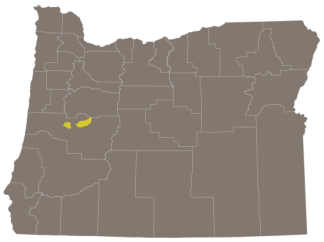
OREGON RESILIENCE CASE STUDY
EUGENE WATER & ELECTRIC BOARD

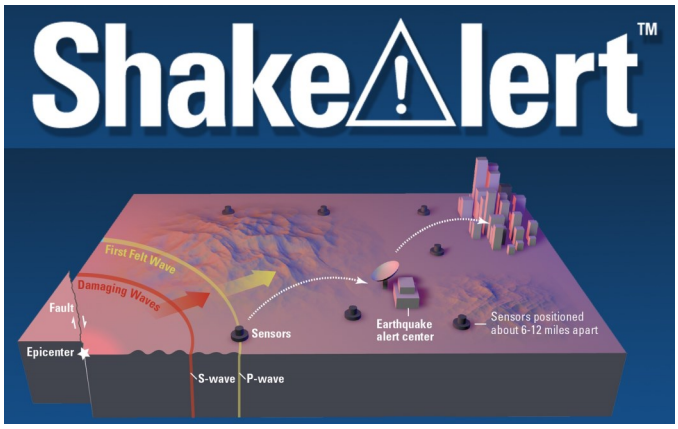
EWEB serves about 93,000 electric customers and 53,000 water customers in the Eugene area.



Earthquake Warning System

EWEB installed two seismometers in its territory, at the Leaburg and Carmen-Smith hydroelectric facilities. The seismometers are tied in to the larger Pacific Northwest Seismic Network, the group of monitoring sites that provide input to the ShakeAlert system. ShakeAlert is an earthquake early-warning program run by the U.S. Geological Survey. The ShakeAlert warning system is in the development stage, where adding seismometers increases the accuracy and improves the quality of information transmitted to recipients of ShakeAlert warnings.

EWEB spent about $25,000 to install the two seismometers. In an earthquake, "P" waves arrive ahead of "S" waves, which are typically more damaging to structures. If the seismometers pick up P waves, it could provide valuable seconds or minutes to implement automatic preparedness procedures, such as closing headgates and opening breakers to minimize damage. The further the seismometer is from the epicenter of a quake, the more warning time it will have; even 30 miles can provide 15-20 seconds warning. ShakeAlert intends to launch a public alert system in the near future, so anyone can benefit – and receive warnings – from the information sent by EWEB's seismometers.



After additional reliability testing, EWEB will work to develop the procedures for automated shut downs or switches in the event of an emergency.

Seismic Testing

EWEB has more than 600 reinforced concrete transmission poles that support most of the utility's 115 kV transmission lines. Most of the poles were built in the 1960s, so EWEB is working with Oregon State University to test how the poles would respond in an earthquake.

EWEB brought two of the large concrete poles up to OSU, where civil engineering students and researchers developed models to test the poles as if they were experiencing threats like earthquakes. The testing was

conducted over three years for $150,000 – the poles did pretty well, though EWEB intends to conduct additional testing through a larger condition assessment effort to identify areas of improvement for the utility's infrastructure.

The testing is part of the Cascadia Lifelines Program, a consortium of Oregon public and private partners focused on research that will improve resiliency for some of Oregon's critical service providers – like power and water. The consortium is conducting testing and considering how lessons learned can be applied in the real world.

Community Emergency Water Distribution Stations

Because EWEB is both an electric and water utility, it is also focused on developing distributed emergency water resources. EWEB plans to identify high-population areas where community members can access water – so locations should be accessible, have a nearby water source, and provisions for backup power capabilities to allow for pumping and filtration of water if the larger grid is down. Ideally, community members will have already stored emergency water at home and at work, and can get through the first few days or weeks after an emergency. This will allow EWEB and fellow responding agencies to get emergency hubs and water distribution centers up and running.

EWEB contractor installs back-up battery power system.

EWEB has partnered with the two Eugene-area school districts to install back-up power capability and install or upgrade water well equipment at district-owned facilities. Many Eugene-area schools have existing rooftop solar that could provide on-site power for pumping water in addition to the back-up power sources. EWEB is investigating several possible back-up power sources, and is installing a microgrid back-up battery power source at Howard Elementary school in 2018 and a new water well and pump station in spring 2019. This microgrid is sized to run the water well pump at the site for up to three weeks, while the existing solar array will be configured to allow for charging of the battery bank. EWEB's project, which is designed to increase resiliency and support research and design, was funded through a grant with ODOE, Sandia National Laboratories, Advanced Grid Research and Clean Energy States Alliance. EWEB's goal is that five schools will be water resource-ready within five years. Within 5-10 years, microgrids may become more cost effective, which may result in penetration of these power sources to the electrical grid, due to an increase in customer-owned battery storage systems. Research from this first project and the following efforts will inform future policies, and will be used for planning purposes to better understand how integration with these systems will benefit the grid and the customer.

Personal Preparedness

EWEB's communication and outreach about emergency preparedness has paid off – the utility has sold about 15,000 three-gallon water jugs to customers over the last few years. The utility partnered with the Red Cross and other utilities to offer the jugs at a discount – just $5 instead of the typical retail price of $15 or more.

In 2012, EWEB completed an emergency water supply plan, which included building emergency water distribution trailers that can be deployed to specific sites. For example, in June 2018, EWEB sent two of its distribution trailers to Salem after the city's water supply showed high levels of toxins that could affect vulnerable people. The trailers are designed to be easy to use, so volunteers can run them to distribute the water.

Moving Forward

In addition to continuing to implement seismic and preparedness activities, EWEB is actively deploying AMI "smart meter" technology, as well as black starting its generation facilities after an emergency to power critical loads in the Eugene area.

An AMI system is still in the deployment stage at EWEB, with about 4,000 or so smart meters deployed among more than 90,000 electric meters territory-wide. An AMI system would allow EWEB to better respond in an emergency, where the utility could turn on or off specific areas around the city and direct power to critical services. EWEB is currently installing the smart meters as opportunity allows – including new construction, new tenants, or large renovations. EWEB hopes to have the AMI system deployed within three years.

After a large emergency, power systems are likely to experience failure. EWEB is investigating the feasibility of black starting its hydro generators and customer owned local generators to power critical facilities after an emergency. Additionally, EWEB is in plans to launch a study to work with customers to better measure their load, and identify how they could trim energy or water use during emergency situations if curtailment is needed to maintain stability. The process could identify the smallest possible load they can handle and still keep things running – this will help ensure that a black-started generator isn't overloaded with a larger load beyond its capability.