Microgrids, Energy Storage, and Resilience

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For U.S. Department of Energy (DOE) Office of Indian Energy Tribal Energy Webinar Series 2019

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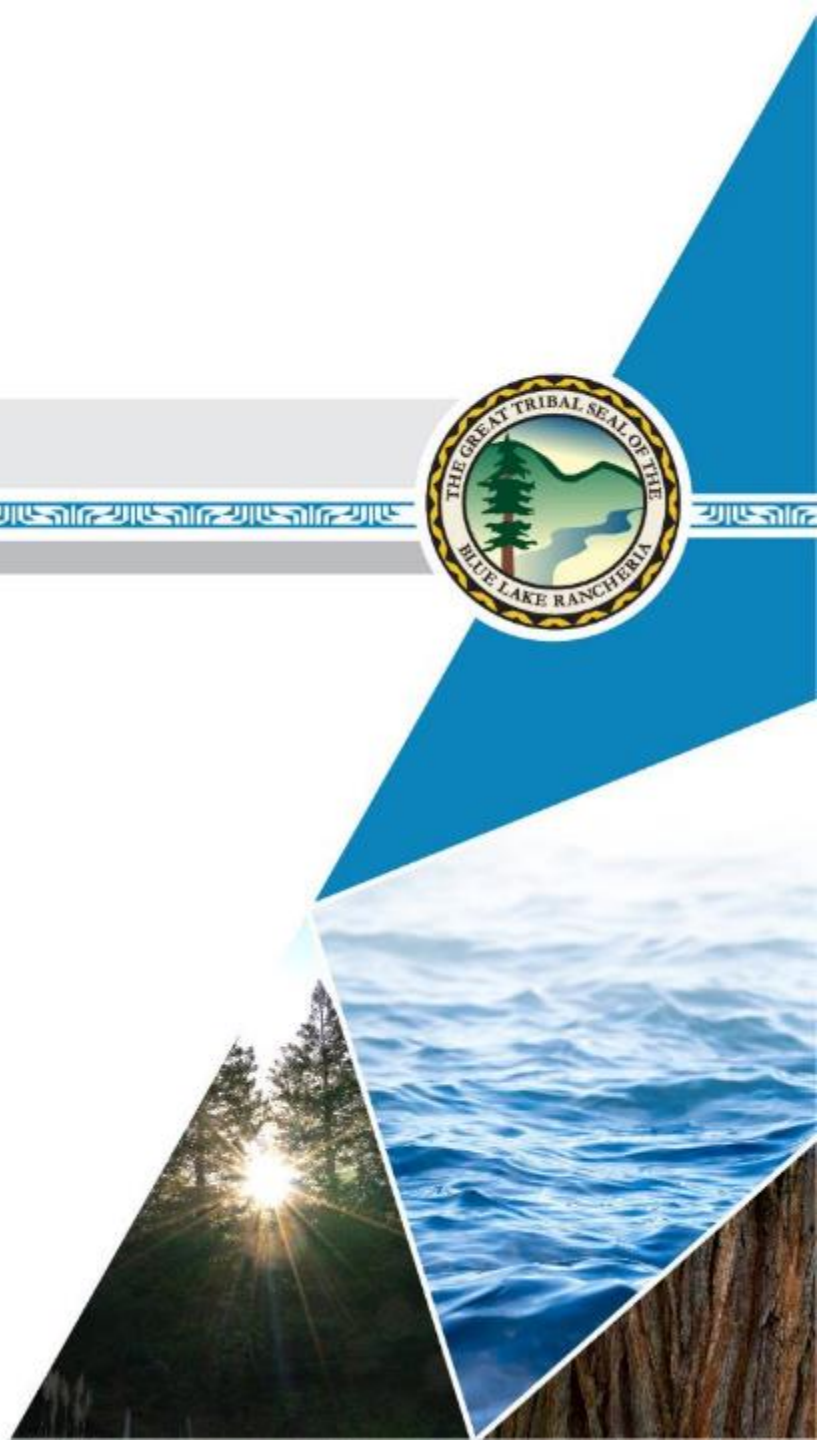

BLUE LAKE RANCHERIA

A Federally Recognized Tribal Government

Climate Disruption

- Global climate change *amplifies* local conditions
- Drought | High and extreme heat days
- Wildfires and air pollution
- Unpredictable, volatile weather, extreme storms
  - Arcata, CA ‘rain bomb’ 9/2019: ~2” in 30 minutes
- Landslides | Floods
- Increased ocean acidification and temperatures
- Sea Level Rise
  - Humboldt has fastest net SLR on the Pacific Coast
  - Impacts local power plants + nuclear waste repository

- We also live ‘on shaky ground’
- Earthquake / tsunami risks
  - Cascadia Subduction Zone
  - Can achieve ~9.0 earthquake
  - Pacific Coast can be simultaneously impacted
  - Due to relative low local population, Humboldt may not be the first concern for responders….
- http://www2.humboldt.edu/shakyground/

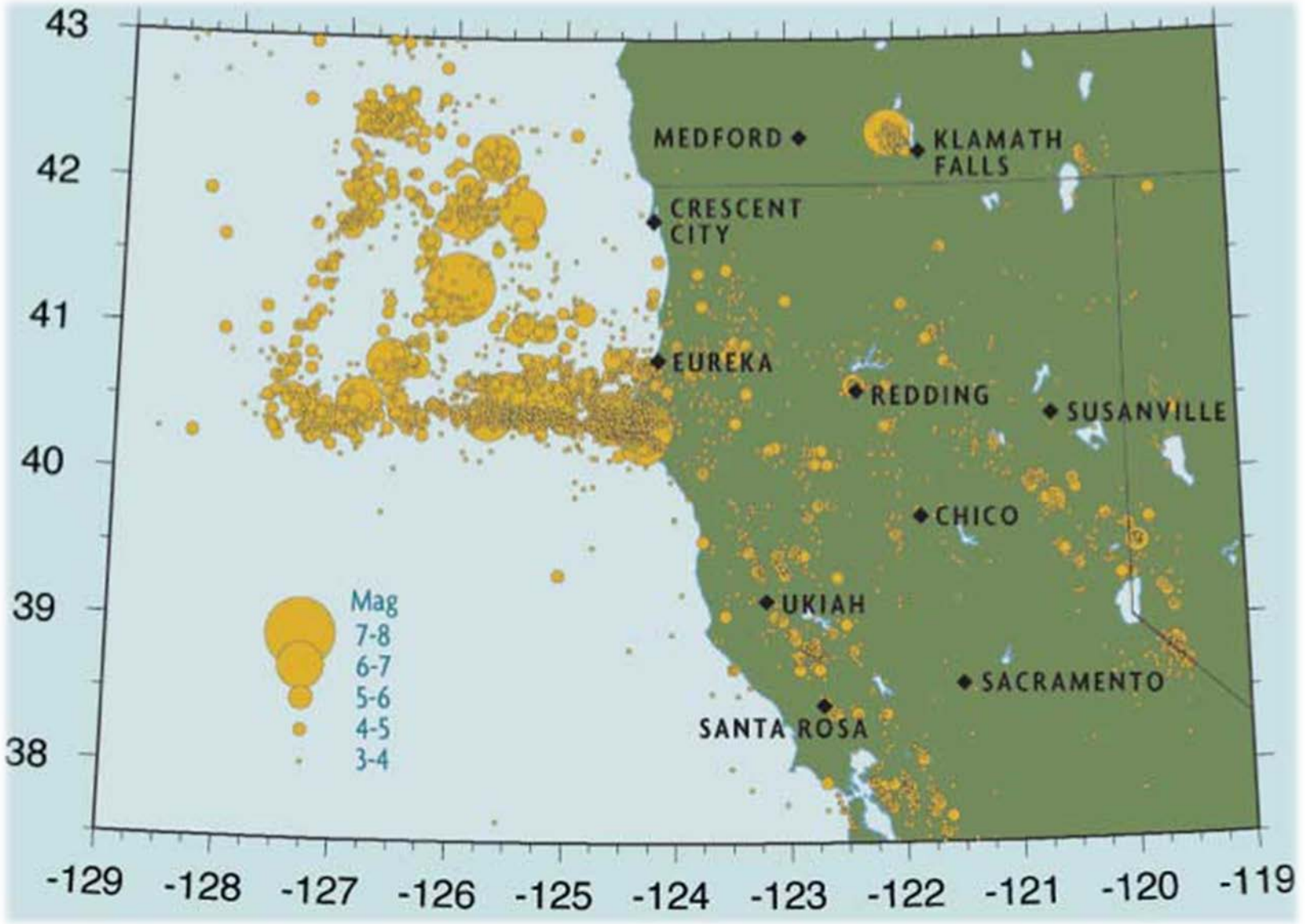

Image credit: Humboldt State University

2017
Highway 299
Credit: CalTrans

Simultaneous landslides across two of three main arterials to the region....

2017
Highway 101
Credit: CalTrans

BLR Tribal Government Resilience Strategy

- "Climate-smart" infrastructure
  - Energy :: Water :: Food :: Transportation :: Communications/IT (the "lifeline sectors")
  - Improved continuity of operations (COOP), community health, resilience
  - Economy-enabling investments; lower, predictable costs; more jobs
- Zero-carbon solutions
  - Pairing climate mitigation* + adaptation** = zero greenhouse gas emissions by 2030

*mitigation = reducing climate-forcing emissions

**adaptation = dealing with impacts already here, with zero carbon solutions to avoid making the underlying climate problem worse.

Low-carbon Microgrids at Blue Lake Rancheria

- Community scale – in operation since 2017
- Facility scale – in commissioning, full operation 11/2019
- Campus scale – in design, full operation by Q4 2020, will include residences
- Three nested / clustered microgrids allows for ongoing reliability studies

Community Microgrid

- Public/private partnership
  - Blue Lake Rancheria, Schatz Energy Research Center, PG&E, Siemens, Tesla, CEC, CPUC, Idaho National Laboratory, others
  - Funded by the Tribe and a CEC EPIC R&D grant
- Powers a 6-building campus
  - Tribal government offices, economic enterprises
  - Critical infrastructure, lifeline sectors
  - Can seamlessly island and reconnect to grid
- Solar + storage
  - 420kW (AC) solar PV
  - 2MWh battery storage
  - Legacy gensets (only used in emergencies)

Facility Microgrid “Solar+”

- Microgrid public/private partnership
  - Blue Lake Rancheria, Schatz Energy Research Center, PG&E, SunPower, Tesla, CEC, Lawrence Berkeley National Laboratory, others
  - Funded by the Tribe and a CEC EPIC R&D grant
- At fuel station / convenience store complex
- Solar PV (60kW) + battery storage (106kw/169kwh) – clean energy
- Can island from, and reconnect to, the larger grid
- Advanced building controls – efficiency, demand response, grid balance
- Creates a replicable, low-carbon ‘resilience package’
- In BAU: lowers costs, GHGs, improves COOP
- In emergencies:
  - Supply lifeline sectors to public; emergency responders
  - Important in areas where these facilities are the only community resource for lifeline sectors and critical infrastructure.

Climate-smart infrastructure is working

- Public Safety Power Shutoff (PSPS) - 10/9/19
  - Electrical grid outage to prevent wildfires
- Served ~10,000 people (~10% of County)
- Supplied general public & response agencies
  - Provided critical medical housing in hotel
    - Credited with saving four lives
  - Fuels (electricity, gas, diesel, propane), ice, water, food, internet access, device charging, ATMs
    - Fuel for local clinic to keep medicines cold; fish hatchery
  - Electric Vehicle (EV) charging
  - Community Support Center | Business Center
    - *Times-Standard* published from BLR
- The PSPS apparently did its job – no wildfires
- The microgrids did their job – regional support

Wildfire Outages + Microgrid Reflections

- Outages were relatively short
  - Utilities worked to limit scope, much appreciated given severe, fast-changing weather
  - If outages would have lasted longer, there would have been other issues
    - Cellular / internet communications outages
    - Water/wastewater systems
    - Economic and social disruption
- BLR's continuity of operations well-received
  - Provided the lifeline sectors (energy, water, food, communication, transportation)
  - Increased interest in microgrids
    - Example: can Humboldt County, CA be segmented into its own microgrid?

Building Microgrids

Feasibility & Design

- Tribal government strategy
  - Project manager
  - Project structure
    - Tribal utility authority?
    - 3rd party partnership(s)?
  - Project funding
    - Pre-development
    - Match funding for grants
    - Patient payback
- U.S. DOE Office of Indian Energy Technical Assistance
  - https://www.energy.gov/indianenergy/technical-assistance

Construction & Operation Sample Resources

- U.S. DOE Office of Indian Energy Policy and Programs annual grant funding
  - https://www.energy.gov/articles/doe-announces-15-million-deploy-energy-infrastructure-tribal-lands
- U.S. Department of Interior
  - https://www.bia.gov/as-ia/ieed
  - https://www.bia.gov/as-ia/ieed/division-energy-and-mineral-development/grants
- Department of Agriculture (USDA)
  - https://www.rd.usda.gov/programs-services/programs-services-tribes
  - https://www.rd.usda.gov/files/508_RD_TribalReport_2019.pdf
- Other funding sources
  - https://www.energy.gov/indianenergy/energy-development-assistance-tool

Microgrids as Solutions

- Build zero-emission microgrids for stacked benefits
  - Resilience, jobs, climate action, pollution reduction
  - Support critical infrastructure + grid ecosystem benefits
    - Segmentation and demand response
- How is microgrid resilience valued?
  - In BAU and emergencies
  - Rate-based (resilience, segmentation, and demand response investment, zero carbon, routine upgrades shifted to microgrids)
- How to best manage microgrids?
  - Increase regional expertise/capacity
  - Ensure safety and grid ecosystem benefits
  - Regional utility owned and operated?
- Microgrid knowledge transfer
  - Avoid inappropriate technology, increase standardization, lower capital and O&M costs

Thank you.

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