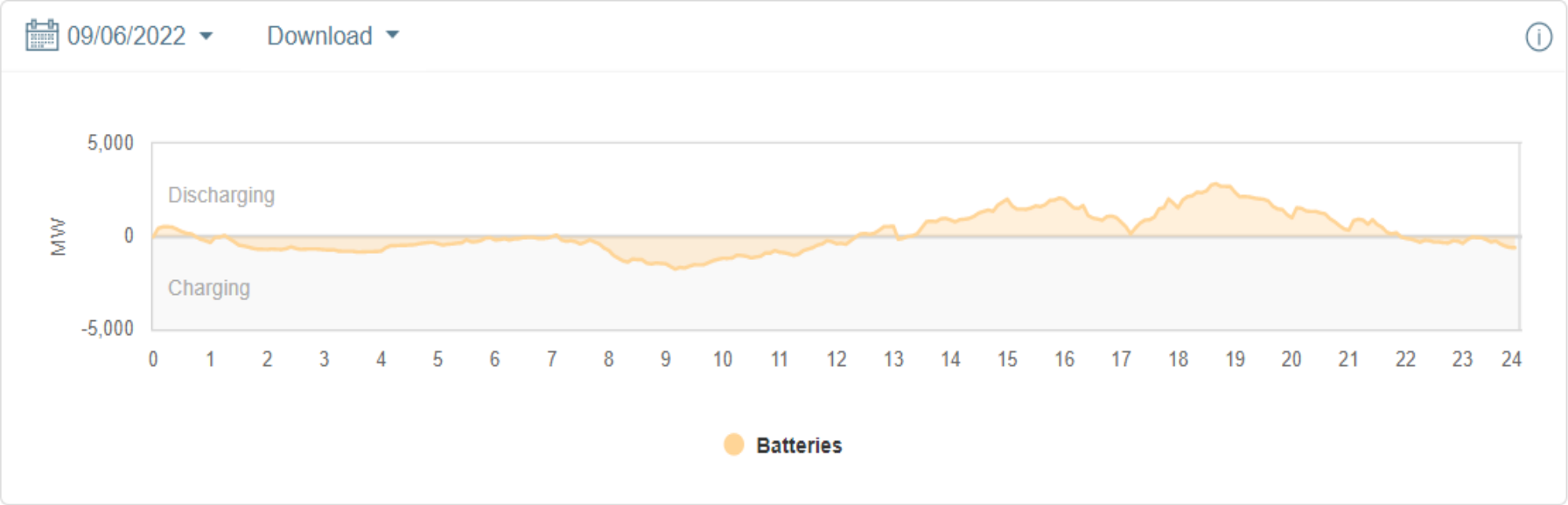
Supply trend

Energy in megawatts broken down by resource in 5-minute increments



Batteries trend

Energy in megawatts in 5-minute increments



Opening energy markets – utility scale integration

Mark A. Gabriel
President & Chief Executive Officer

Dec. 6, 2022

United Power

- Electric cooperative founded in 1938
- Smallest land mass co-op in Colorado at 900-square miles
- One of the fastest growing co-ops in the nation, serving 17 Denver metro area communities
- Second largest co-op in Colorado by meters: surpassed 100,000 meters in June 2021, the 31st co-op in the nation to reach this milestone
- Largest cooperative by load (19%)
- Third largest utility (by load) in Colorado

UNITED POWER
Your Touchstone Energy® Cooperative

Fundamental change

The challenge for the utility of today is not only what is real but what is perceived as real.

Societal changes

Close to home

- **5,800+** registered EVs and plug-in hybrids*
- **9,400+** members have solar rooftops
- **150+** battery walls in member homes
- System peak approaching **600 MW**

Source: EValuateCO, Oct. 27, 2022

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Choice vs. risk


UNITED
POWER

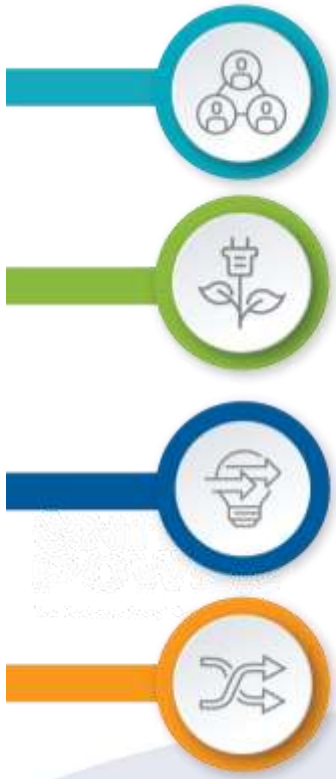
What does the future hold?

- Dramatic reduction in centralized generation
- Inability to construct transmission in time
- Moving to become a DSO (distribution system operator)
- Direct market interactions (FERC 2222)
- Being a network provider capturing and providing value to member

OUR COOPERATIVE ROADMAP

Transforming the Future

RELIABILITY | AFFORDABILITY | FLEXIBILITY | RESPONSIBILITY



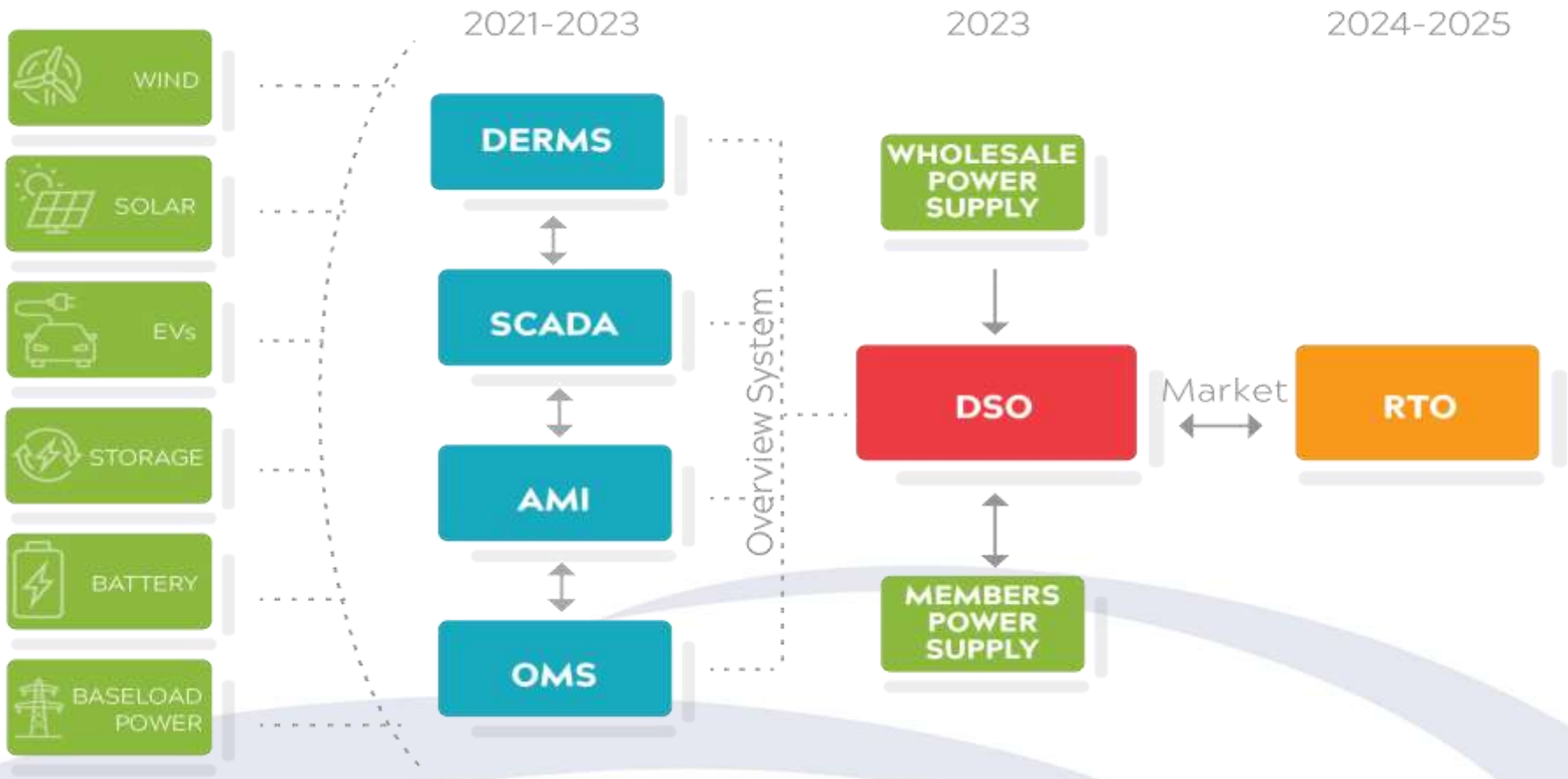
Empower and engage our membership and community.

Provide flexible, affordable, sustainable power, and services.

Continuously optimize our electric distribution system.

Achieve and maintain business agility and resilience through IT/OT and system operations synergy.

Taking a “no regrets” strategy



How can Colorado avoid mistakes in a new energy future?

- Join a power market sooner rather than later
- Fully and actively manage distribution systems
- Recognize the need for a balanced portfolio
- Physics, not politics

Radical thoughts

The kilowatt-hour is dead

Time-of-purchase
vs. time-of-use

All-you-can-eat energy

OUR COOPERATIVE ROADMAP | *Transforming the Future*

RELIABILITY AFFORDABILITY FLEXIBILITY RESPONSIBILITY

unitedpower.com/roadmap

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Your Touchstone Energy® Cooperative

Contact me

Mark A. Gabriel

President & Chief Executive Officer

303-637-1215

Mark Gabriel

mgabriel@unitedpower.com

unitedpower.com

@UnitedPowerCoop

United Power, Inc

UnitedPower

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Your Touchstone Energy® Cooperative

The Anatomy of a Utility Pole

Andrew Phillips
VP T&D Infrastructure, Electric Power Research Institute (EPRI)

Matt Fauver
Journeyman Lineman and Engineering and Operations Data Analyst, Rappahannock Electric Cooperative

Chad Newton
Senior Director for Wood Portfolio Services, Osmose

Carson Zerpa
Senior Business Growth Manager, Itron

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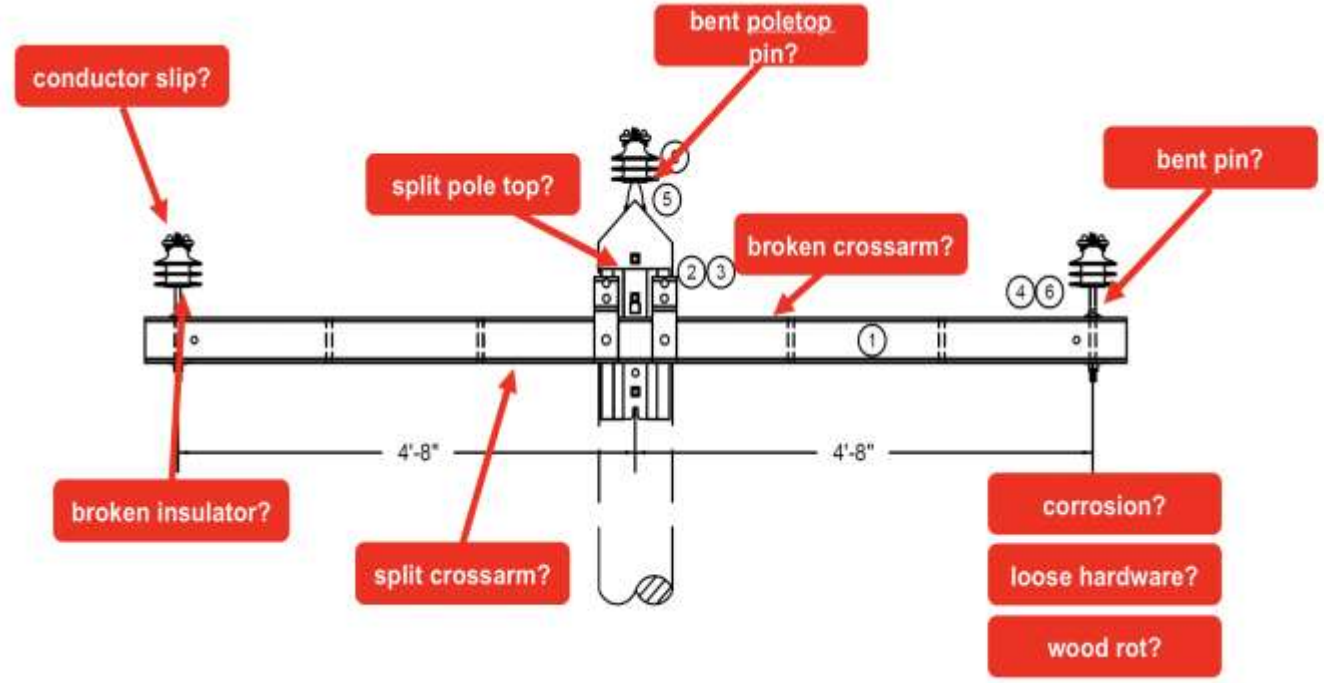
Resilient Distribution Structures

Dr. Andrew Phillips
Vice President, Transmission & Distribution Infrastructure

Why Resilient Design?



Falling trees and large branches greatly contribute toward structure damage

Our survey showed that it takes **24** hours to replace a broken pole but **6** to replace a failed cross-arm

What if we can make structures fail in locations where we want them to – so we don't have to replace the pole, just the cross-arm or hardware

We test structures to help improve design and make them more resilient

GRIDWISE ALLIANCE


Resilient Crossarm Construction

Impact of the research

13 utilities have tested, some multiple times

85+ structures tested

Dominion Energy Case Study on EPRI Journal

Projected Impact Measures from a Single US Utility

- 13 construction standards ***improved***
- 8 ***new*** construction standards
- ***>10%*** improvement in SAIDI

GRIDWISE ALLIANCE

Composite Structure Resilience

Potential Advantages

- Stronger poles and crossarms, more flexibility
- Engineered product
- Low-maintenance, long service life

Unknowns

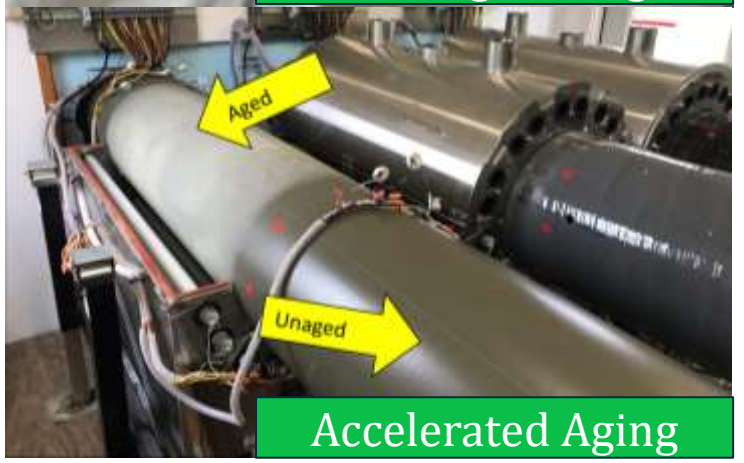
- Actual service life
- Susceptibility to damage during installation
- Susceptibility to damage from attachment interaction

What EPRI's doing

- Accelerated aging
- Strength testing
- Attachment interaction tests
- Hardware overtightening tests

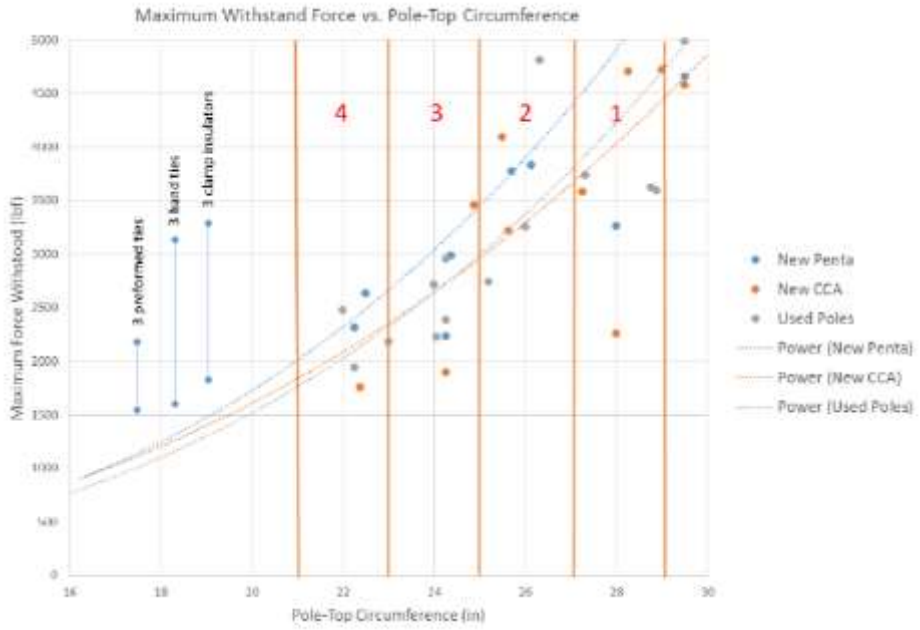
Attachment Damage

Overtightening



Accelerated Aging

Resilient Structures with Smaller Poles



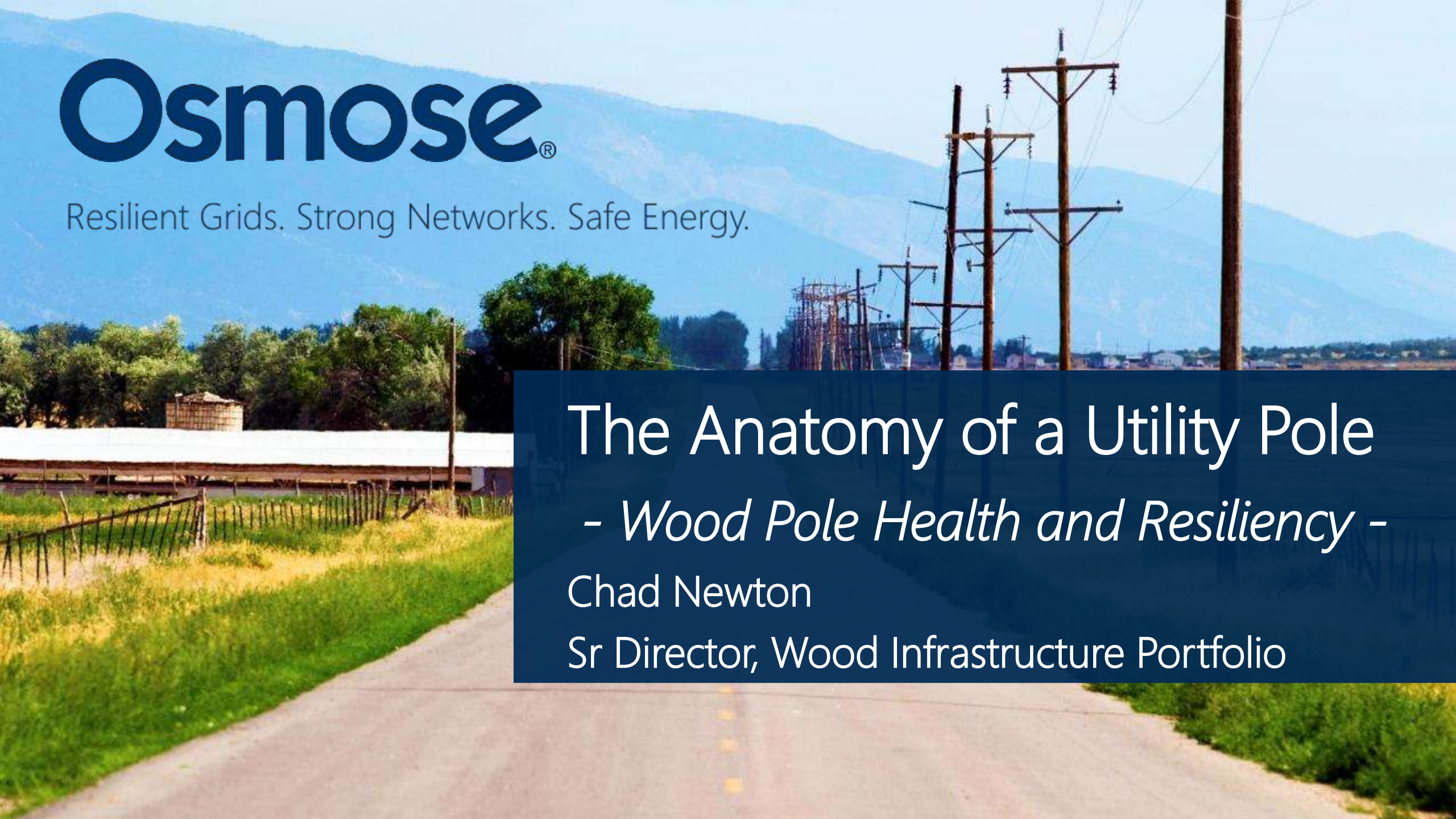
Larger poles take longer to grow, have long lead times, short supply

Smaller poles still available – EPRI testing structures that use class 4 poles

EPRI has conducted testing to help limit maximum force applied to pole top


Together...Shaping the Future of Energy®

Example Tests



The Anatomy of a Utility Pole

- Wood Pole Health and Resiliency -

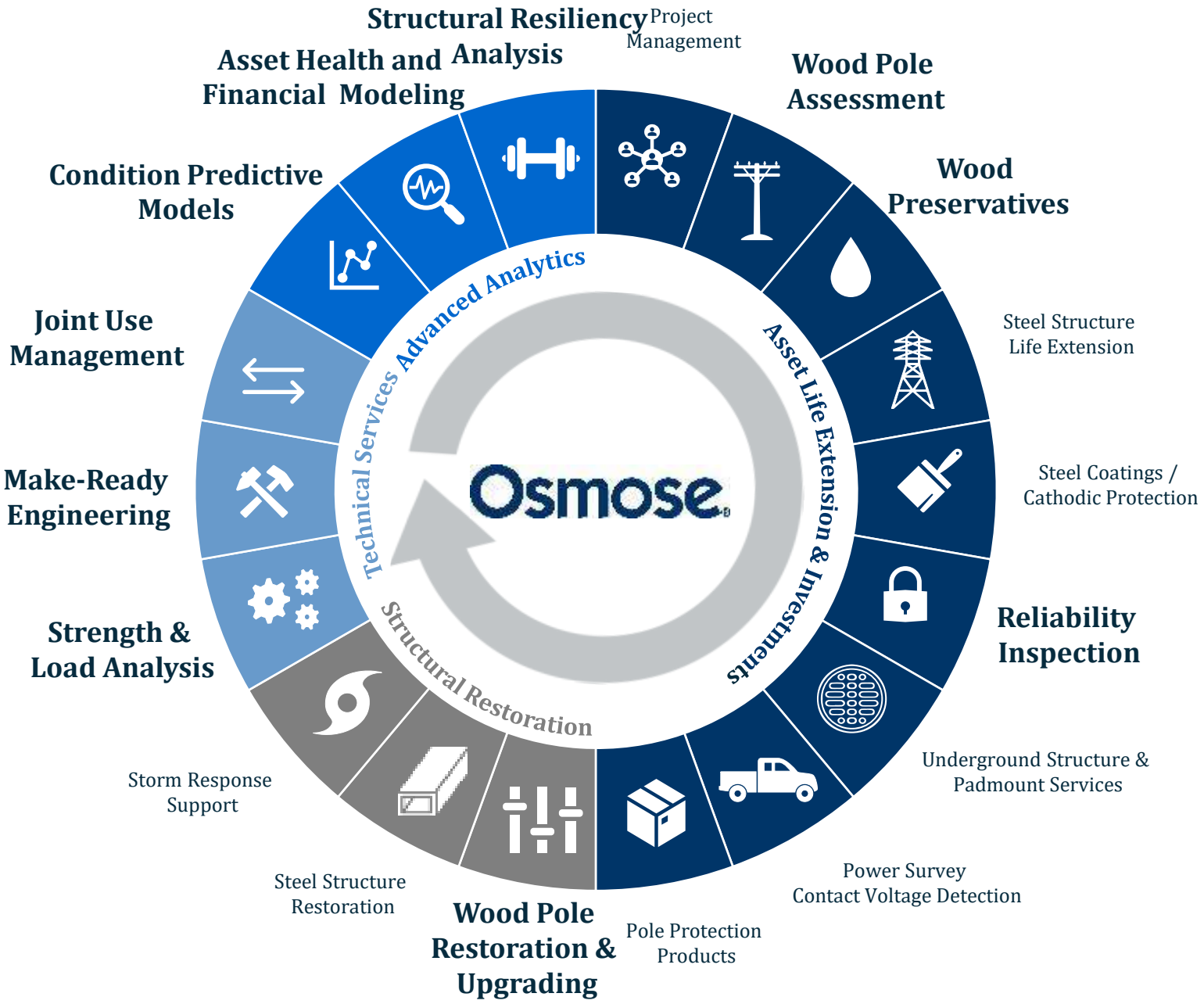
Chad Newton

Sr Director, Wood Infrastructure Portfolio

Osmose Expertise

Expertise and Services Specific to **Wood Utility Poles**

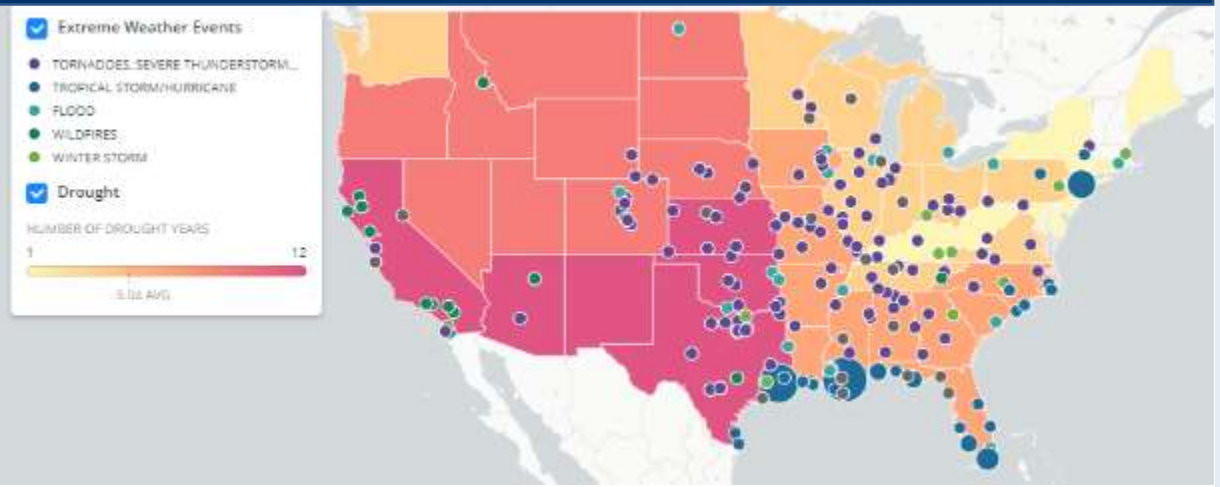
Structure Integrity Assessment
In-Service Preservative Application
Strength Restoration
Structure Life Extension
Bending Capacity Upgrading
Strength & Loading Analysis
Joint Use Management
Make-Ready Engineering
Pole Replacement Engineering
Overhead Detail Inspection
Wood Pole Analytics
Condition Predictive Modeling
Financial Predictive Modeling
Structural Resiliency Analysis



The Changing Environment

Increase Frequency & Severity of Weather Events

Billion-Dollar Extreme Weather Events, 2000-2021



Utilities are Responding to the "New Normal" of Extreme Events

- ❖ Enhanced Analysis
- ❖ Hardening Overhead lines
- ❖ Strategic Undergrounding
- ❖ Smart Monitoring
- ❖ Enhanced Vegetation Mgt
- ❖ Mutual Assistance

Where Osmose has assisted Utilities with our expertise

- ❑ Pole Load Modeling
- ❑ Intrusive Groundline Inspection
- ❑ Overhead Detail Inspections
- ❑ Hardening with Truss Installations
- ❑ Targeted Replacements

Poles Are Critical to a Resilience Strategy

Increasing structural resiliency of pole plants reduces recovery time and restoration costs significantly

Approaches to Improving Plant Health and Resiliency

Structural Health
The condition and longevity of structural assets as compared to its original condition at installation

1

Optimized life extension program to preserve **structural health** and **strength**

Structural Resiliency
The ability of structural assets to withstand a high impact event, and recover to pre-event state quickly

2

Analytics-driven targeted hardening to improve **structural resiliency**

Understanding Assessment Techniques

Each inspection technique, or program type, has a different level of **effectiveness** with respect to **identifying rejects**

Visual

Sound

Sound & Bore

Partial Excavate

Full Excavate

Understanding Assessment Techniques

Each inspection technique, or program type, has a different level of **effectiveness** with respect to **identifying rejects**

Visual

Sound

Sound & Bore

Partial Excavate

Full Excavate

NCB
Non-Condition Based

0-10% | 5-10% | 10-20% | 35-45%

Program implies, when Decay is found **DO NOT** conduct Full Excavate

CB
Condition Based

50-60% | 75-85%

Program implies, when Decay is found conduct a Full Excavate

98%

Osmose

*effectiveness ranges derived though a comprehensive empirical field study. Numbers displayed are specific to thick sapwood species poles

Asset Management & Structural Health

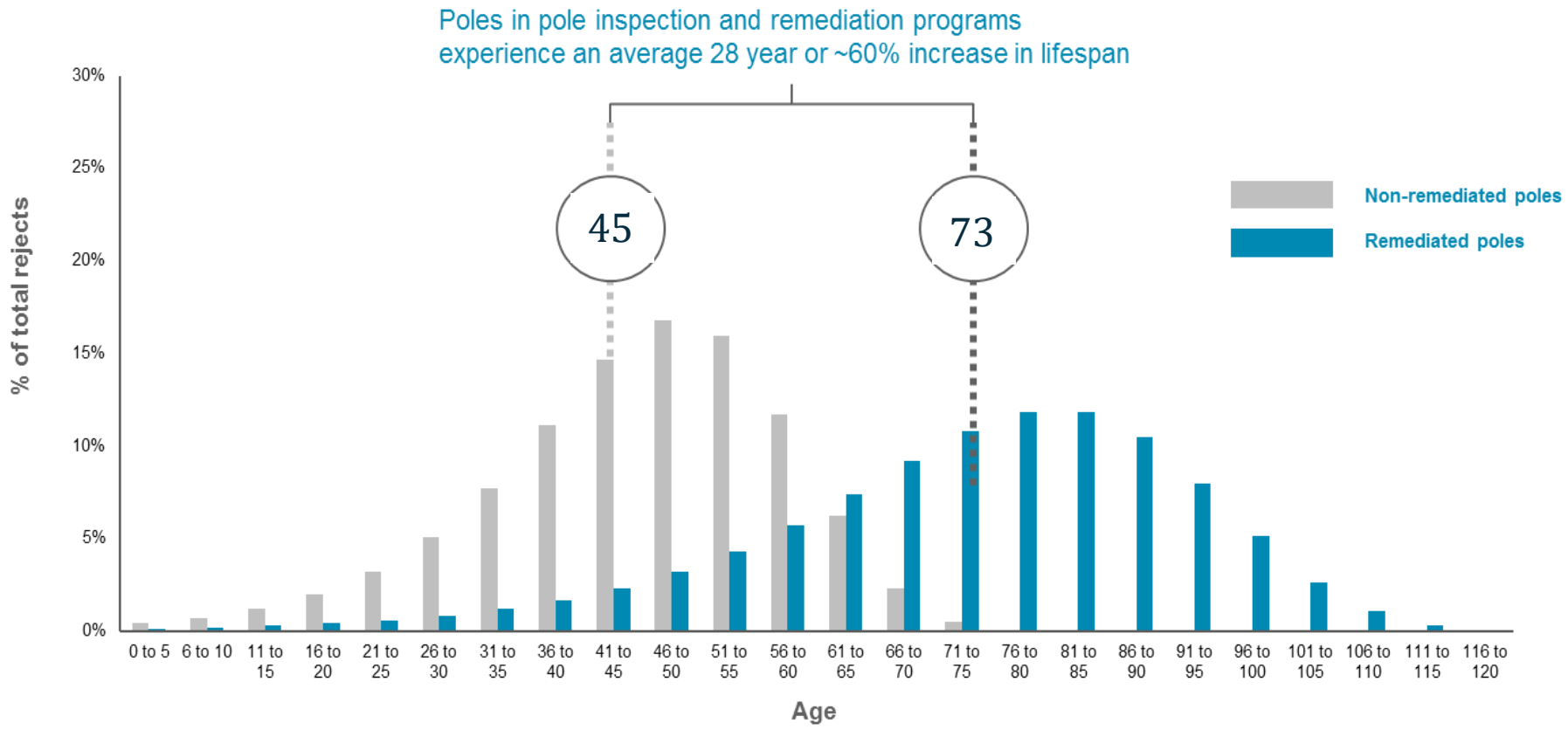
An ***Optimized*** **Life Extension Program**

- **Enhanced Assessment**: Maximizes the identification of decay & rejects
- **Arrest Active Decay**: Application of remedial preservative treatments
- **Retain Strength:** preservative application significantly extends the safe, reliable service-life of wood poles
- **Engineered Restoration Systems:** Further extends life on an otherwise replacement pole in a safe and cost-effective way.

Life Extension of the Asset

-Projected General Linear Model-

Projecting reject rates for poles past age 50 shows an even larger life extension due to pole inspection and remediation

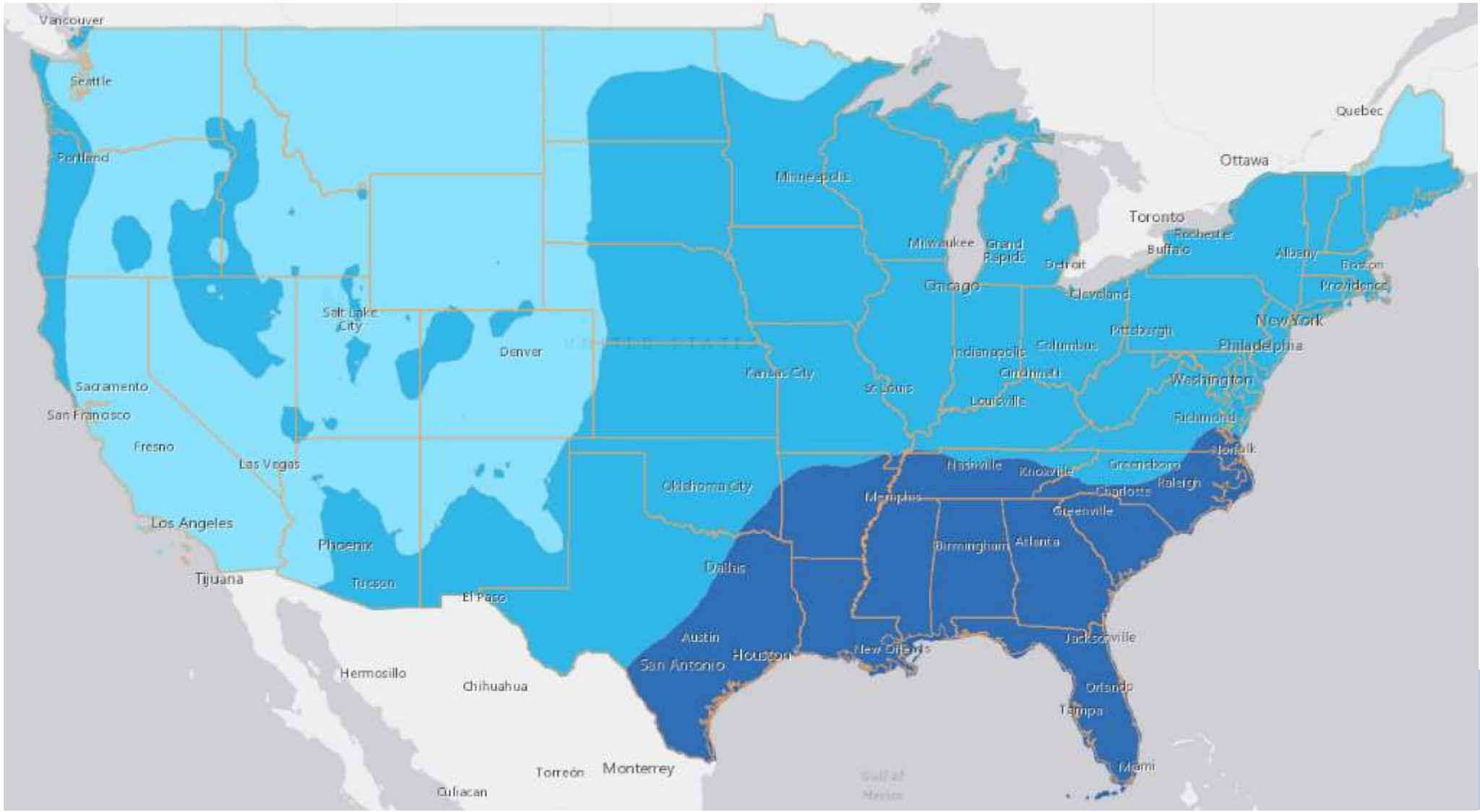


Reject rates were modeled using a best fit general linear model based on decay rates for poles ages 0 to 50

Structural health directly impacts Structural Resiliency

Targeted hardening further improves Structural Resiliency

National Maps – Decay Hazard Zones



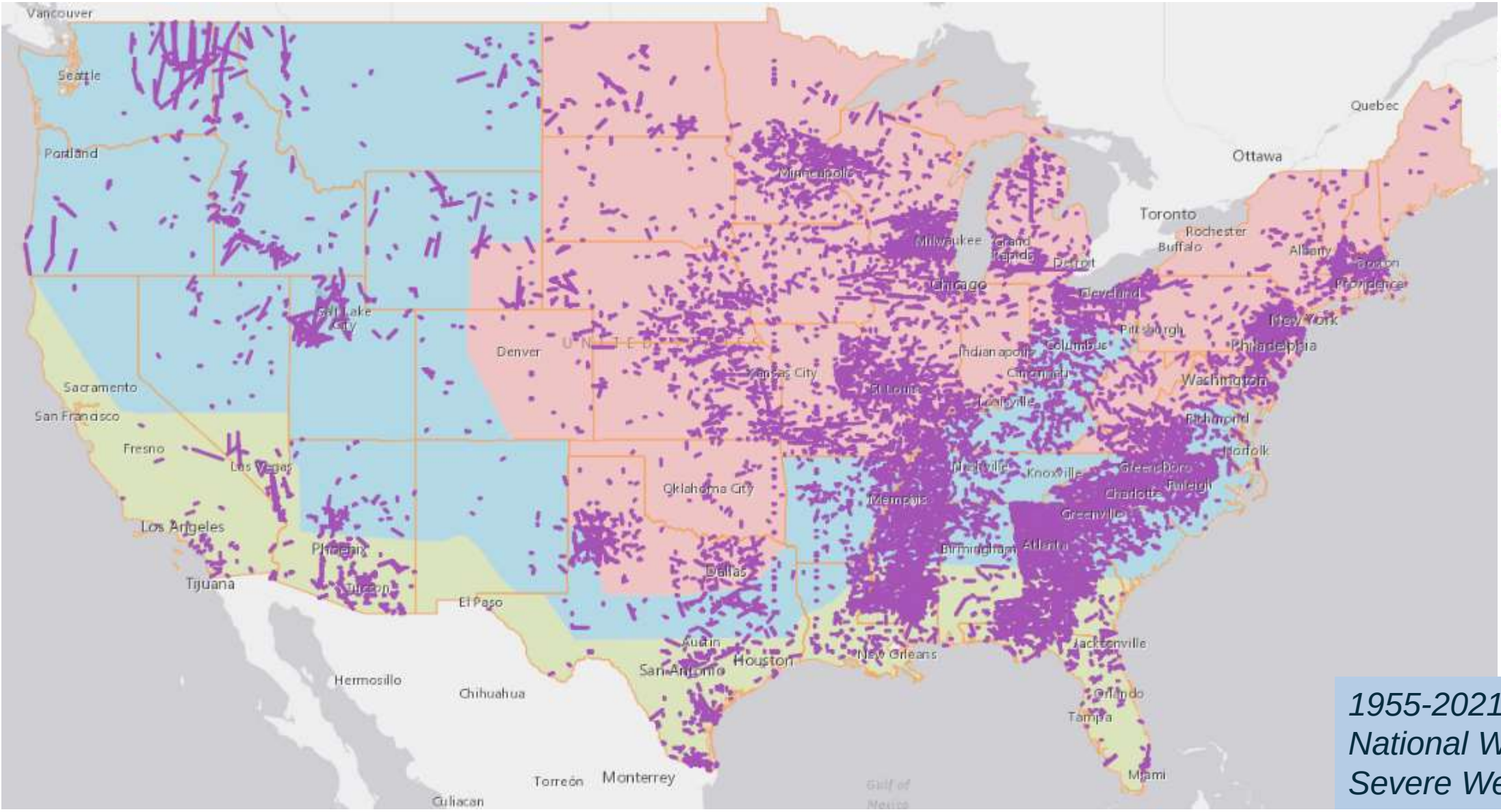
AWPA

- Low
- Moderate
- Severe

AWPA
PROTECTING WOOD SINCE 1904

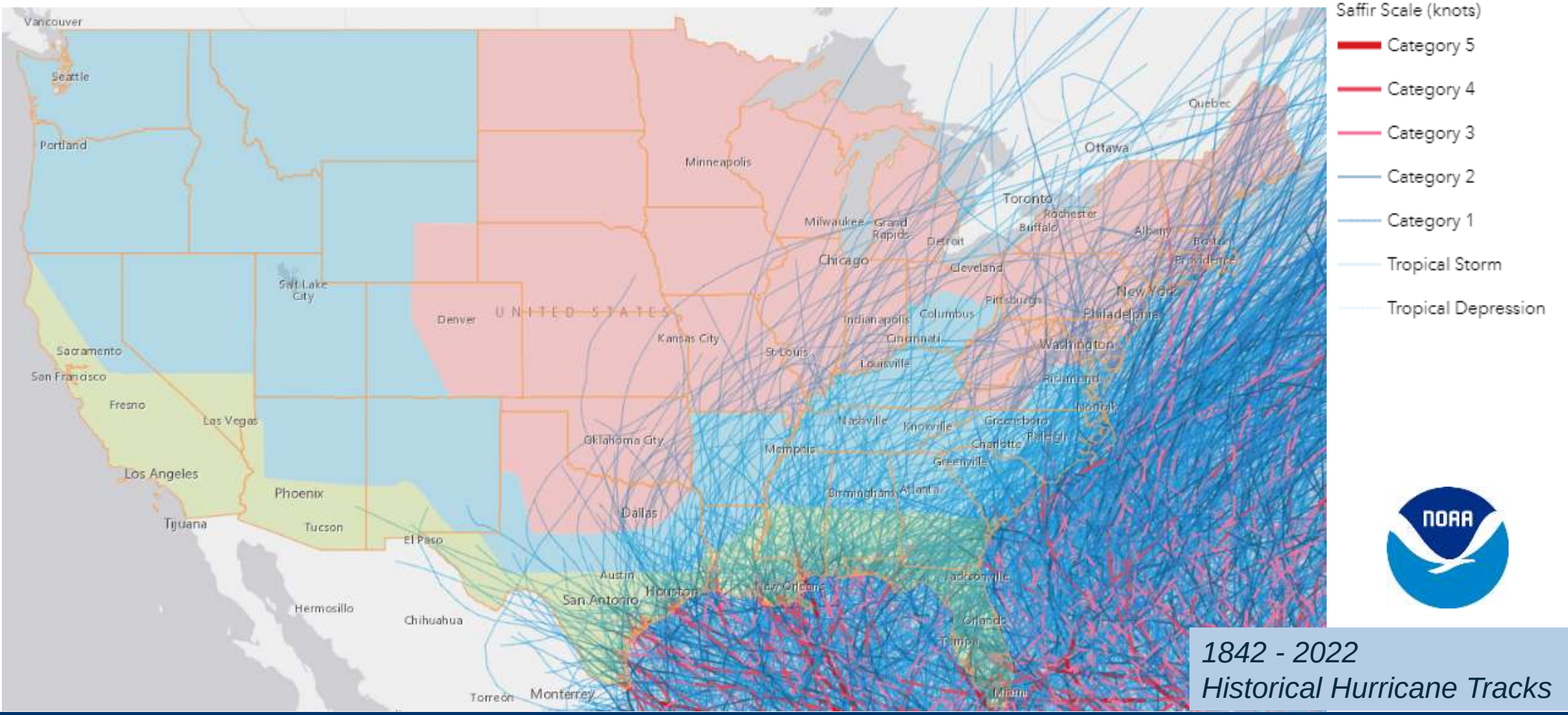
2021
American Wood Protection Association

National Maps – Straight Line Wind Events



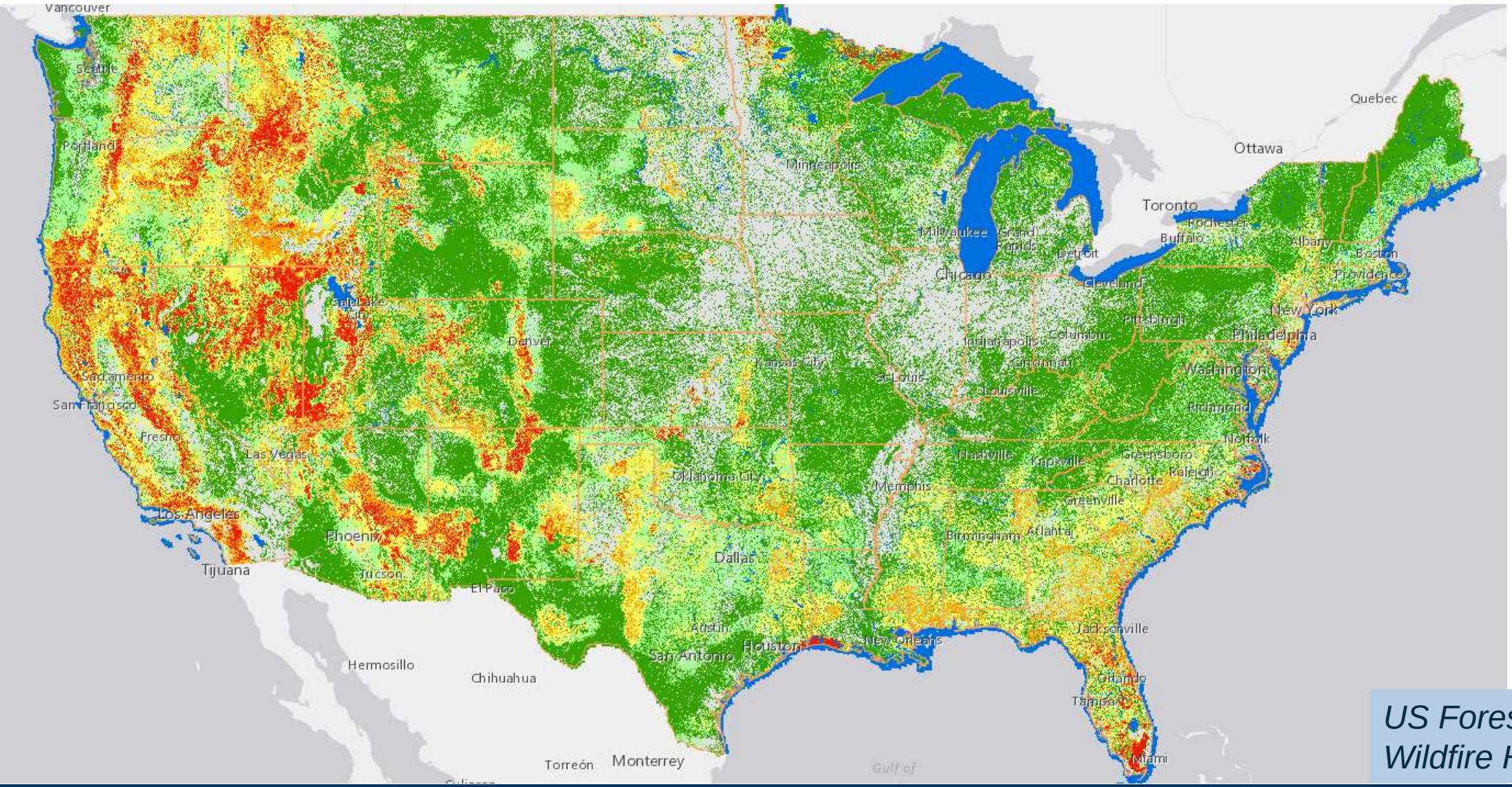
1955-2021
National Weather Service
Severe Weather Database

National Maps – Historical Hurricane Tracks



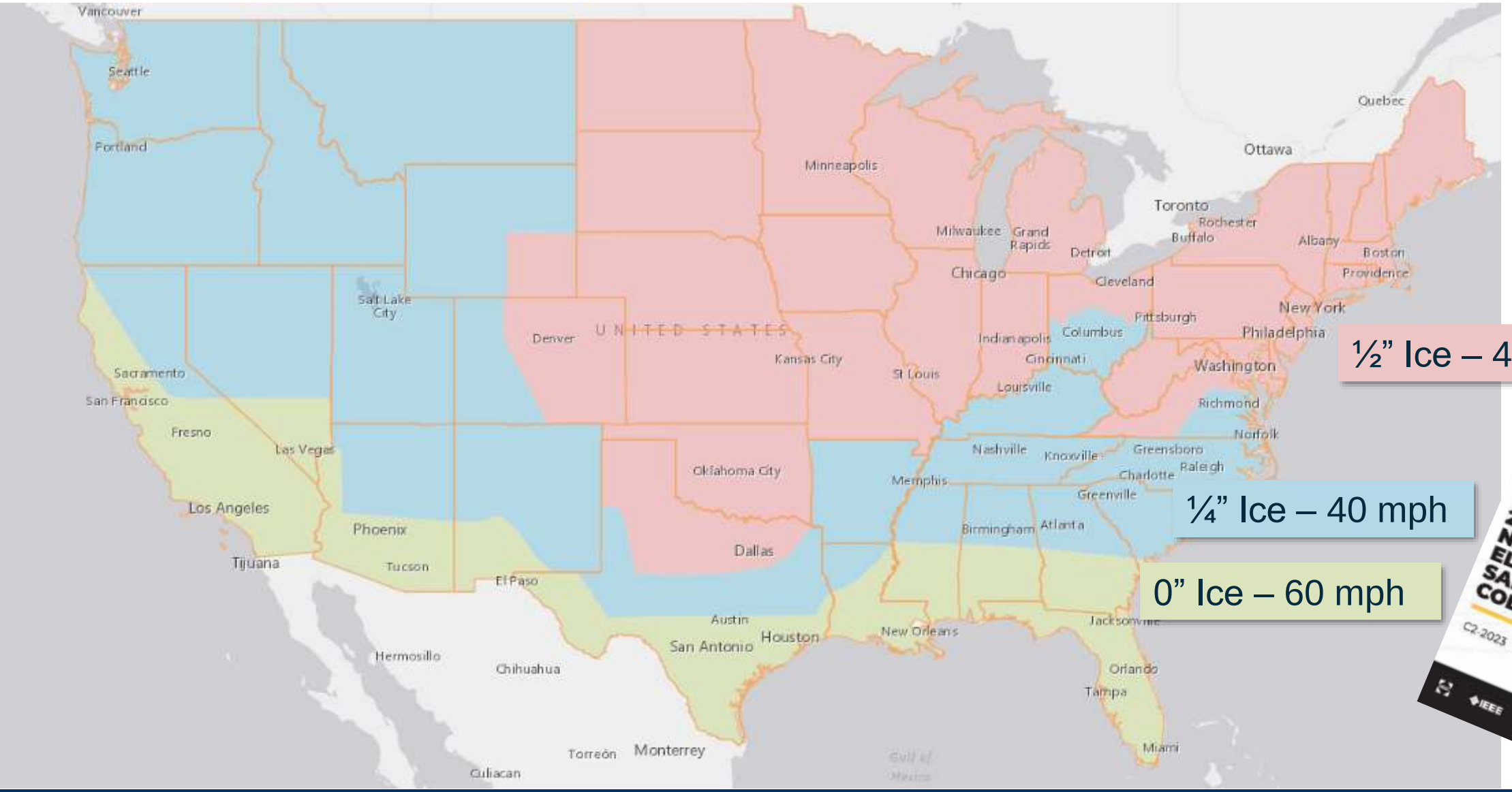
1842 - 2022
Historical Hurricane Tracks

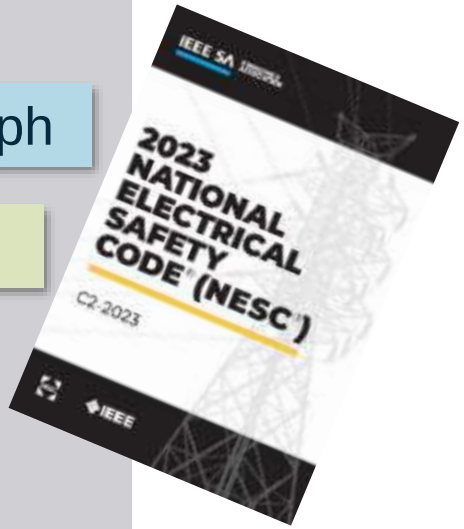
National Maps – Wildfire Hazard Potential



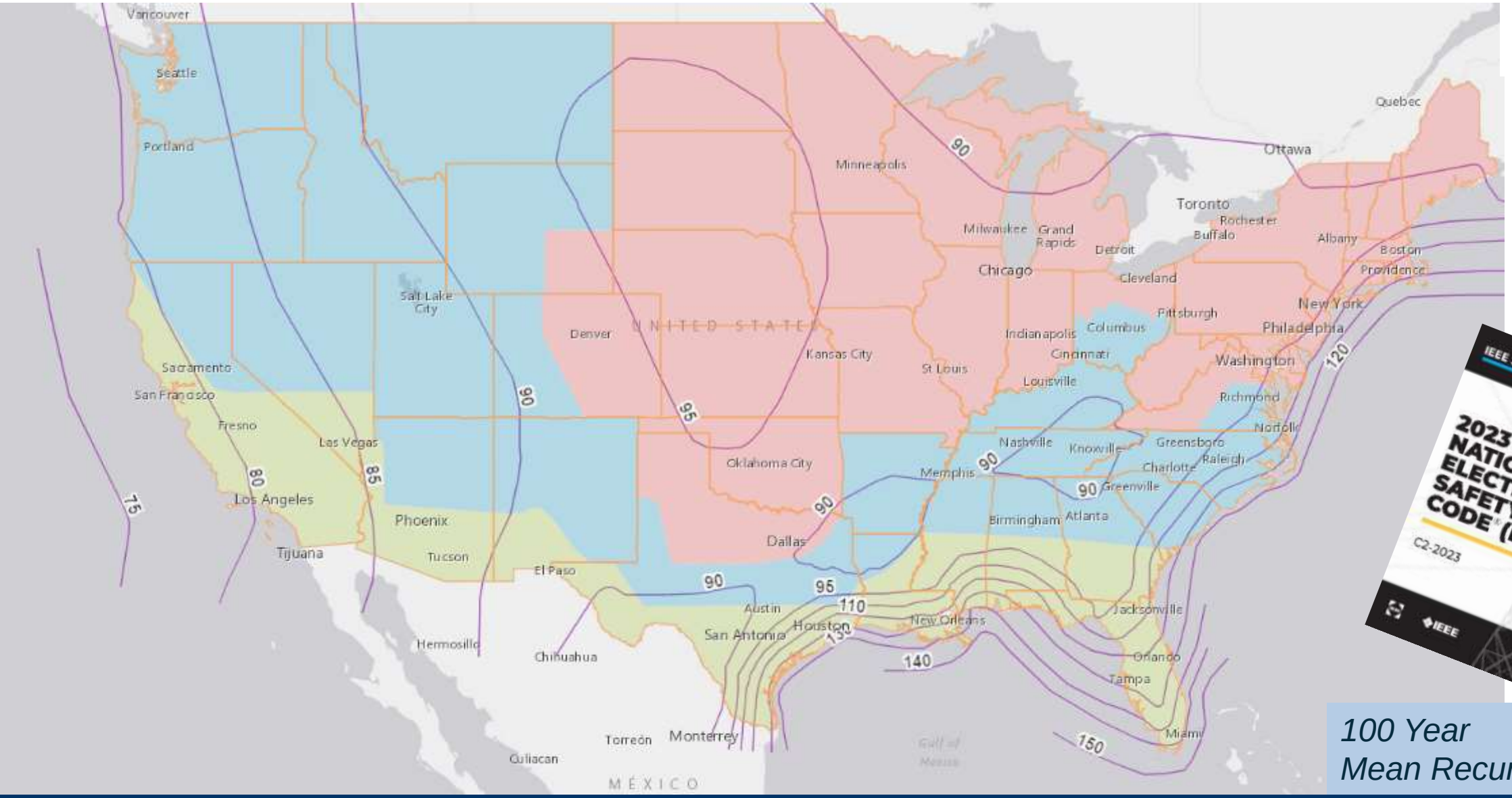
US Forest Services Wildfire Hazard Potential

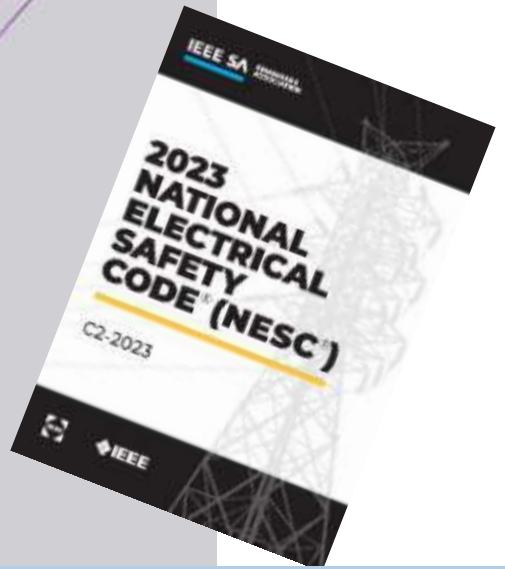
NESC – 250B District Loading





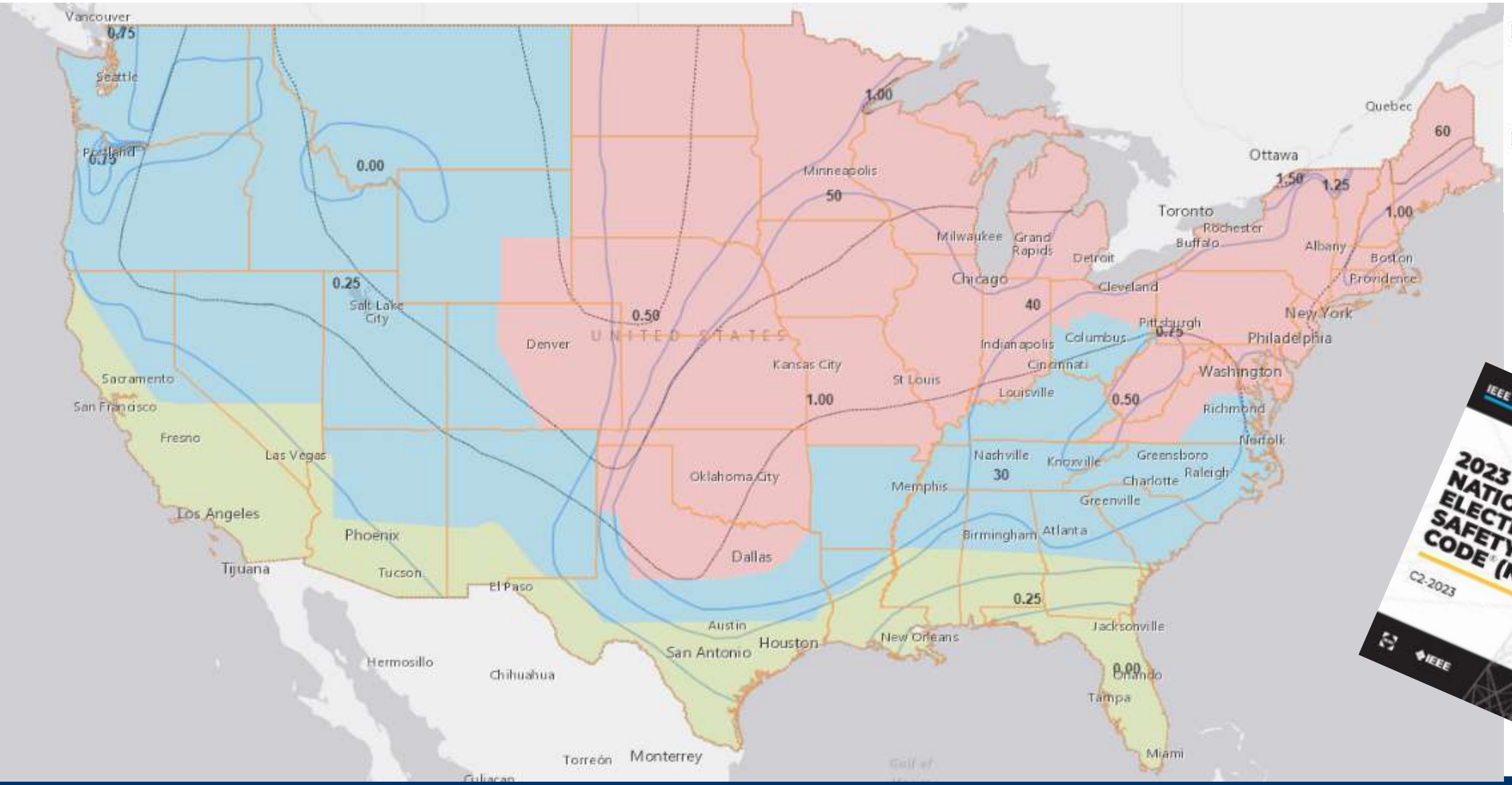
NESC – 250C Extreme Wind





100 Year
Mean Recurrence Interval

NESC – 250D Wind w/ Concurrent Ice

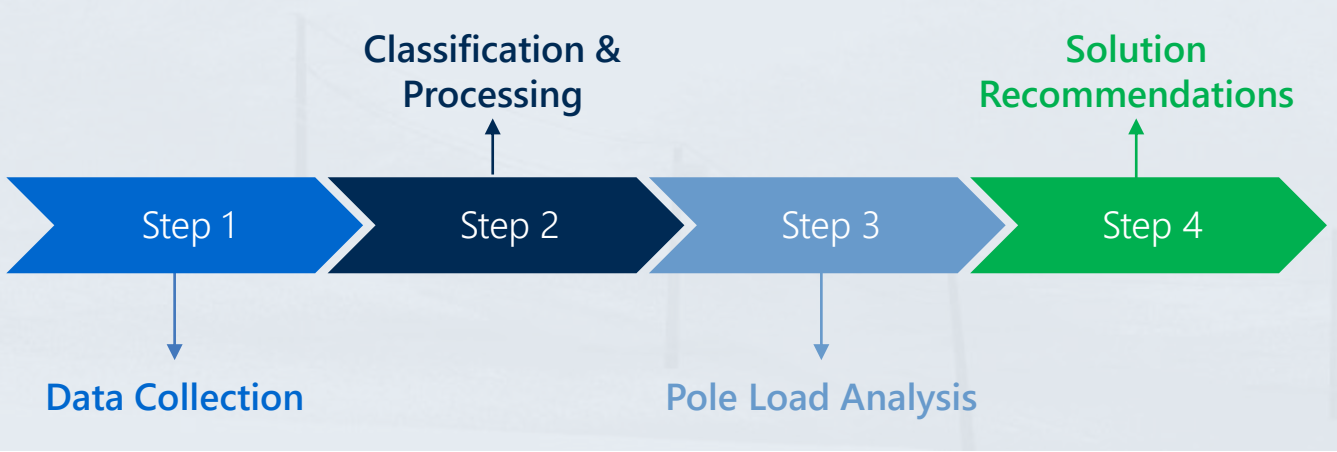


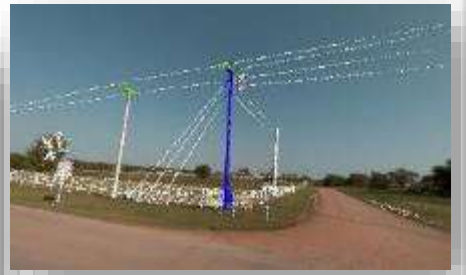
NESC 250D Gust

NESC 250D Ice Load

Pole Modeling and Resiliency

Steps to risk informed and targeted Structural Resiliency™ improvements





Activities Implemented by Utilities

Generate Insights

Data Analysis & Simulation

Analytics

- Health prediction
- Resilience modeling
- Financial performance

Data Collection

- LiDAR and imagery
- Efficient data collection and workflows
- Digital Twin creation

Pole Load Modeling

- Pole load analysis
- Model automation
- Solution recommendation

Implement Recommendations

Trussing | Treatment | Replacement Solutions

Restore

Restore with ***Extra Capacity***

Significant ***Capacity Upgrade***

Inspection with Preservatives

LIFE EXTENSION & STRENGTH RETENSION

Asset Fire Protection

RESILIENCY

Structural Resiliency Systems

LIFE EXTENSION + RESILIENCY

Case Study: One Utility, Two Storms

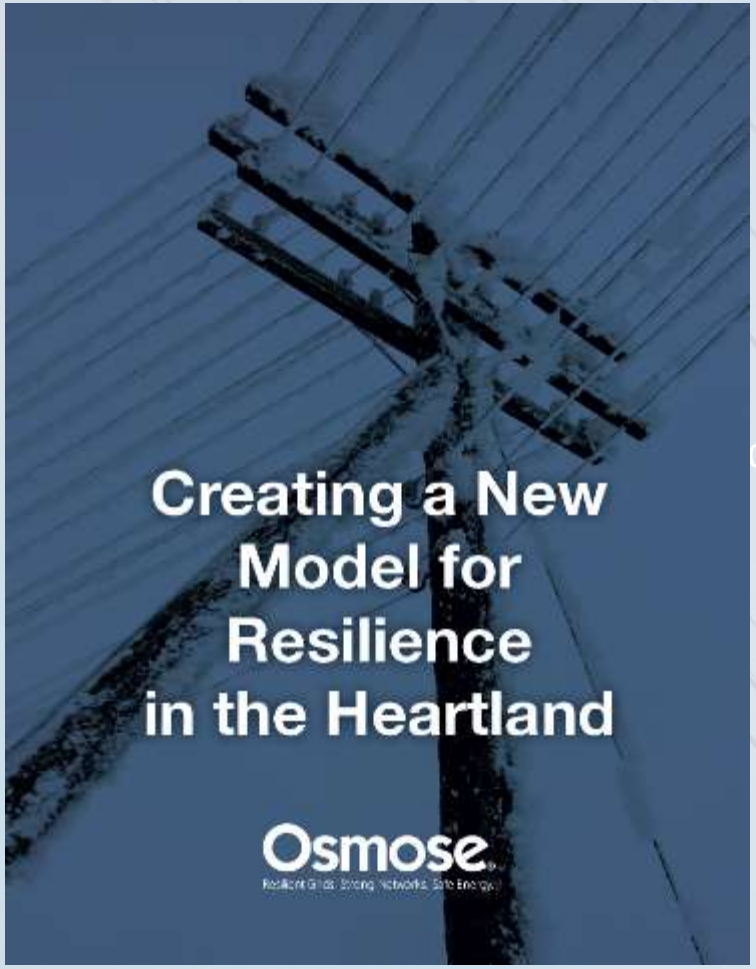
An IOU was hit by a hurricane in 2005, and again in 2017 after implementing a system hardening program

	Hurricane Wilma (2005)	Hurricane Irma (2017)
Pole Program	No Program	Life Extension (Two 8 Year Cycles)
Category	3	4
Pole Failures	12,000+	70% Fewer (0 due to Wind)
Time to Restore	4% Restored (24 Hours)	40% Restored (24 Hours)

70%
pole failure reductions

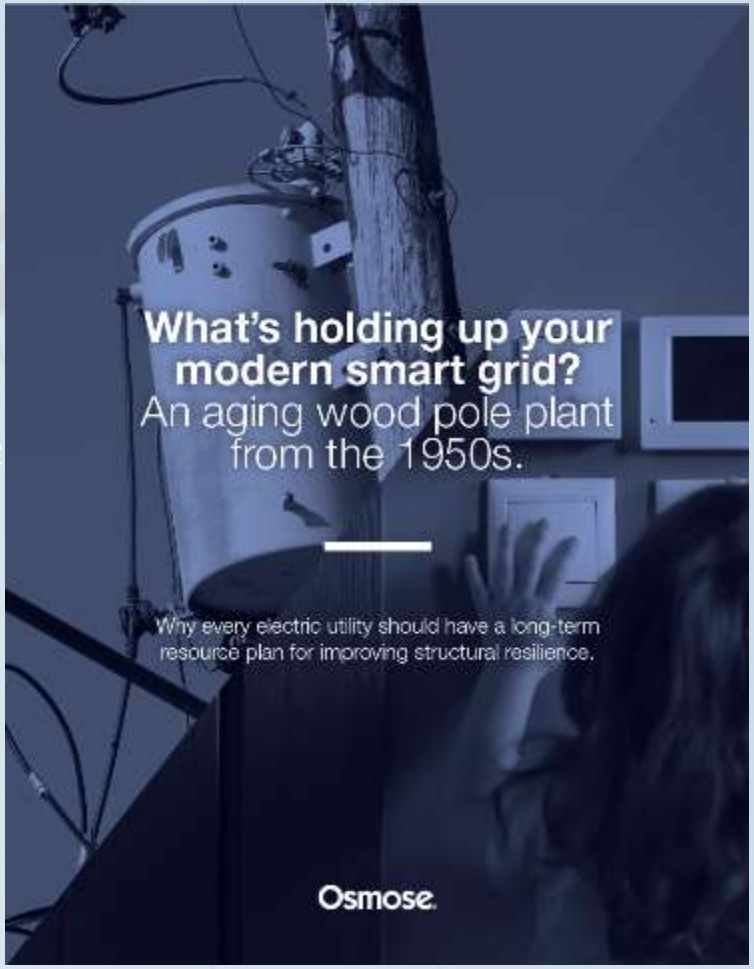
10x
restoration time reduction

White Papers Related to Wood Utility Poles



www.osmose.com/creating-a-new-model-for-resilience-in-the-heartland

www.osmose.com/a-new-map-climate-driven



www.osmose.com/modern-smart-grid

Osmose®

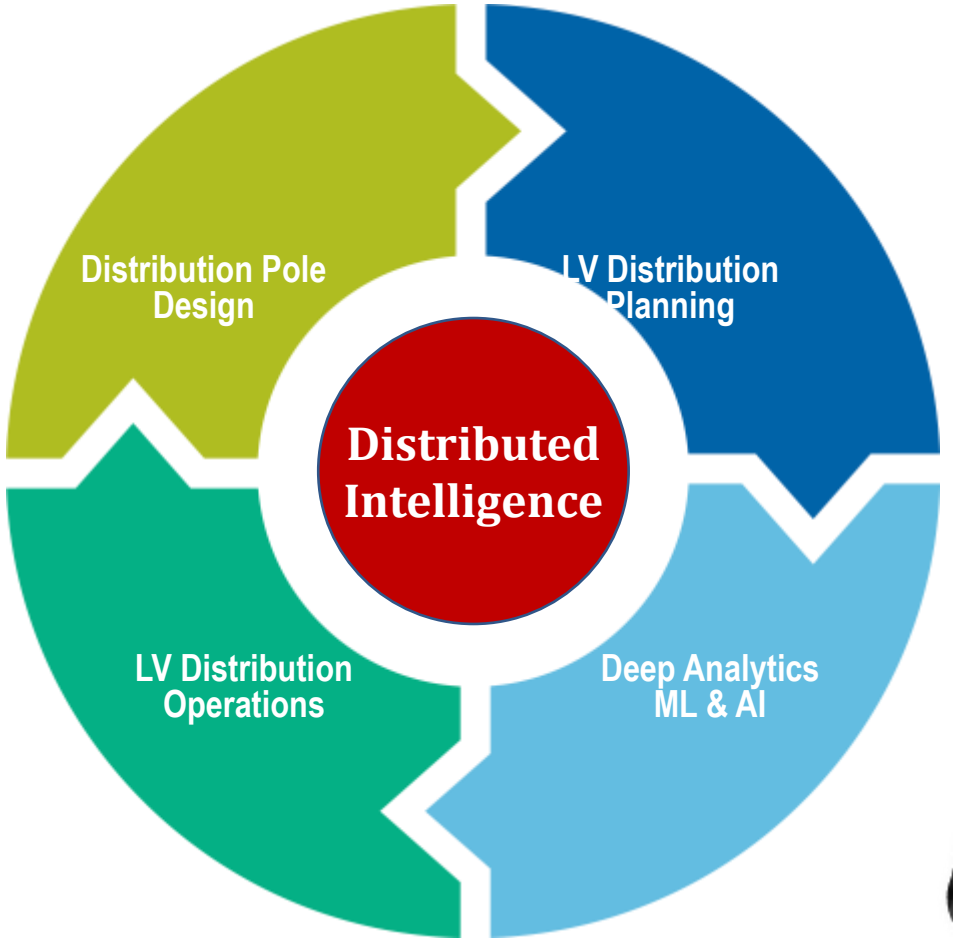
Thank you!

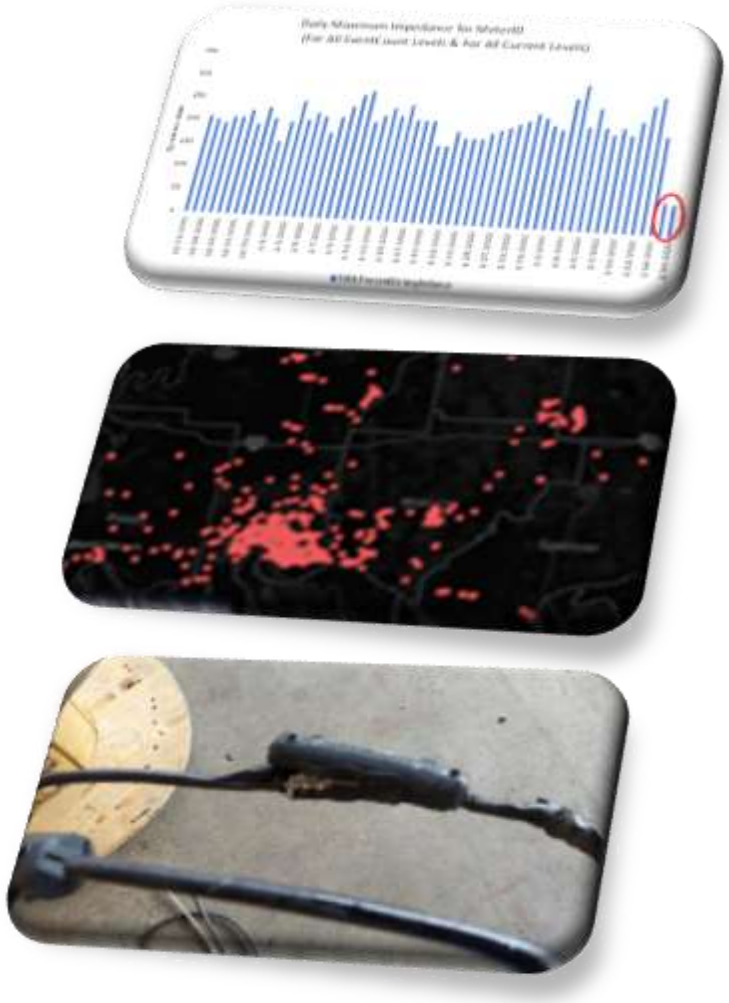
Chad Newton
770-632-6777
cnewton@osmose.com

Digital Transformation of Distribution Pole

Physical

- Motion/optical sensors & visual detection
- Gunshot detection
- Snow depth calculations
- Streetlight alarm systems
- Weather sensors & alarms
- Pedestrian counting
- And much more…..





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Industry Roundtable

Supporting State, Local and Tribal Implementation of Grid Infrastructure Investments

Courtney Haynes, Office of Clean Energy Demonstrations, DOE

Dan Lauf, Program Director, Energy, NGA

Kirsten Verclas, Senior Managing Director, Electricity Program, NASEO

Jason Stanek, Chairman, MD Public Service Commission

David Bobzien, Director, Nevada Governor's Energy Office

Carl Imhoff, Manager, Electricity Market Sector, PNNL

David Peters, Associate Program Manager for Resilience and Sustainability, AASHTO

Dylan Reed, Senior Advisor, Grid Deployment Office, DOE

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NASEO
National Association of State Energy Officials

gridCONNEXT 2022: Industry Roundtable Supporting State and Local Implementation of Grid Infrastructure Investments

December 6, 2022

Kirsten Verclas, NASEO

About NASEO

- The only national non-profit association for the governor-designated energy officials from each of the 56 states and territories
- Serves as a resource for and about the State Energy Offices through topical committees, regional dialogues, and informational events that facilitate peer learning, best practice sharing, and consensus building
- Advances the interests of the State and Territory Energy Offices before Congress and the Administration
- Learn more at www.naseo.org

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Key Overall State and Local Energy Opportunities

Key State and Local Energy Opportunities			
Provision	**Section**	**Funding Amount**	**Notes**
U.S. State Energy Program (funding for a range of efficiency, renewables, grid, transportation and security priorities)	40109	$500 million (formula funding to State Energy Offices)	ALRD issued August 26, 2022, deadline for applications is December 5, 2022.
Weatherization Assistance Program	40551	$3.5 billion (formula funding to states)	State and territory allocations and ALRD issued March 2022, applications were due July 1, 2022
Energy Efficiency and Conservation Block Grant	40552	$550 million ($150 million to State Energy Offices)	Of the $550 million appropriated in IIJA for EECBG, 28% will be allocated to states through formula grants, 68% to eligible units of local government, 2% to tribes, and 2% for competitive grants to ineligible local governments and Indian tribes, as prescribed by the Energy Independence and Security Act of 2007. Each state will receive an allocation of at least 1.25%, and the remaining funds will be allocated to states based on three equally weighted factors.
Energy Efficiency Revolving Loan Fund Capitalization Grant Program	40502	$250 million (formula funding to State Energy Offices)	On November 15, 2022, DOE released the guidance documents. Applications by states for this program are due to DOE no later than April 21, 2023.

Transportation Provisions in the IIJA

Select Sustainable Transportation Provisions		
Provision	**Section**	**Funding Amount**
National EV Formula Program	Division J	$5 billion (U.S. DOT)
Charging and Fueling Infrastructure Program	11401	$2.5 billion (U.S. DOT)
Joint Office of Energy and Transportation	Division J	$300 million (U.S. DOT/U.S. DOE)
Clean School Bus Program	Division J	$5 billion (U.S. EPA)

Additional funding for battery recycling/manufacturing, fleets, ferries, ports, transit available

Broadband Provisions in the IIJA

Select Broadband Provisions		
Provision	**Funding Amount**	**Notes**
Broadband Equity, Access & Deployment Program (BEAD)	$42.45 billion	State & Territory Formula Grant. Each state will receive at least $100 million. Each state's final funding allotment will be based on how many unserved locations they have, as determined by FCC broadband maps. States submit plans for approval by NTIA.
Tribal Connectivity Technical Amendments	$2 billion	Eligible Entities: Tribal Governments; Tribal Colleges or Universities; Tribal Organizations; Native Corporations; and The Department of Hawaiian Home Lands on behalf of the Native Hawaiian Community, including Native Hawaiian Education Programs
Digital Equity Act Programs	$2.754 billion	Eligible Entities: State Planning Grant Program: Any U.S. State, the District of Columbia & Puerto Rico. State Governors must appoint an 'administering entity,' which can be one, or a partnership of.
Enabling Middle Mile Infrastructure	$1.0 billion	Eligible Entities: State or its political subdivisions, Tribal government, Tech company, Electric utility, utility cooperative or public utility district, Telecom company or cooperative, Nonprofit foundation, corporation, institution, or association, Regional planning council, Native entity, Economic development

Requires states to develop and revise state Energy Security Plans , **in consultation with owners and operates of energy infrastructure**, to

1.Assess the existing circumstances in the State.

2.Propose methods to strengthen the ability of the State to:

a) Secure the energy infrastructure of the State against all physical and cybersecurity threats,

b) Mitigate the risk of energy supply disruptions to the State,

c) Enhance the response to, and recovery from, energy disruptions, and

d) Ensure that the State has reliable, secure, and resilient energy infrastructure.

In addition, a State Energy Security Plan shall:

1.Address all energy sources and regulated and unregulated energy providers.

2.Provide a State energy profile, including an assessment of energy production, transmission, distribution, and end-use.

3.Address potential hazards to each energy sector or system, including:

a)Physical threats and vulnerabilities, and

b) Cybersecurity threats and vulnerabilities.

4. Provide a risk assessment of energy infrastructure and cross-sector interdependencies.

5. Provide a risk mitigation approach to enhance reliability and end-use resilience.

6. Address:

a)Multi-State and regional coordination, planning, and response, and

b)Coordination with Indian Tribes with respect to planning and response.

7. To the extent practicable, encourage mutual assistance in cyber and physical response plans.

State Energy Security Plans are to be administered through the State Energy Office. Efforts undertaken to support the State energy security planning process, e.g., the risk assessment activity, should inform the grid resilience planning process under Section 40101(d).

Electric System Resilience Provisions

Section	Title	Funding	Eligible Entities	Status
40101 (d)	Preventing Outages and Enhancing the Resilience of the Electric Grid	$2.5 billion (formula)	States; Territories; Indian Tribes	ALRD open, deadline March 31, 2023 (applications could be submitted earlier)
40101 (c) – GRIP Topic Area 1	Preventing Outages and Enhancing the Resilience of the Electric Grid	$2.5 billion (competitive)	1. An electric grid operator, 2. An electricity storage operator, 3. An electricity generator, 4. A transmission owner or operator, 5. A distribution provider, 6. A fuel supplier, and 7. Any other relevant entity, as determined by a State or Indian Tribe with the approval of DOE.	GRIP Program, FOA (Amendment 1) released November 18, 2022. Amendment 2 issued November 29, 2022. Concept paper due December 16, 2022 (Topic Area 1 and 2) and January 13, 2023 (Topic Area 3)
40103 (b) – GRIP Topic Area 3	Electric Grid Reliability and Resilience Research, Development, and Demonstration	$5 billion (competitive)	Eligible entities: State, combination of 2 or more States; Indian Tribes; units of local government, and/or public utility commissions.	
40107 – GRIP Topic Area 2	Deployment of Technologies for Grid Flexibility	$3 billion (competitive)	Institutions of higher education; For-profit entities; Non-profit entities; and State and local governmental entities, and tribal nations	

State Approaches to 40101(d)

- Designation of Lead State Agency
- Objectives and Metrics
  - Tie-in to State Energy Security Plans
  - Most states are establishing broad objectives
  - Hazard-specific focus (i.e., wildfires)
  - Rural Focus (small utilities)
  - SAIDI/SAIFI metrics
  - Continued Challenges and Metrics (value of resilience)
- Grant Program
  - Most states looking at competitive solicitations
- Eligible Activities
- Public Hearings and Outreach
  - Utilities
  - Advisory Committees
- Roles and Responsibilities
- Resilience Planning in the Future

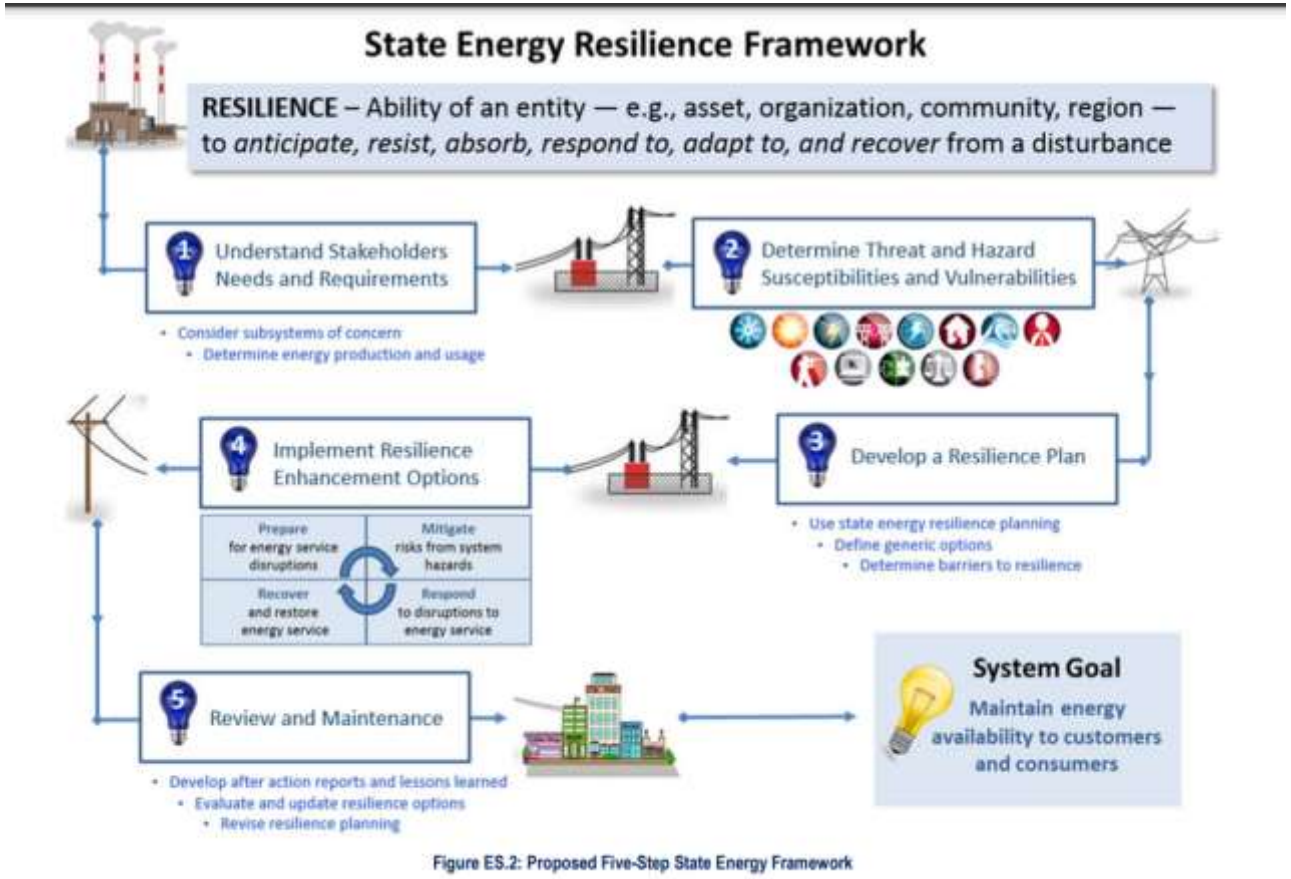

Figure ES.2: Proposed Five-Step State Energy Framework

State Technical Support Needs

Specific Technical Assistance and Analytical Support

- Setting Metrics and Objectives (especially non-traditional resilience and equity metrics)
- Analysis (impacts of climate change (especially on state and local level); cross-sector interdependencies; etc.)
- Specific 40101(d)-related questions (small utilities' set aside, eligibility of activities etc.)

Overall Grid Resilience Planning and Coordination Support

- Interplay between 40101(d), GRIP, NEVI, broadband provisions etc.
- Roles and responsibilities for state agencies and industry
- Exchange of best-practices
- Harmonization of requirements and metrics

Organizational Support and Increased Staff Capabilities

- Organization and staffing of state agencies
- Transmission and distribution planning
- Local and state coordination

Contact

Kirsten Verclas
Senior Managing Director
NASEO
Email: kverclas@naseo.org

gridCONNEXT 2022 - Industry Roundtable Supporting State Implementation of Grid Infrastructure Investments: Opportunities with DOE Office of Clean Energy Demonstrations

Courtney Haynes
Stakeholder Engagement Specialist, Energy Improvements in Rural or Remote Areas (ERA)
Office of Clean Energy Demonstrations (OCED)
December 6, 2022

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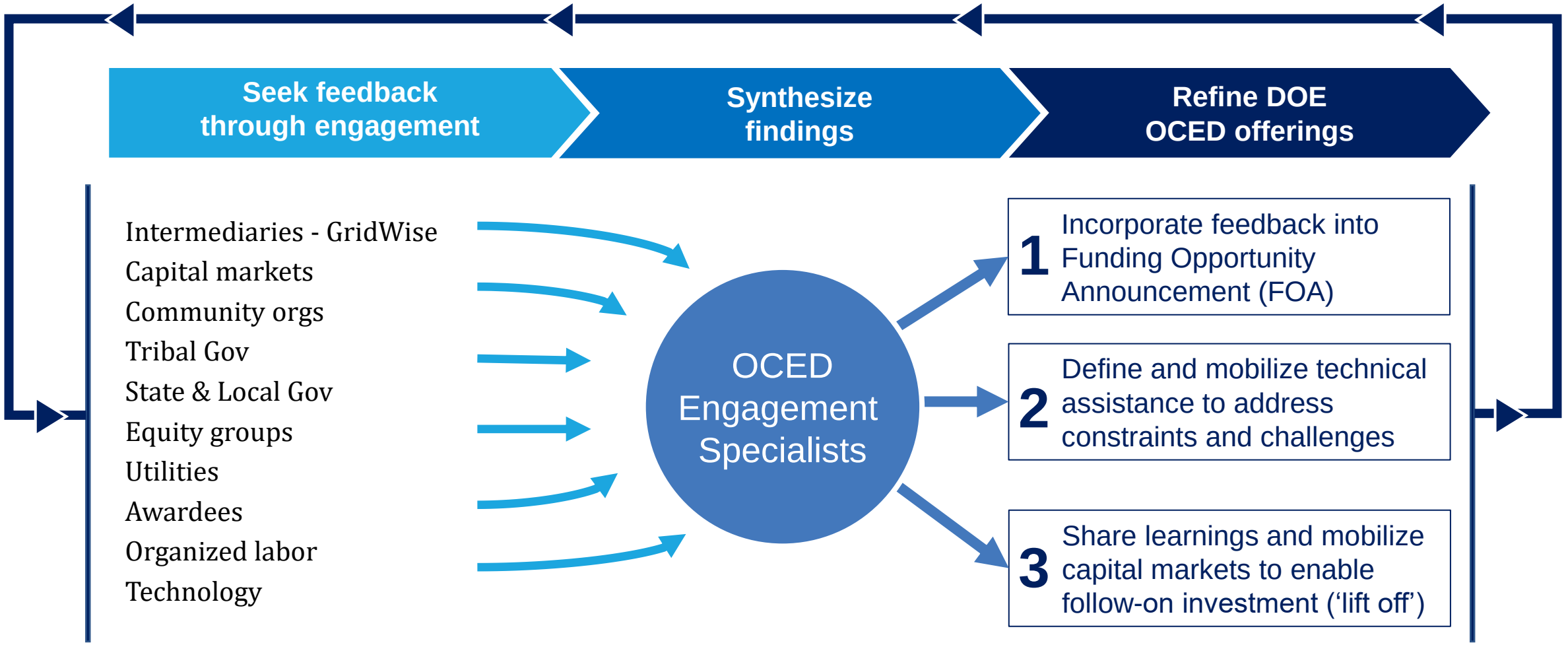
OCED Uses Iterative Stakeholder Engagement Process to Refine Offerings



Thank You! Stay in Touch!

For more information, please visit: energy.gov/OCED

Email: era@hq.doe.gov

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