Kristyna Wentz-Graff/OPB

A large tree limb is tangled in a power line, lying across SE Ash Street near 20th Avenue in Portland on Tuesday. The area spent the week digging out after huge snow and ice storms.

Outages

Continued from A1

In short, when electricity, the lifeblood of modern living, goes out, chaos and sometimes tragedy follow.

The power outages experienced in the Willamette Valley over the past week are nothing like those experienced in Texas, where surging demand, power plant outages and lack of access to backup electricity supplies forced grid operators into rolling and extended blackouts that affected millions of customers across the state.

Closer to home, the problem was three waves of weather that began Feb. 11 in the lower Willamette Valley and got worse with successive waves of icing that moved north over the weekend. More than a week later, the outage numbers had declined from a high of about 340,000 around Oregon to some 38,000 midday Sunday.

Why the outages?

Oregon's outages have little to do with surging demand or available electricity, but repeated failures of transmission and distribution lines that aren't designed to carry such heavy loads of ice, and problems with falling trees and branches that went well beyond the scope of state rules requiring utilities to keep vegetation around their infrastructure clear.

It's hard to overestimate the impact of that kind of weather, which left large swaths of PGE's, and to a lesser extent PacifiCorp's, service territories looking like a war zone. Their restoration efforts, in many ways, have been a minor miracle, even as tens of thousands have been left in the cold. PGE's customers were particularly hard hit because of where the storm hit and the fact that it has a larger, denser customer base and transmission system.

Yet Oregon regulators have identified repeated failures by the state's two largest electric utilities in keeping up with tree trimming, preventing vegetation from contacting conductors and maintaining required clearances. Last year, regulators told both utilities that their vegetation management programs were deficient, and that may have exacerbated recent problems.

Inevitably, the latest storm will prompt public and private conversations about what can be done to prevent the situation from recurring.

Utility officials say it is possible to harden the grid against such outages and increase their system's resiliency through stepped up tree and vegetation trimming, advanced grid technology and other infrastructure improvements. Utilities are already moving on those fronts, but there are limitations and tradeoffs, and the solutions often come with a steep price tag.

"We will learn from this event," said Larry Bekkedahl, vice president of grid architecture at PGE, which saw a peak of more than 300,000 customers affected by blackouts. Given enough money, he said, engineers can design a solution to almost anything. The question is the cost versus benefit.

"Is this going to be a 40- or 50-year storm? Or maybe this is happening more often," he said.

"Ultimately it is the customer who is either impacted or is paying for it, and we want to make sure we're doing the right things."

Vegetation management

Utilities' vegetation management programs are clearly a piece of the problem — and the solution.

One of the programs' primary aims is to reduce wildfire risks, particularly in rural areas. But the strategy has obvious implications during wind and ice storms, too: If trees and branches are farther from lines and poles, they're less likely to take them down when they fall.

Safety staff at the Public Utility Commission conduct annual field inspections to sample the utilities' tree trimming programs, identify vegetation touching overhead lines, and ensure utilities are maintaining the state's mandated line clearances.

Last year's audits noted serious problems and violations for both companies.

The PUC issued a "warning" notice to PGE that based on its review of its system, its vegetation maintenance "appears to have deficiencies that are potentially systemwide." In a review of "various" urban and rural areas, regulators found "719 locations where evidence existed of contact between vegetation and primary electrical conductors." Based on historical reviews, they said the number of tree and energized conductor contacts were approaching all-time highs.

PGE says it typically trims trees on a three-year cycle, and has doubled its spending since 2017 to $26 million in 2020. The utility sees even higher spending moving forward — as high as $40 million with new construction and emergency trimming. It says it is actively using the audit results to improve its program.

PGE's system is larger than PacifiCorp's, with more miles of overhead lines. But regulators also found problems with PacifiCorp's vegetation program, issuing a lower level "caution" notice to that utility indicating that its program "needs improvement to ensure safety compliance." While Pacific Power's 353 violations showed a decrease from the 472 found in the 2019 review, the PUC said the number of contacts was still too high considering the high-profile wildfire mitigation efforts and identified tree hazards in the region.

About a decade ago, Pacific Power transitioned from a three-year trimming cycle to a four-year, with interim trimming of hot spots. That corresponded with a significant increase in violations identified by the annual audits. Utility commission staff said they were concerned the four-year cycle is not adequately meeting administrative rules on keeping trees safely distanced from power lines and equipment.

Last year, PacifiCorp, Pacific Power's parent company, unsuccessfully sought its first rate increase since 2013. One of the company's rationales for that increase was to help cover expanded vegetation management and other wildfire prevention work.

A filing in the case shows PUC staff was skeptical because PacifiCorp had no projection for when its vegetation management would be under control. Instead, regulators proposed making some of those cost recoveries dependent on the utility bringing its violations under established levels, and suggested a reasonable number of violations in a given year would be fewer than 75.

Kandi Young, a PUC spokeswoman, said utilities don't need approval to adjust their trim cycle. The utility is responsible to execute what's needed to provide safe and reliable service — including meeting or exceeding the minimum requirements for line clearances. Utilities submit a breakdown of expenditures in their rate cases, and regulators scrutinize them. But the PUC approves overall rates, not specific line items.

Both utilities say they are seeing faster tree growth in some areas due to rising temperatures and longer growing seasons. Prolonged droughts and bug infestation in other zones are undermining the health of trees in or bordering their rights of way.

One obvious solution is to trim trees more aggressively so they maintain clearances by the end of the trim cycle. But that's a sore spot with customers, who often complain that utilities' contractors are butchering their trees.

Some Portlanders also lay blame with the city, which requires residents to maintain street trees that often grow up into power lines and cause problems during storms like last week's.

Dennis Phillips, a Hollywood resident, said he was looking to plant street trees that would grow to 20 feet at maturity. But to satisfy the city requirements, he ultimately settled on a Katsura that grows 40 to 60 feet tall.

"Tree policy is crazy," he wrote in an email. "The city argues larger trees produce more foliage and shade which leads to reduced AC loads and CO2 emissions. We wanted smaller trees to maintain our view of the early morning sky, reduce moss buildup on our roof, reduce risk of limbs falling on power and cable lines, minimize leaf removal and pruning costs, and avoid costly sidewalk and sewer repairs. Does the city's tree policy make economic sense?"

Utilities say they have an ongoing conversation with the city about its urban forestry program to make sure residents are planting "the right tree in the right place." But they acknowledge that the tree programs in many communities complicate their job.

"They do have a significant role in it," said PGE's Bekkedahl. "Each community is slightly different, and we need to work together to find the right solutions there…We do need to improve."

Meanwhile, utilities are turning to 3D laser scanning and other imaging technology that can help map tree density, species, clearances and even tree health, to make better, more timely decisions about what needs to be cut back over a broad area.

"We love our trees in the Pacific Northwest and there's a lot of them," said Allen Berreth, vice president of operations at PacifiCorp. "We're always evaluating the performance of the program to see if it needs to change and we can get better results. There is no one solution that's solves all these problems."

Strengthening infrastructure

One common question after wildfires or ice storms is why utilities don't simply run their lines underground.

In fact, it's standard practice in new subdivisions or new buildings, and is often used in rural corridors with reliability issues, more unpaved rights of way, and high wildfire risks. The general limitation is cost, particularly in established urban neighborhoods where it involves digging a trench up streets and to each individual home. It also involves changing out customer-owned equipment — a significant and unwelcome cost for ratepayers, Berreth said.

California's biggest electric utility, Pacific Gas & Electric, has estimated that it costs an average of $3 million per mile to convert overhead distribution lines to underground, compared to $800,000 a mile to build new overhead lines. Some industry studies put the disparity even higher.

PGE's Bekkedahl says burying lines is appropriate in many situations, but they are not immune to outages either. Data in the company's 2019 annual reliability report shows equipment failures were responsible for about 15% of customer outage hours overall. In those cases, the largest contributor, responsible for almost 40% of the underlying outage hours, is problems with underground conductors.

"Underground cable is one of our biggest headaches in terms of failure rates," he said. "When people say just 'underground everything,' (they don't recognize) it fails more than other equipment and it takes you longer to repair it. There's some pain associated with that."

The same data showed that failed poles and other structures were responsible for less than 1% of the outage hours due to equipment failure in 2019. That number may not change much this year, as the company will attribute most of its recent pole failures to adverse weather. But Bekkedahl says the company will have to replace 1,500 to 1,600 poles from this storm.

"This is our version of a hurricane," he said.

In some parts of its service territory, entire corridors of poles were dragged to the ground. A single pole, in some cases, can carry multiple transformers and both transmission and distribution lines. Repairing them involves clearing up downed lines, trees and limbs, getting rid of the old pole and setting a new one, putting on cross arms and installing the new electrical equipment. It's a big project, one that can be compounded by environmental issues if a blown transformer leaked oil, for instance.

The solution, in some cases, will be installing steel poles, which are stronger and don't rot.

The biggest problem in last week's storm was downed transmission lines and neighborhood power lines. Utilities follow regional specifications for what level of icing lines are designed to withstand.

In the valley, Behkkedahl said, that's a quarter-inch of ice, and in the foothills a half-inch. During this storm, utilities saw lines encased in 2 inches of ice in some areas. Meanwhile, branches that might normally sway as much as 5 feet — and still maintain desired clearances — sagged over power lines or simply collapsed on them, with predictable results. Tall trees from outside the areas they are required to clear were coming down on lines, too.

Strengthening the system, in this case, might involve using covered conductors that can handle more load and vegetation contact without shorting. Utilities can also replace brackets that connect lines to poles with models designed to break away at a specific point, without dragging down the pole or the cross arm.

When a line goes down, the power goes out. But technology can help there too.

Utilities have installed smart meters over the last several years that give them faster, more granular information about which customers are out. More advanced "recloser" and relay technology can also help utilities locate faults faster and determine which electrical switches to close to isolate the outage and which to open to reroute service to affected customers.

PacifiCorp is piloting that technology in several areas, though PUC staff remains skeptical of many of the related capital projects the company proposed in its recent rate case.

One more esoteric solution to the outage problems is a micro-grid, a defined geographic footprint with its own source of generation (solar, wind and generators) and battery backup. PGE has simulated a micro-grid in Salem with a 1.25-megawatt lithium battery array and access to power from generators owned by third parties to maintain greater reliability. As a concept, it works, and can be deployed in emergency facilities. But it's impractical in a multi-day outage spread over a broad area or even a neighborhood.

"You can see a future where we'd have large batteries in a specific area, but they're only a four- to eight-hour solution," Bekkedahl said. "If you're going days you need localized (power) generation that supports that as well."

Utility experts said the extent and duration of this outage will eventually be hashed out in both public and private forums. Some of the solutions will be implemented, especially where they address overlapping risks.

"The question is how much effort and investment do you make for a one in 50-year event," said Bob Jenks, executive director of the ratepayer advocacy group, the Citizens Utility Board of Oregon.

But with climate change driving more intense storms and wildfires, he asked, "what dollars do you throw at it, recognizing that these events are going to cost a lot of money themselves."

Thousands in the dark in Oregon

Some 38,000 Portland General Electric customers were still without power Sunday. The vast majority were in Clackamas County, which had nearly 14,000 households and businesses still out, and Marion County, with nearly 13,000. The utility said it had restored power to 14,000 customers Saturday, and that some 400 utility crews were in the field Sunday. PGE had called in crews from surrounding states to assist after an unusually fierce snow and ice storm last weekend knocked out power to more than 700,000 customers at various points.

Pacific Power, with a much smaller service area, said it had restored power to all but a relative handful of customers, most in the Salem area.

— The Oregonian

WINTER STORMS

Hospitals confront water shortages

Associated Press

HOUSTON — Hospitals across the South grappled with water shortages Sunday as the region carried on with recovery efforts in the wake of a devastating winter storm, and the weather offered a balmy respite — temperatures as high as the mid-60s.

At the height of the storm, hospitals were left scrambling to care for patients amid record cold, snow and ice that battered parts of the country more accustomed to going through winter with light jackets and short sleeves. The icy blast ruptured water mains, knocked out power to millions of utility customers and contributed to at least 76 deaths — half of which occurred in Texas. At least seven people died in Tennessee and four in Oregon.

A rural hospital in Anahuac, Texas, about 50 miles east of Houston, lost both water and power.

William Kiefer, CEO of Chambers Health, which runs the hospital along with two clinics and a wellness center, said the facilities resorted to backup generators and water from a 275-gallon storage tank. They refilled it three times using water from a swimming pool in the wellness center.

Last Monday, when temperatures were in the teens, a woman about to give birth walked into the hospital after she could not make it through the ice and snow to her hospital in suburban Houston. Emergency room staff delivered the baby safely, Kiefer said.

"It would have taken her another two hours to get to (the suburban Houston hospital) if our facility wasn't there," he said. "We can probably assume she would have had the baby in her car and the snow. Not a good situation."

Water was restored Thursday, and operations had returned to normal Sunday, he said.

Still, hundreds of cars lined up at NRG Stadium to receive food and water from the Houston Food Bank. The bank also delivered supplies to vulnerable citizens, including seniors and the disabled.

Memphis, Tennessee, saw 10 inches of snow last week. Memphis, Light, Gas & Water issued a boil-water advisory on Thursday out of concern that low water pressure caused by problems at aging pumping stations and water main ruptures could lead to contamination. The advisory was still in place Sunday; utility officials said they did not know when they might lift it.

About 260,000 homes and businesses were under the advisory. Hospitals and nursing homes have been forced to switch to bottled water. The Tennessee National Guard was supplying St. Francis Hospital with water.

Meanwhile, the White House said about a third of the COVID-19 vaccine doses delayed by the storm were delivered over the weekend. The weather created a backlog of about 6 million doses as power outages closed some vaccination centers and icy weather stranded vaccine in shipping hubs. White House press secretary Jen Psaki told ABC's "This Week" that about 2 million of those doses have gone out.

Nearly 230,000 customers across the South were still without power as of Sunday, according to PowerOutage.us, a website that tracks power outages.