1 BACKGROUND

PacifiCorp serves more than 2 million customers across over 144,000 sq. miles of service territory in six western states. Two of these states — California and Oregon — are particularly vulnerable to wildfire and other extreme weather events. The increasingly urgent goals of resilience and wildfire mitigation align PacifiCorp with state and local priorities to protect citizens of the West facing the devastating impacts of wildland fire. PacifiCorp has established detailed wildfire mitigation plans for these states, as well as for Utah, to predict, protect, and maintain its electrical lines and equipment to minimize the risk of wildfire ignition. PacifiCorp continues to analyze its electric system to develop longer-term strategies that consider the changing climate and increasing wildfire risk.

Over the past three years, PacifiCorp has invested an average of $263 million per annum in asset hardening and control center upgrades to mitigate against the potential risks of extreme weather events.

These investments address four key categories: (1) wildfire mitigation efforts, in compliance with state wildfire mitigation requirements, (2) rebuild or replacement of poles, lines, and hardware, (3) rebuild or replacement of transmission and/or distribution substation assets and (4) overall reliability improvements related to strengthening the electrical system, reducing line exposure, adding functionality, or improving restoration capability.

Table 1 below provides a summary of PacifiCorp's past and future planned investments under each of these categories across its six-state territory.

Table 1—PacifiCorp's Resilience Investments

	Actuals (in $ millions)			Forecast (in $ millions)		
Resilience Category	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Wildfire Mitigation	39	65	143	273	158	136
Poles, Lines, and Hardware	106	115	121	120	77	162
Substation Equipment	26	34	30	57	36	70
Reliability Improvements	28	37	45	141	70	71
Total	**199**	**252**	**339**	**591**	**342**	**439**

Note: PacifiCorp is currently revising its integrated resource plan; the forecast investments for 2024 and 2025 may be revised upwards to account for inflationary trends and accentuated resiliency requirements.

As evident from Table 1, resilience investments per annum have been increasing consistently, with approximately 30% annual rise in the last two years. While these figures indicate PacifiCorp's

significant focus on building resilience, the rapidly rising frequency and impact of extreme weather events and wildfires affecting its service territory has been significant.

PacifiCorp, like other utilities in the region, must balance the need to minimize customer rate increases, while maintaining high service levels in the face of extreme weather events and wildfires. This means that the company must carefully evaluate risks and prioritize locations for infrastructure upgrades based on factors such as circuit reliability, age of assets, wildfire risk, and the number/type of customers served.

PacifiCorp recognizes the need to significantly enhance resilience investments in the near future; its 2023 forecast is 75% higher than the previous year ($591 million; up from $339 million in 2022). U.S. Department of Energy funding will permit PacifiCorp to adopt a community-focused, holistic approach that addresses multiple extreme weather vulnerabilities all at once — especially relevant as it applies to company service territories with disadvantaged, rural, often low-population regions.

More details about the type of resilience investments undertaken by PacifiCorp are provided in Section 2. Section 3 provides information about the stringent process undertaken by PacifiCorp for ensuring the optimum prioritization of resilience investments.

2 PACIFICORP RESILIENCE INVESTMENT EFFORTS

2.1 Wildfire Mitigation

The increasing threat posed by wildfires has been, and will continue to, reflect in plans, policies, and priorities of the states that PacifiCorp operates in. In California, under Senate Bill 901, utilities are required to prepare and submit wildfire mitigation plans to the Office of Energy Infrastructure Safety (OEIS) for review and approval. In Oregon, Wildfire Mitigation Plan (WMP) strategies must comply with OAR 860-300-0002 effective September 22, 2022, per Order No. 22-335.[1] In accordance with the wildfire mitigation priorities of its respective states, PacifiCorp undertakes projects that reduce the risk related to wildfires, as detailed below.

Several of the wildfire mitigation elements discussed below also minimize public safety power shutoffs (PSPS). PSPS events, or, planned power outages to minimize the risk that power lines will spark fires, are a measure of last resort. Though they have become a necessary tool in recent years, they are highly impactful to customers and communities. Microprocessor relay installation, micro weather stations and advanced situational awareness *both* mitigate fire risk *and* support more targeted PSPS events — instead of a broad, full-circuit approach — further reducing the impact of PSPS.

PacifiCorp has invested **$247 million** over the past three years on wildfire mitigation projects and anticipates investing additional **$567 million** between 2023 and 2025.

[1] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB901 ; Public Utility Commission : Wildfire Mitigation : Safety : State of Oregon

Condition corrections – These projects correct equipment conditions that are identified through field inspections, where any obvious damage or defects in poles, lines, and hardware could affect safety or reliability; in California, these corrections align with GO 95 and GO 165. The majority of these projects involve pole, crossarm, and transformer replacements. In recent years, robust company effort related to its quality assurance and quality control program have supported field inspections. This program generally includes desktop and field audits designed to identify gaps in the inspection programs and inspector capabilities. QA/QC also includes corrections that increase inspection accuracy and reliability, which is critical to ensure effectiveness and to support risk reduction.

Line rebuilds – These projects involve reconstruction of a selected segment of a line, including the installation of new conductors and new poles. Depending on specific terrain, access, and environmental conditions, overhead facilities may be replaced with new overhead conductor (including covered conductor) or with underground cable and pad-mounted equipment.

An additional element of line rebuild includes the replacement of small-diameter copper conductor. Small diameter copper and iron conductors coordinate with devices and line equipment under normal operating conditions and standard protection and control schemes to identify and isolate faults. However, this small diameter conductor is often incompatible with the upstream fusing and relay settings required for fault detection programs.. Specifically, under certain fault conditions, the small diameter conductor with fail before the protection scheme is able to operate. As PacifiCorp's advanced fault detection programs reduce wildfire risk, the company's small diameter copper and iron conductor replacement program is viewed as a necessary element of these programs, thereby reducing wildfire risk. Small diameter copper is replaced through the line rebuild design process.

Pole replacements – The company prioritizes poles for replacement based on pole age. All poles in excess of 45 years in operation in high wildfire risk areas will be selectively replaced as part of the program. In addition, poles are often replaced to accommodate the additional weight of covered conductor.

Relays for advanced system protection – These projects replace slower electromechanical relays with microprocessor relays that exercise programmed functions much more quickly, allow for greater customization to address environmental conditions through a variety of settings, and are better able to incorporate complex logic to execute specific operations. The targeted installation of reclosers and relays allows more precisely targeted PSPS events. Microprocessor relays also retain event logs that provide data such as the date, time, recording interval, and predefined categories (voltage, amperage, etc.) for fault location and post-event fault analysis.

Weather stations and situational awareness systems – These mitigation projects install micro weather stations that collect data every 10 minutes to provide more precise local weather data. This data, along with weather forecasting hardware/software, is used to help determine when and where to implement high-risk operating procedures; it also supports more precise targeting, in both time and location, of disruptive PSPS events.

Wildlife Protection Plan (WPP) – These projects leverage proven Avian Protection Plan practices and methodologies and, where needed, apply new approaches to respond to wildlife incidents,

and implement proactive measures. The ultimate goal of PacifiCorp's proposed WPP is to reduce the potential for wildlife incidents within high wildfire risk boundaries and emerging focal areas.

Distribution SCADA additions – The addition of communications and SCADA provide the ability to remotely modify the settings of advanced microprocessor relays operating reclosers and circuit breakers. This allows enhanced fire protection settings to be enabled quickly during wildfire season or other high-risk events. These additions also support remote operation of the protective devices when needed.

Lessons learned and risk assessments – A key component of these plans is incorporating customer feedback, internal analysis, subject matter expertise, external industry collaboration and stakeholder and regulator feedback. PacifiCorp leverages the strategies that result from these findings to maximize the effectiveness of the technologies described and to continually evaluate new approaches.

2.2 Poles, Lines, and Hardware

These projects rebuild or replace transmission and/or distribution line assets that have failed, have reached the end of their life span, or have been deemed unsafe or unreliable and have become a threat to the continuity of the system. The assets in need of replacement may be found through normal inspection cycles, during outage response and restoration efforts, or through operational improvement planning. PacifiCorp invested **$342 million** between 2020 and 2022; the company plans to invest **$359 million** between 2023 and 2025.

2.3 Substation Equipment

These projects rebuild or replace transmission and/or distribution substation assets that have failed, have reached the end of their life span, or have been deemed unsafe or unreliable and have become a threat to the continuity of the system. The assets in need of replacement may be found through normal inspection cycles, during outage response and restoration efforts, or through operational improvement planning. PacifiCorp has invested **$90 million** between 2020 and 2022; the company plans to invest **$163 million** between 2023 and 2025.

2.4 Reliability Improvements

These projects rebuild existing infrastructure and/or add new infrastructure with the intent of reducing customer outages and outage durations by strengthening the electrical system, reducing line exposure, adding functionality, or improving restoration capability. PacifiCorp has made investments of **$110 million** between 2020 and 2022; the company plans to invest **$282 million** between 2023 and 2025.

Key reliability improvement strategies employed by PacifiCorp include the following:

Mainline sectionalizing plans – These projects rebuild existing infrastructure and/or add new infrastructure with the intent to reduce customer outages and outage durations by focusing on zones of protection and balancing customer exposure.

Voltage conversions – These projects rebuild and replace infrastructure that is operating at non-standard nominal system voltages (deemed obsolete and no longer being propagated) with standard voltage rated and stocked equipment.

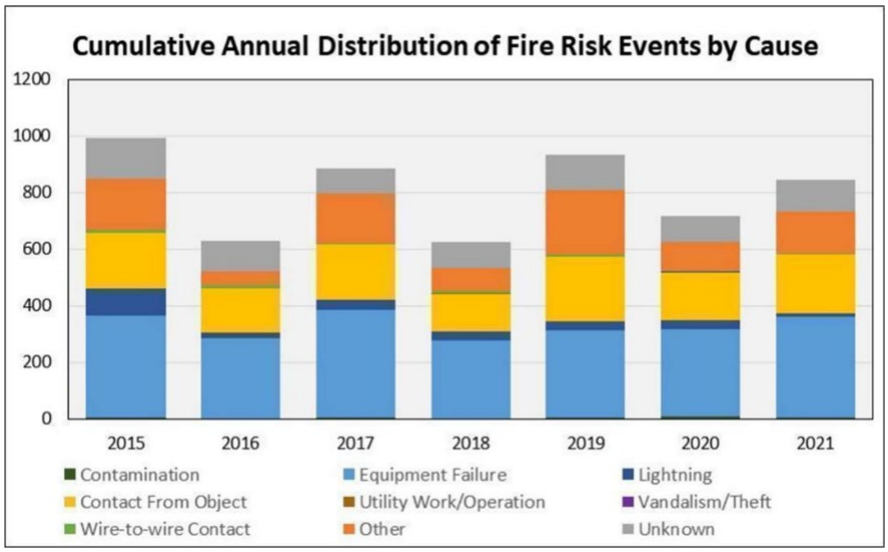
Other functional upgrades – These projects replace or add new equipment to gain additional functionality, to improve efficiency, or to enhance productivity functions of an asset.

3 RESILIENCY DECISION-MAKING PROCESS

PacifiCorp follows a four-step process to ensure that the best solutions are identified and implemented when pursuing resiliency upgrades. These steps — (i) evaluating risks, (ii) identifying mitigations, (iii) evaluating and selecting strategies, and (iv) scoping and deployment — can best be exemplified in wildfire mitigation-related resiliency decisions discussed below.

3.1 Evaluating Risks

PacifiCorp begins the decision-making process by identifying trends in risk events. Risk events are identified using the company's outage data, which is aligned with IEEE 1366 and IEEE 1782. After the risk drivers are categorized, PacifiCorp uses the outage data to quantify the frequency of each risk driver. The figure below is an illustration of PacifiCorp's risk drivers and the frequency with which they have impacted wildfire risk events.



3.2 Identifying Mitigations

To identify possible approaches to mitigation, PacifiCorp evaluates current and evolving industry practices and technologies. PacifiCorp reviews the results of pilots and demonstration projects as described in other utilities' technology reports, reliability guidelines, best practices, and wildfire mitigation plans. These sources, in addition to other industry publications, supply valuable information on proven industry solutions to improve reliability and resiliency and to reduce asset risks from extreme weather events. Additionally, PacifiCorp has developed strong relationships with other industry associations and utilities across the country; these relationships facilitate discussions about industry practices and provide opportunities to learn from each other. PacifiCorp continually updates cost-benefit analyses of different technologies and solutions for evaluation of alternate mitigation strategies.

3.3 Evaluating and Selecting Strategies

Mitigation strategies and relevant technologies are evaluated for implementation based on the following criteria:

- Commission or regulatory requirements
- Extreme weather and wildfire risk impacts
- Customer impacts
- Ease of implementation

Once approved by PacifiCorp's executive team, these mitigation strategies and technologies are assigned to subject matter experts and program managers for planning, procuring, and commissioning.

3.4 Scoping and Deployment

Scoping varies greatly depending on the type of program. Generally, PacifiCorp reviews risk mitigation programs that might already be under implementation and prioritizes work to address higher risk or more vulnerable locations first. After program prioritization is finalized, a program moves to the design stage. Following design, the detailed implementation plan is developed and the mitigation and deployment steps are initiated.

Before, throughout implementation, and after completion of the program, a variety of metrics are collected and recorded. Metrics vary, depending on the specific program, and can include installation dates, completion dates, conditions, ignitions reported, and/or outages reported. This data is incorporated into future revisions of risk modeling for these resiliency efforts.

3.5 Training

Training is conducted before implementation. Ongoing training and best-practices information exchange continue post-implementation. PacifiCorp adheres to "Plan-Execute-Measure-Correct" model to ensure consistent frameworks are applied to programs and continuous improvement is achieved throughout the program cycle.

4 CONCLUSION

As evident from this document, PacifiCorp adopts a structured, risk-appropriate approach to planning and prioritizing investments in building resilience for its electric infrastructure. The most critical constraint faced currently by PacifiCorp, and by the region, is availability of funds to address the rapidly rising threats from wildfire and extreme weather events. This often leads to a fragmented approach towards asset hardening; it can take a long time for customers to realize benefits from the overall project.

DOE funding will permit the concurrent planning and implementation of multiple technologies on the system to eliminate a piecemeal approach and allow improved technology deployment velocity and efficiency benefiting disadvantaged communities encountering the highest risk from extreme weather events. This holistic approach is expected to have a greater impact than the traditional linear approach, as it addresses multiple vulnerabilities at once and allows PacifiCorp to enhance its ability to provide safe, reliable and affordable electricity to its customers and communities.