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COMMENTS OF THE GREEN POWER INSTITUTE ON THE 2023-2025 BASE WILDFIRE MITIGATION PLANS OF THE SMJUs

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The Green Power Institute (GPI), the renewable energy program of the Pacific Institute for Studies in Development, Environment, and Security, provides these *Comments of the Green Power Institute on the 2023-2025 Base Wildfire Mitigation Plans of the SMJUs*.

Introduction

The GPI performed a review of the SMJUs' 2023-2025 WMPs with a general focus on Risk Methodology and Assessment; Grid Design, Operations, and Maintenance; and Vegetation Management; particularly with respect to how these issues affect the electrical distribution system. Our comments and recommendations cover the following topics:

- Cross-Cutting Issues: SMJUs are leveraging their small and/or multi-jurisdictional territories to advance their WMP initiatives
- Risk Assessment and Modeling: The SMJUs are engaging Technosylva to overhaul their wildfire risk planning modeling tools and approaches
- Risk Assessment and Modeling: Likelihood of Risk Event (LoRE)
- Risk Assessment and Modeling: Consequence of Risk Event (CoRE)
- Risk Assessment and Modeling: [Liberty] The link between updated risk modeling approaches, tools, and outputs and mitigation selection and prioritization are not well defined
- Risk Assessment and Modeling: [PacifiCorp] The link between updated risk modeling approaches, tools, and outputs and mitigation selection and prioritization are not well defined
- Risk Assessment and Modeling: [BVES] The link between updated risk modeling approaches, tools, and outputs and mitigation selection and prioritization are not yet well defined

- Risk Assessment and Modeling: The SMJUs do not have risk assessment approaches that clearly take into account factors such as asset age or operating conditions
- Risk Assessment and Modeling: Design Basis Scenarios
- Risk Assessment and Modeling: Ingress/Egress risk mitigation
- Grid Design, Operations, and Maintenance: Liberty is slowing their Covered Conductor program due to uncertainty and in exchange for slower undergrounding mitigations
- Grid Design, Operations, and Maintenance: Interim Mitigations
- Grid Design, Operations, and Maintenance: Expulsion fuse replacement ignition risk
- Grid Design, Operations, and Maintenance: Liberty should correct discrepancies regarding tree attachment removals completed
- Grid Design, Operations, and Maintenance: BVES should clarify its undergrounding and traditional overhead hardening targets
- Grid Design, Operations, and Maintenance: PacifiCorp Shows aggressive mitigation goals in 2023 that taper substantially in 2024 and 2025
- Grid Design, Operations, and Maintenance: PacifiCorp must provide Performance Metrics for 2022 and in their WMPs thereafter
- Grid Design, Operations, and Maintenance: Liberty did not complete its 2022 inspection coverage goals and is halting its Detailed Inspections program to work down their work order backlog caused by a system level inspection
- Grid Design, Operations, and Maintenance: Pilot programs should be right-sized to produce timely meaningful data.
- Grid Design, Operations, and Maintenance: PacifiCorp's open and overdue work order backlog is increasing
- Grid Design, Operations, and Maintenance: BVES inspection scheduling
- Grid Design, Operations, and Maintenance: BVES should provide additional details on their Grid Design, Operations, and Maintenance QA/QC results
- Vegetation Management: Liberty and BVES approaches to VM fuels and slash removal may facilitate timely access to private property for VM activities

- Vegetation Management: California must begin to take a long view on utility vegetation management methods, woody biomass end-uses, best practices, and transparency
- Vegetation Management: SMJUs should expand on IVM progress to date
- Vegetation Management: Open work order backlogs
- Vegetation Management: PacifiCorp must provide performance metrics for their VM activities relevant to the 2023 WMP and in all following WMPs
- Vegetation Management: PacifiCorp's WMP vegetation management inspection section is incomplete
- Vegetation Management: PacifiCorp should provide a clarified VM QA/QC narration and results table
- Vegetation Management: PacifiCorp should assign levels to VM open work orders and track their progress

Comments

Cross-Cutting Issues: SMJUs are leveraging their small and/or multi-jurisdictional territories to advance their WMP initiatives.

Comments from the SMJUs made during the June 16, 2023, workshop provided examples in which the SMJUs are leveraging their small and/or multi-jurisdictional territories to facilitate wildfire mitigation planning and implementation. For example, BVES described how they performed a detailed assessment of wildfire risk model outputs in relation to their expert knowledge of the service territory and subsequently followed up with model developers in order to better understand model output noise for the purpose of supporting a risk-informed, decision-making process. This latter example exhibits the ability to effectively interpret and apply risk modeling outputs in conjunction with subject matter experts' (SMEs) local knowledge, versus applying these two critical components in a siloed fashion. BVES representatives also recounted how their small territory and customer base allowed for direct customer service with lead vegetation management and wildfire planning staff in order to address and effectively resolve vegetation management work issues such as private property access and concerns over VM slash and fuel removal. Liberty has been able to leverage the benefits of its small territory size by

offering comprehensive slash and fuel removal after VM work, which has in turn improved customer satisfaction and reduced barriers to private property access. PacifiCorp noted that they are leveraging outage and ignition data from their multi-jurisdictional territory to facilitate risk assessment and modeling by amassing a larger data set than what is available in their California territory alone.

Some of the benefits SMJUs are able to leverage are included in their WMPs. For example, BVES's WMP states:

> BVES management also tracks the schedule and implementation of each mitigation project and initiative closely. Due to the size of the staff and service territory, all projects have full visibility up to the highest level of the utility. Additionally, staff conducts weekly management briefings and management reports to track progress, project needs, challenges, and delays, if any, on every project.[1]

Conversations during the June 16, 2023, workshop suggest there are additional aspects of their operations that facilitate WMP implementation. In future WMP filings, GPI encourages the SMJUs to expand on how they leverage their territory size, community connections, and/or multi-state coverage to facilitate detailed risk assessments/modeling application and vegetation management efforts among other WMP activities.

Risk Assessment and Modeling: The SMJUs are engaging Technosylva to overhaul their wildfire risk planning modeling tools and approaches.

All three SMJUs announced plans to overhaul their wildfire risk modeling (planning) and assessment approaches. These plans include contracting Technosylva to provide probability of ignition (PoI) and wildfire consequence modeling. We discuss each of these modeling aspects in comments below. In general, this decision marks the universal adoption of Technosylva wildfire risk modeling products by IOUs and SMJUs for the purpose of informing wildfire risk planning strategies. Previously, PacifiCorp engaged with Technosylva in support of "decision making processes during PSPS events."[2] PacifiCorp contracted Reax to support weather station

[1] BVES 2023-2025 Base WMP, p. 112

[2] PacifiCorp 2023-2025 Base WMP, p. 17

deployment.[3] Liberty and BVES previously engaged Reax Engineering for PoI and consequence modeling.[4,5]

GPI supports the transition to a common model basis for wildfire risk assessment and planning purposes. We have not specifically compared Reax versus Technosylva wildfire risk models or model outputs and generally supported the use of either product for the purpose of informing granular risk and risk-informed mitigation selection, location, and prioritization. However, unifying the foundational models that utilities employ to estimate granular risk can help standardize statewide risk planning thresholds that map directly to model outputs.

We still consider utility wildfire risk modeling to be in the relatively early stages of development. Individual IOU modeling and model output application approaches are stabilizing. However, the design basis (inputs), assumptions, calibration to OEIS-defined catastrophic wildfire planning thresholds, application approaches, and resulting risk-informed mitigation plans across the utilities are still highly variable between utilities. Applying each utilities' risk modeling and application method to the same region would likely produce somewhat different risk maps that result in different mitigation investment portfolios for the same system. It is not apparent how large those differences are and/or whether all proposed risk-informed investments are necessary.

The SMJUs risk modeling and application approaches are just getting going. Working from a common risk model basis for the current 3-year WMP cycle, in this case Technosylva wildfire risk models, can help level the approach to risk-informed mitigations by removing some of the "degrees of freedom" utilities have when designing risk models. However, given the latitude that the current risk planning standards provide, some of the most critical aspects of SMJU (and IOU) wildfire risk modeling and resultant risk-informed mitigation selection still include input selection (e.g. worst case versus probabilistic sub-set of available data years), output format (e.g. max, average, percentile), and how the SMJUs apply the outputs. The SMJUs have only just

[3] PacifiCorp 2022 WMP R1, p. 152

[4] BVES 2022 WMP Update, p. 31

[5] BVES 2022 WMP Update, p. 70

begun to define the optional aspects of Technosylva modeling and its relationship to risk-informed mitigation decision making.

The translation of risk model outputs into actionable mitigation decisions is especially under-developed at this stage. The way SMJUs (and IOUs) elect to apply model outputs can include a wide range of considerations such as: Do the models inform mitigation prioritization or mitigation type? Are risk mitigation thresholds set? Is the output converted using an MAVF? Do SMEs consider risk model outputs in the initial selection phase or as a tie-breaker? Based on the SMJU 2023-2025 Base WMP filings it is not readily apparent if or how the merging into Technosylva risk modeling products will alter SMJU wildfire mitigation strategy. This Technosylva risk model integration and application lag could be viewed as an opportunity to provide additional top-down guidance that establishes clearer planning thresholds and unifies risk modeling across the SMJUs.

The current top-down risk planning basis or thresholds include the use of old HFTD maps and a goal to eliminate the occurrence of utility-caused Catastrophic wildfires, defined as a fire that results in least one death, damages over 500 structures, or burns over 5,000 acres. HFTD maps are determined to be too low granularity (i.e. regional) to inform strategic and cost-effective long-term mitigation investments. Granular probability of failure, probability of ignition, and consequence modeling are intended to fill this gap. At least two additional risk planning gaps exist: (1) A gap between the deterministic Catastrophic wildfire risk planning standard and the reality that risk has a probabilistic component; and (2) a gap between the deterministic Catastrophic wildfire consequence planning standard versus what wildfire consequence models actually produce, which is a time constrained location-specific wildfire simulation based on input(s). Both gaps call for additional risk planning guidelines or standards.

The latter currently requires each utility to develop a calibration to relate wildfire consequence model outputs to Catastrophic wildfires. Alternatively, with a unified modeling basis such as Technosylva matchdrop simulations, risk planning thresholds could define a state adopted (e.g. top-down) calibration that directly relates to consequence risk model inputs and outputs, or simply define model inputs and outputs as a planning standard. Unifying the utility wildfire risk modeling capabilities can support reverse engineering of a planning standard that is directly

relatable to the available risk model architecture and outputs. A model-informed risk planning standard does not necessarily lock planners into using one model product since other publicly or commercially available wildfire risk models can be configured to provide the same output format.

Risk Assessment and Modeling: Likelihood of Risk Event (LoRE)

Likelihood of Risk Event (LoRE) minimally includes probability of failure and probability of ignition due to a failure. The SMJU's relatively small territories present data limitations due to low counts of total and/or risk driver-specific failures (e.g. outages) and CPUC reportable ignitions. This severely limits the statistical power of SMJU risk event data for the purpose of modeling if, when, where, and why future risk events occur. This fact has historically led the SMJUs to employ very different granular LoRE models and approaches relative to each other and the IOUs.

Liberty

Liberty uses a REAX developed ignition rate model based on the correlation between outage rate (Outages per line mile per hour) and wind gust speed (mph). This model clearly identifies both an exponential dependency between utility ignition risk due to outage rate as a function of wind speed and model a dependency between PoI and wind-driven wildfire consequence. This contrasts with SCE's risk modeling method, for example, which is designed with the assumption that granular wildfire consequence is independent of P(f) and P(i|f). It is also different from PG&E's risk modeling approach which ascribes a calibrated consequence score based on FPI and Technosylva consequence risk thresholds. Liberty states:

> Due to the exponential dependency of power line fire ignition rate on wind gust, fire occurrence may be dominated by a small number of low probability/high consequence wind events, to the extent that they are reflected in the driving climatology.[6]

The concept of PoI risk and resulting wildfire consequence is critical to the discussion of wildfire risk modeling. High wind gusts resulting in an order of magnitude higher outage *rates* and

[6] Liberty 2023-2025 Base WMP, p. 77

therefore increased likelihood of ignition do not constitute the majority of outage events, which occur under "normal" wind conditions. PG&E has the largest risk-event dataset, and therefore illustrates this point clearly (Figure 1 and 2). This evokes many risk-modeling, and therefore mitigation selection questions, especially whether risk modeling should treat P(i|f) and wildfire consequence as dependent or independent variables, and how fuel versus wind-driven fires should be considered in risk modeling and model application.

Figure 1. PG&E HFTD Tier 2 risk events during RFW, HWW, and normal (none) days from 2020-2022

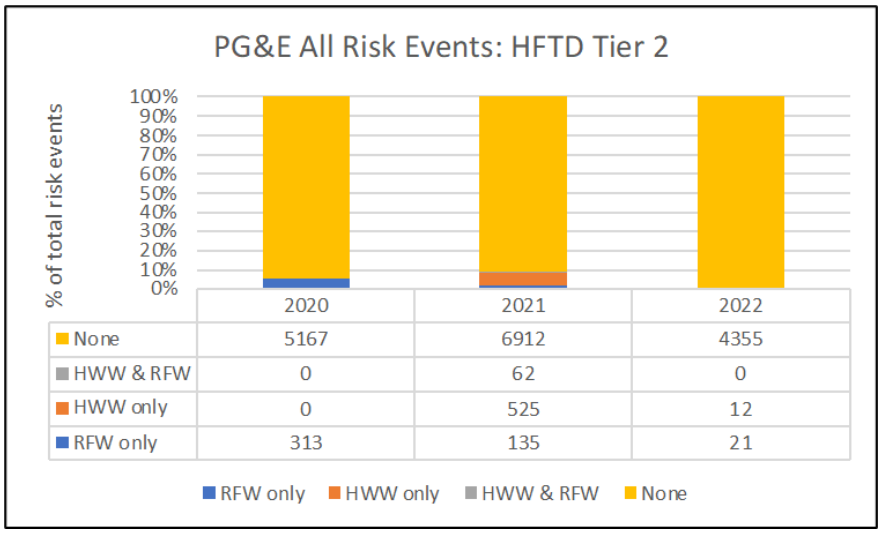
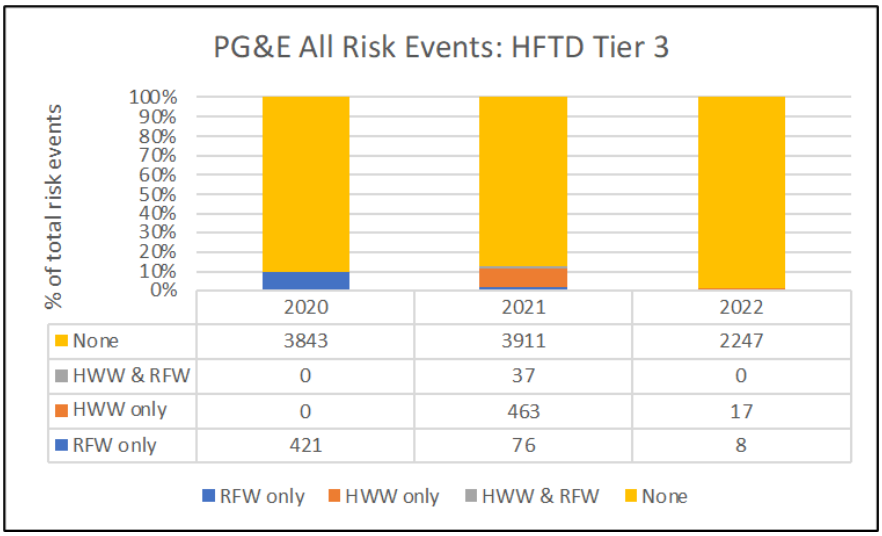


Figure 2. PG&E HFTD Tier 2 risk events during RFW, HWW, and normal (none) days from 2020-2022



Liberty determines ignition spatial and temporal occurrence as a function of the wind gust speed model as well as fuel moisture and temperature across their territory and totals the number of ignitions predicted based on 100,000 years of simulated climatological data. Circuit granularity PoI is mapped as ignition rates tied to frequency of wind speed, temperature, and fuel moisture conditions. This model is valuable in terms of its ability to take into account the dependency of wildfire LoRE and CoRE in order to target low probability but very high consequence risk conditions and select suitable wildfire risk mitigations. We also observe the following model limitations.

- Liberty's LoRE model does not inform the type(s) of risk drivers associated with outage rates as a function of wind gust. As stated in their 2023 WMP:

  Liberty has not assessed the risk drivers impacting the overall risk scores and instead used older studies to support this WMP.[7]

  Outage rates above a wind threshold could be a product of a limited number of risk drivers (e.g. CFO-veg). Building out the outage rate model to include a risk driver assessment could hone in on the types of risk drivers that Liberty's service territory is most vulnerable to during high wind, high outage rate conditions and the associated consequence risk. This could provide additional insight that is directly relevant to risk mitigation selection, work prioritization, or discretionary inspections.

- Liberty uses a P(i|o) from the National Fire Danger Rating System that is based on fuel bed ignitability as a function of moisture content and temperature.[8] PG&E showed that Probability of ignition given an outage in their territory is also dependent on the risk driver. This may hold for other utilities including Liberty.

- This model highlights order of magnitude higher LoRE due to high wind conditions that are associated with high consequence wind-driven wildfires. LoRE and CoRE are dependent. It's not clear how locations characterized by lower outage rates but high total

[7] Liberty 2023-2025 Base WMP, p. 117

[8] Liberty 2023-2025 Base WMP, p. 75

outage and ignition events during less windy conditions (e.g. terrain-driven fires) are risk ranked by this approach. Understanding how this "second type" of granular risk manifests in the model output could inform model application for the purpose of risk mitigation selection. Is it possible to differentiate between locations with very high ignition rate risk that in turn cause very high consequence wind-driven wildfires versus low rate but high total ignitions that can result in potentially less severe terrain-driven wildfire consequences? Can multiple complimentary models identify risk associated with both types of LoRE and CoRE risk to inform granular grid hardening mitigations?

Liberty reports that it contracted Technosylva to provide WRRM wildfire risk analytics and received the first results in February 2023. The Technosylva WRRM suite can help to fill these limitations. It's not clear from their WMP whether the Technosylva WRRM PoI model will replace or supplement their existing REAX probability of ignition model discussed above. At this stage Liberty only refers to Technosylva WRRM model outputs and integration as a planned improvement to:

> Improve risk-based decision-making framework using risk models and analyses (*e.g.*, Technosylva's Wildfire Risk Reduction Model ("WRRM"), pole risk and investment optimization models and process flow charts, wildfire and PSPS consequence models with social vulnerabilities factored, weather analytics for situational awareness and mitigation planning).

GPI recommends that Liberty clarify its use cases for each risk modeling product in its 2024 WMP Update.

Liberty's WMP also states:

> Foundational risk calculations were assessed in silo at the asset and vegetation risk level and were not factored in the overall probability of ignition and fire spread analytics from Reax.[9]

And

> Section 7.2.2.2 Risk Impact of Mitigation Initiatives… Initial baseline risk analysis and assessments were conducted at the asset and vegetation level separately by circuit.[10]

[9] Liberty 2023-2025 Base WMP, p. 64

[10] Liberty 2023-2025 Base WMP, p. 136

It's not entirely clear what is meant by these statements. We interpret this as referring to narration in Section 7.1.4 Mitigation Selection Process subtitled, "Vegetation risk" and "Asset risk."[11] These summaries are general descriptions of service territory characteristics, risk, and related risk mitigations. These risk assessments are vague and do not explain whether or how Liberty is assessing location-specific vegetation and asset risk, risk calculations, specific data use, or decision-making frameworks that are used to inform location specific mitigation selection or prioritization. These descriptions do not pass as an adequately developed risk-informed mitigation selection process.

Liberty also does not provide a method for determining risk impact as a function of mitigation initiatives (Section 7.2.2.2), or estimate the projected risk reduction on the highest risk circuits over the 3-year WMP Cycle (Section 7.2.2.3), stating that this capability is forthcoming in 2023.[12] This suggests Liberty's wildfire risk planning models are not yet operational, including for informing RSE, or determining granular risk buydown.

Liberty is also contracting Direxyon to assist with Technosylva result analysis, scenario modeling, and spatial and temporal "risk reduction interventions." Discussion during the June 16, 2023, workshop further indicated that Liberty is initially focusing on developing a pole risk model with support from Direxyon. This pole risk model is the only clearly defined Technosylva use case development plan in its risk assessment improvement plan and in response to the problem statement: Liberty has not established a formal risk-based decision-making framework for its wildfire risk assessment or mitigation planning.[13]

GPI recommends issuing updated ACIs that address these ongoing shortfalls despite past ACIs requiring that Liberty improve its risk-informed decision-making process.

We did not review Liberty's PSPS risk model. Although Liberty weights its wildfire and PSPS risk scores 80/20 in its Overall risk score – its PSPS Risk scores can exceed Wildfire Risk scores

[11] Liberty 2023-2025 Base WMP, pp. 119-121

[12] Liberty 2023-2025 Base WMP, pp 136-137

[13] Liberty 2023-2025 Base WMP, pp 104-105

for a given circuit.[14] This is an interesting result that is worth investigating for the purpose of better understanding the risk planning design basis (LoRE and CoRE) and methods that are informing wildfire and PSPS risk mitigation planning decisions across the Utilities (IOUs and SMJUs).

PacifiCorp

PacifiCorp is in the middle of a merger from their Localized Risk Assessment Model (LRAM) to the Technosylva Wildfire Risk Reduction Module (WRRM) model. Previous WMPs describe Technosylva consequence models. However, this year PacifiCorp and BVES are adopting the Technosylva WRRM suite, which includes both probability of ignition and consequence models. The WRRM will provide PacifiCorp with equipment likelihood of ignition, contact from vegetation ignition likelihood, and contact from object ignition likelihood, as well as probability of failure sub-models. The P(f) models only consider outages that can cause a spark, and uses fragility curves that include both "a static probability of failure that represents the POF in the absence of wind and the dynamic exponential increase due to wind."[15,16] P(i|f) is based on statistical modeling of "circuit information, weather data, and outage records."[17] Appendix B also provides an indication of model accuracy in reference to P(f). All three ignition risk driver classes (Equipment failure, CFO-veg, and CFO) are modeled similarly. Furthermore, Technosylva models "Expected Risk" as the product of PoI, PoF, and Conditional Risk (CR), which is essentially a consequence risk potential of an asset. It's not entirely clear but it appears that the conditional risk may be assessed using the same input conditions that determine P(f) and P(i|f). Weather-day design basis is a probabilistic selection of historical fire season (May – October) weather days that include typical, statutory, and/or worst weather fire days.

The Technosylva WRRM suite, which now includes P(f) and P(i|f) models, can take into account the likelihood of failure and likelihood of ignition on low/no wind days and under windy conditions. Based on our understanding, LoRE and CoRE are considered dependent variables.

[14] Liberty 2023-2025 Base WMP, p. 96

[15] PacifiCorp 2023-2025 Base WMP, p. 380

[16] PacifiCorp 2023-2025 Base WMP, p. 80

[17] PacifiCorp 2023-2025 Base WMP, p. 380

Technosylva models presumably leverage composite risk event datasets that include IOU risk events, allowing the SMJUs to overcome the limitations of their limited territory-specific risk event datasets. At this stage, the Technosylva WRRM suite appears to offer a major improvement for PacificCorp, BVES, and Liberty wildfire risk planning model capabilities. The release of accompanying P(f) and P(i|f) models address previously identified modeling capability gaps such as modeling the dependency between LoRE and CoRE. Technosylva's WRRM suite with P(f) and P(i|f) models may be suitable as a universal California utility wildfire risk modeling approach (IOUs and SMJUs) that informs long-term wildfire risk mitigation planning and investments. It remains to be seen how PacifiCorp (and the SMJUs) elect to use the model outputs, including PoI models, in risk-informed decision making.

Bear Valley Electric Service

BVES developed the Fire Safety Circuit Matrix that defines high, moderate, and low risk tranches based on variables such as the number of customers, wood poles, bare wire, tree attachments, and expulsion fuses. This is a deterministic approach to identifying granular risk based on where assets with high probability of failure (P(f)) and/or ignition (P(i|f)) are located, and where they intersect with wildfire consequence risk factors (e.g. customer number). Once these assets are replaced the Fire Safety Circuit Matrix will output a static, low-risk score. This approach does not identify the granular likelihood of a risk event occurring due to contact from object, vegetation contact, or asset failure risk drivers including environmental conditions (e.g. wind) or asset health (e.g. age, overloading).[18] BVES also used REAX probability of ignition models beginning in 2021, though this model suite also does not inform risk based on risk driver (See discussion on Liberty above).

In their 2023-2025 WMP BVES is shifting their approach with plans to replace their Fire Safety Circuit Matrix and close risk modeling gaps with Technosylva modeling products that now include probability of ignition modeling:

[18] BVES 2023-2025 Base WMP, p. 62

> BVES believes that replacing the Fire Matrix with the WRRM will provide a probabilistic model and the level of granularity will eventually shift from the circuit level to the segment or span level. The model will provide calculated probability, consequence, and risk.[19]

PacifiCorp's Model Documentation describes Technosylva's PoI model design, but BVES's 2023-2025 Base WMP does not include an Appendix B with Model Documentation. BVES plans to use Technosylva products to close all PoI modeling gaps, including Equipment failure likelihood of ignition, Contact from vegetation likelihood of ignition, Contact from object likelihood of ignition, Burn Probability, and PSPS likelihood.[20] See our discussion above regarding Technosylva's PoI models. Similar to the other SMJUs, BVES still has a long way to go given the absence of risk model outputs and developed use cases for risk-informed decision making.

BVES's Fire Safety Circuit Matrix may yet have some functionality that Technosylva's WRRM PoI models cannot provide. Namely, the circuit matrix provides one metric for where to logically prioritize system hardening efforts, whether line rebuild projects or asset specific replacement programs, based on the location of known high-risk assets. GPI suggests that continuing to report on system risk reduction per the Fire Safety Circuit Matrix in future WMPs would also facilitate progress reporting on the systematic elimination of high-risk assets such as expulsion fuses, tree attachments, and bare wire. Updating the matrix can be done with relatively little effort and in addition to employing other wildfire risk modeling approaches.

In Section 6.2.2.1 Likelihood, BVES describes acquiring Technosylva WFA-E ignition likelihood outputs on a daily basis, which they use for assessing PSPS risk. They also state plans to develop an FPI. Both of these risk models are consistent with operations models, not planning models. To our knowledge PG&E is the only utility to use an FPI as an input to risk planning models. In their 2024 WMP Update BVES should clarify which model products are used for planning versus operations applications.

[19] BVES 2023-2025 Base WMP, p. 3

[20] BVES 2023-2025 Base WMP, p. 63

Collectively the SMJUs are overhauling their risk modelling approaches with varying levels of detail provided in the 2023-2025 WMPs. Based on the SMJU Technosylva roll-out timelines, the next two WMP Updates are anticipated to expand on model adoption, design bases, and integration approach, filling in some of the gaps seen in the 2023-2025 WMP Section 6 and Section 7 narrations. While models may take time to setup and integrate into mitigation decision making, it will be important to track actionable progress over the newly iniated 3-year WMP cycle. GPI recommends closely tracking the SMJUs risk modeling overhaul and establishing clear progress benchmarks and deliverables, especially given the SMJUs weak track record for developing risk model output applications.

GPI also notes that, while the IOU risk modeling methods are stabilizing, SMJUs forthcoming risk modeling overhaul will substantially affect the WMP Section 6 and 7 narrations, and should inform their Section 8 plans. This should be kept in mind when designing WMP "Update" filing templates and guidelines. All SMJUs will also need to include Appendix B risk planning model documentation in their 2024 WMP Updates.

Risk Assessment and Modeling: Consequence of Risk Event (CoRE)

Technosylva consequence risk modeling package

BVES, PacifiCorp, and presumably Liberty, will all use the Technosylva WRRM suite for wildfire consequence modeling. Liberty's description regarding to what extent they will use Technosylva WRRM for future risk modeling is the least developed of the SMJUs' 2023 WMPs. PacifiCorp included Model Documentation for Technosylva's consequence risk modeling in Appendix B. For completeness and posterity, the other SMJUs must provide similar or the same documentation in their future WMPs.

Technosylva offers two sub-models: Risk Associated with Ignition Location (RAIL) and Risk Associated With Value Exposure (RAVE). The models use somewhat different language to describe consequence outputs relative to OEIS standards. The documentation maps

Technosylva's RAVE model "Location Risk" output to be synonymous with what is commonly referred to as "wildfire consequence" in the WMP.[21]

RAVE Outputs are Community Resiliency (resiliency, response, evacuation) and Fire Intensity (fire behavior and area impacted). Output metrics are classified into two categories: "Locational Risk Factors" (relatively static) and "Asset Fire Susceptibility Factors" (dynamic). To date, granular wildfire consequence and resultant wildfire risk has been based on only two or three Asset Fire Susceptibility Factors: Acres Burned (8 hour simulations), Buildings Threatened, and Population Impacted. PG&E is an exception and utilizes Fire Behavior Index • Flame Length and Rate of Spread in their Destructive Fire calibration method. The WRRM RAVE also outputs Estimated Buildings Destroyed, Building Loss Factor and Burn Frequency (i.e. "the number of times the pixel was burned from fire simulations from asset ignitions").[22] Location risk factor metrics include: Population Density, Population Count, Building Density, Number of Buildings, Building Loss Factor • Road Density – major and minor, Fire Station Density, Social vulnerability (i.e. senior population ratio, disability population ratio, and poverty population ratio), Majority Fuel Model, Terrain Difficulty Index, Road Availability (with and without social vulnerability factors), and Years Since Last Fire. Location specific summary output formats include granular standard deviation, average, and percentiles for all simulations.

The RAVE consequence model will substantially advance SMJU consequence modeling capabilities to include updated WMP requirements regarding "Social Vulnerability and Exposure to Electrical Corporation Wildfire Risk," as well as egress considerations. Other RAVE output metrics, such as building loss factors, fire station density, and terrain difficulty index (suppression) are not currently included as WMP risk modeling or planning requirements. A common thread is that there are currently no planning standards or established best practices for any of these additional risk factors. This insight into Technosylva's most up to date WRRM suite capabilities marks potential for both converging and diverging risk modeling and risk-informed mitigation planning approaches. Universal adoption of Technosylva's WRRM product will largely unify the WMP consequence model. At the same time, it may be necessary to track

[21] PacifiCorp 2023-2025 Base WMP, Appendix B, p. 341

[22] PacifiCorp 2023-2025 Base WMP, p. 351

if and how each utility elects to consider each consequence risk output and format. It may also be prudent for the OEIS and/or CPUC to establish best practices or standards that outline use of the available WRRM RAVE model outputs for the purpose of risk-informed decision making. The IOUs are already establishing their own boundaries in terms of whether or not they intend to take consequence risk factors, such as suppression, into account in their long-term risk mitigation plans. GPI recommends that the SMJUs describe in their 2024 WMP updates if and how they intend to consider each RAVE consequence output.

Wind-driven and terrain-driven fire events

Technosylva's WRRM consequence model outputs can include both wind-driven and terrain-driven fire events. This is a function of model design basis inputs. PacifiCorp states:

> To account for the unique characteristics of its service territory, Pacific Power is using the attributes in the RAVE and RAIL sub models to develop a Wildfire Consequence score each circuit based on wind-driven and terrain-driven fire events. By modeling consequence for each type of fire, Pacific Power expects to have a better understanding of the highest risk circuits and risk drivers to apply to mitigation selection and prioritization. Pacific Power is currently selecting the attributes to use that will best reflect the wildfire consequence for wind driven and terrain driven events respectively.[23]

PacifiCorp further defines their granular asset-based ignition risk (likelihood x consequence, IR, i.e. WRRM Composite Risk) as the sum of wind-driven, fire-ignition risk and terrain-driven fire ignition risk.[24] This is in contrast to SCE's consequence-based risk assessment which uses the maximum granular consequence value, whether it is associated with a wind-driven fire or a terrain-driven fire event. Ignition risk scores that aggregate or average probability of ignition and/or consequence scores, use a single score (e.g. maximum), or use a percentile score will all require utilities to develop different risk planning thresholds. Aggregating or averaging consequence values could mask individual or maximum event risk or risk distribution. Conceptually, if wind-driven and terrain-driven fire events in two locations have ignition risk event scores of 10 and 1, versus 6 and 5, respectively, both location ignition risk scores would sum to 11, but the first location has much higher individual event risk and risk distribution. If a

[23] PacifiCorp 2023-2025 Base WMP, p. 83

[24] PacifiCorp 2023-2025 Base WMP, p. 84-85

risk planning threshold/standard is set at an event ignition risk of 7, only the first site would pass the threshold; whereas if the combined ignition risk planning threshold/standard is 7, both sites will pass the threshold. In this conceptual example lower individual event ignition risk is masked in the second location. The latter approach could result in high-cost mitigation installations where individual event risk is relatively lower. These types of risk modeling elements, planning threshold relationships, and applications must be considered across utilities as well as for each individual utility.

In general, these nuances may not be as impactful for SMJU risk model outputs since they do not currently have quantitative risk planning thresholds that determine mitigation type (e.g. undergrounding). However, it is still critical that the SMJU model application approaches are well reasoned and effective at informing mitigation decision making. For example, this includes selecting a basis for defining risk tranches (e.g. high, medium, low risk) from model outputs. The SMJUs should be encouraged to clearly define the model outputs they will use to inform mitigation selection and prioritization and how they apply them in the decision-making process in their 2024 WMP Updates.

Wildfire spread simulation duration

Liberty's REAX fire spread simulation duration is 24 hours. All other utilities use an 8-hour wildfire spread simulation. During the June 16, 2023, SMJU WMP workshop, Liberty stated that they believe a 24-hour simulation provides a good estimate of initial wildfire consequence risk. Wildfire spread simulation duration has been a topic of interest for wildfire risk modeling with respect to balancing robust consequence evaluation with result uncertainty (e.g. model uncertainty, suppression impacts, etc.). GPI is not specifically opposed to Liberty's election to run 24-hour wildfire simulations and use resultant consequences. However, if utilities use different wildfire simulation durations this can lead to divergences in utility risk planning thresholds as well as how each output is related to the OEIS catastrophic wildfire planning standard. The outcome is a reduced ability to compare planning thresholds between the utilities, assess compliance, and support WMP transparency.

Wildfire simulation model outputs and the resultant consequence scores are not linear over time. Longer wildfire simulations will likely increase the distribution of granular consequence values

across a utility territory in a variety of ways. For example, simulated fires that peter out in the 8-hour simulation will still do so in the 24-hour simulation, while other fires will have the opportunity to grow much larger, creating a larger distribution of wildfire consequence. This creates challenges for comparing, or developing comparable, quantitative, or even qualitative risk planning thresholds between the utilities.

Our recent consideration of top-down wildfire risk planning thresholds includes the value of establishing wildfire consequence planning standards that are directly informed by and relate to risk model outputs. Currently, risk model outputs, especially wildfire consequence outputs, require calibration in order to map to the OEIS Catastrophic wildfire consequence planning standard. One of the gaps between consequence model output and risk planning standard that utilities will have to fill includes a time and concomitant consequence extrapolation factor between each deterministic fire simulation and the future potential consequence of the simulated fire. SCE established an operational definition of Destructive Fire based on 8-hour wildfire consequence simulations and developed a calibration approach to relate simulation consequence to the OEIS definition of Catastrophic wildfires. PG&E developed a different calibration approach to relate 8-hour wildfire spread attributes to a slightly different operational definition of "Destructive Fire," and made a further comparison to relate their planning threshold to the OEIS-defined Catastrophic wildfire planning standard. Liberty would need to develop its own consequence extrapolation, or calibration in order to relate its 24-hour wildfire simulation duration to the OEIS definition of catastrophic wildfires. This will result in at least three different calibrations used by different utilities to relate modeled consequence risk to the OEIS Catastrophic wildfire planning standard. Since the consequence model output – planning standard gap exists, it is reasonable to assume that the other utilities may also develop their own calibration methods in order to show alignment with the Catastrophic wildfire planning standard.

Standardizing wildfire spread simulation duration is one opportunity to establish a planning standard. This planning standard would be one aspect of either a top-down calibration relating OEIS defined Catastrophic wildfires to model output, or is part of a top-down planning standard that is defined as an *n* hour wildfire simulation output with specific consequence outcomes. A planning standard that maps directly to wildfire simulation parameters (e.g. n hours) and outputs (e.g. buildings, acres) would unify utility consequence-based risk planning thresholds and

substantially increase transparency and comparability of utility risk-informed mitigation decision making.

Mapping consequence to the OEIS definition of Catastrophic wildfires

Utilities should understand how their consequence model outputs relate to the planning standard in order to support risk-informed mitigation decision making. In their forthcoming model roll-outs, the SMJUs should relate their wildfire consequence model outputs to the OEIS Catastrophic wildfire planning standard. GPI suggests the SMJUs could preliminarily use an existing method such as that developed by SCE, or develop a joint SMJU method. Taking a long-term perspective, GPI advocates for improved top-down risk planning standards that either fulfill this requirement for the utilities, or establish a planning standard based on available consequence model outputs.

Use cases for multiple wildfire ignition and consequence risk models

BVES and Liberty detail plans to use Technosylva and REAX wildfire risk modeling. Liberty provides a detailed summary of their REAX risk modeling, including consequence method. This approach distributes ignitions across utility assets proportional to location-specific ignition rate and models fire spread for each ignition using ELMFire. The risk model assumes that ignition risk and consequence are dependent variables. Consequence outputs include acres burned and structures threatened. Safety/fatalities are based on structures threatened. We understand that the current REAX use case includes wildfire risk planning.

During the June 16, 2023, workshop, Liberty explained that they will use Reax for operations risk modeling and Technosylva for planning risk modeling. BVES and Liberty's WMPs do not describe the risk modeling use cases (e.g. planning versus operations) for Technosylva versus Reax models. While we recognize that updated risk modeling and model integration descriptions are forthcoming, BVES and Liberty should clarify how they are using these risk modeling products in their 2024 WMP updates.

Consequence scoring with MAVF

An MAVF is used to combine consequence risk outputs into a single unitless score that can facilitate risk ranking. While the SMJUs are not required to develop an MAVF per the CPUC, this quantitative tool is one way to rank locations by risk based on consequence. Liberty provided a MAVF method, which they had not previously detailed in the 2022 WMP.[25] Their MAVF supports circuit risk ranking and the direct comparison of PSPS and wildfire consequence risk. BVES and PacifiCorp have not developed optional MAVF methods. With the adoption of the WRRM suite the BVES and PacifiCorp may find it prudent to develop an MAVF method for comparing consequence risks.

Risk Assessment and Modeling: [Liberty] The link between updated risk modeling approaches, tools, and outputs and mitigation selection and prioritization are not well defined

Liberty's narration on Wildfire Mitigation Strategy Development states:

> Liberty's strategy development for this WMP did not utilize wildfire risk scores developed by Reax. Instead, Liberty assessed grid hardening efforts, such as covered conductor projects, asset repairs, and replacements completed in recent years along with enhanced vegetation management work to review holistically what is working effectively system-wide to reduce wildfire risk. Liberty has collected risk-related data over the years that once consolidated in a risk-based decision-making framework, will enable Liberty to use data analytics to assess baseline risk at the circuit level.[26]

While its location-specific long-term mitigation decision-making processes appears to leverage other data sets, assessments, and Subject Matter Expertise, it's not clear how these elements are used in concert to determine "what is working effectively". Their method also does not take into consideration wildfire risk model results although they have had REAX risk outputs since 2021.[27]

[25] Liberty 2023-2025 Base WMP, p. 79

[26] Liberty 2023-2025 Base WMP, p. 107

[27] Liberty 2021 WMP R1, p. 104

In response to Problem Statement 1, Liberty has not established a formal risk-based decision-making framework for its wildfire risk assessment or mitigation planning, Liberty responds:

> *Planned Improvement for Problem Statement #1*: In late January 2023, Liberty signed a formal agreement with Direxyon to pilot its asset risk decision-making solution to be incorporated, in part, in this WMP. Liberty and Direxyon have since launched workshop discussions to scope out the parameters and metrics for the various model offerings, including risk, decision, cost, and degradation models. If the pilot is successful for the pole asset type and produces effective decision-making tools for Liberty 's management team, Liberty will continue building out the risk-informed decision-making tools for multiple assets to better plan future investments and repairs and maintenance plans given budget and resource constraints.[28]

Liberty has yet to develop methods for operationalizing their wildfire risk planning model and has still not clearly established a formal risk-based decision-making framework for its wildfire risk assessment or mitigation planning. Their risk assessment improvement plan to adopt Technosylva models is also the vaguest of the three SMJUs. While Liberty states they will use "quantified expected risk circuit ranking as the basis for future mitigation plans," there is no past or current basis for this. GPI recommends issuing an ACI that requires Liberty to develop a more comprehensive timeline and stepwise plan for developing specific risk modeling and assessment application capabilities. GPI also recommends that Liberty be required to expand its Section 7. Wildfire Mitigation Strategy Development narration to include a more detailed description of the specific data types and SME considerations that go into determining their mitigation strategy.

In 2022 Liberty was issued ACI LU-22-13: Further Integrate Risk-Informed Decision Making into Inspection Scheduling and Planning. In 2023, Liberty reports that they use risk model outputs to inform prioritization including annual asset and vegetation work:

> In its 2023 WMP, Liberty primarily used the Reax wildfire risk and qualitative consequence mapping to select areas to prioritize mitigations and compliance work activities.[29] Liberty will plan normal compliance work and will use the Reax risk map where feasible to prioritize asset/vegetation work on an annual basis.[30]

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[28] Liberty 2023-2024 Base WMP, p. 104-105

[29] Liberty 2023-2025 Base WMP, p. 114

[30] Liberty 2023-2025 Base WMP, p. 116

The plan to use REAX outputs "where feasible" for prioritization is vague and does not define actionable use cases or how they intent to use the risk maps. This response does not adequately address the problem statement. Liberty should be required to provide additional detail on how they used risk-informed decision making to inform inspection scheduling and planning.

Liberty also did not meet the requirement of LU-22-15. Improve Transparency of the Initiative Selection Process:

> **Description**: As presented, Liberty's risk determination and initiative selection process lacks full transparency. Specifically, Liberty does not clearly explain or pinpoint where RSE estimates are considered in its decision-making process. In addition, Liberty's decision-making flow chart does not define each step towards initiative deployment.
>
> **Required Progress**: In its 2023 WMP, Liberty must describe in detail and demonstrate where RSE estimates are considered in its WMP initiative selection decision-making flowchart. In addition, Liberty must explain its initiative selection process with greater granularity and further break out its flowchart to show steps taken from evaluation to deployment.
>
> **Liberty Response**: Refer to Section 7.1.4.1 of Liberty's 2023 WMP. Liberty did not utilize RSE calculations for its initiative selection process. See Section 6 for additional information on Liberty's risk based decision making framework for the initiative selection process.

Liberty only provides a summary of vegetation risk analyses based on LiDAR data in Section 7.1.4.1 Identifying and Evaluating Mitigation Initiatives. The entry for Section 7.1.4.1 fails to address the entirety of the OEIS guideline requirements for this section. GPI recommends requiring Liberty to update this section in an ACI and via a revised 2023-2025 Base WMP.

Risk Assessment and Modeling: [PacifiCorp] The link between updated risk modeling approaches, tools, and outputs and mitigation selection and prioritization are not well defined

PacifiCorp's WRRM model application approach is under development, and they failed to provide the required summary of top risk circuits/segments.[31] It remains to be seen how it decides to apply WRRM outputs to inform risk mitigation selection or prioritization. For example, whether max versus percentile wildfire risk is used, or if it is used to inform mitigation

[31] PacifiCorp 2023-2025 Base WMP, p. 92

type versus work prioritization. PacifiCorp does outline a risk evaluation framework and process that is informed by four analytical tools, one of which is the WRRM. They also provide a timeline for developing ignition risk and risk reduction applications that spans the entire 3-year WMP cycle from Q1 2023 to Q4 2025. Q4 2025 goals include:

> Q4 2025 QDR: Utility Risk and expected risk reduction because of selected mitigations. This will be a numeric calculation using WRRM, PSPS Risk and RSE models to calculate for the highest risk circuits and assets the current Utility Risk and expected Utility Risk after implementation of mitigations and the percent change.[32]

GPI is concerned with this timeline and the slow rate of development, especially given that the SMJUs can leverage methods that IOUs have developed. While progress can be tracked via WMP Updates, if objectives are not met on time it may be necessary to issue an ACI in the future that requires PacifiCorp to provide interim updates on their progress. PacifiCorp should be issued an ACI that requires it to provide a summary of top risk circuits segments by Q4 2023. PacifiCorp should already have some method with which to risk-rank circuits.

Risk Assessment and Modeling: [BVES] The link between updated risk modeling approaches, tools, and outputs and mitigation selection and prioritization are not yet well defined

BVES's Technosylva model output and implementation method is set for delivery in the 2024 WMP Update. Their 2023 WMP outlines very general frameworks for integrating Technosylva wildfire risk modeling into their risk assessment methodology, and provide no insight on how they intend to operationalize model outputs for risk-informed mitigation selection and prioritization. In reference to "Potential Mitigation Initiative Evaluation and Selection," BVES states:

> The risk reductions and RSEs, developed using the Risk-Based Making-Decision process is utilized to establish an initial project selection screening. Then, the resulting risk mitigation outcome of executing the project is projected using the Fire Safety Circuit Matrix model described in Section 7.1.1 of this WMP. This provides more granular information at the circuit level. …Additionally, the projects are viewed against the risk maps developed by REAX Engineering

[32] PacifiCorp 2023-2025 Base WMP, p. 129

and Technosylva to determine where the wildfire mitigation greatest risk benefit may be achieved by each project.[33]

This description does not detail the risk map outputs (e.g. average, max, percentile) they use to inform project selection or how they consider/apply the results. BVES also states that the Technosylva outputs will replace their Fire Safety Circuit Matrix, indicating that this approach will change substantially in the next year. The IOU's Technosylva model output applications are an indication that we should not make assumptions about how this merger will affect BVES's risk modeling and risk-informed mitigation selection approach.

The current WMP template should provide adequate guidance for reporting on their modeling methodologies and model application approach. However, GPI encourages BVES to provide clear descriptions on how and why they select particular model inputs and output formats for application purposes, as well as how they are applying the model outputs to inform their risk mitigation activities. For example, is a combined PoI and wildfire consequence score used to inform grid hardening approach (e.g. CC, Undergrounding, or traditional hardening) or to inform inspection cycles or discretionary inspections (e.g SCE)? If so, how? For example, is it applied as part of a decision-making rubric, or based on a risk planning threshold, or as one piece of information provided to SMEs when selecting mitigation type and priority? Both the technical details determining risk model outputs and the way in which they are operationalized are critical to wildfire risk mitigation and cost-effectiveness.

Risk Assessment and Modeling: The SMJUs do not have risk assessment approaches that clearly take into account factors such as asset age or operating conditions

IOU machine learning probability of failure models indicate that asset age and operating conditions (e.g. overloading) are relatively strong predictors of asset failure for some asset types. While operating standards, SME assessments, and inspection cycle standards already address some of these risks (e.g. intrusive pole inspections), it appears that risk model results can supplement these approaches by informing probability of failure based on asset conditions (e.g. age, overloading occurrences). These types of risk predictors can inform preventative

[33] BVES 2023-2025 Base WMP, p. 94-95

replacement in lieu of a run to failure approach, or might support maintenance and operations decision-making in gray areas. In general, the SMJUs are not currently using (or minimally, not clearly reporting on) risk assessment approaches, models, or standards beyond standard inspections processes and replacement requirements that could identify probability of asset failure and ignition risk based on factors such as asset age or operating conditions. This capability is not only important for present day system hardening prioritization or inspection frequency, but also future grid maintenance on existing and hardened systems via a pro-active asset replacement approach.

We use BVES as an example. BVES's Fire Safety Circuit Matrix takes into account high-risk assets such as wood poles, bare wire, tree attachments, and expulsion fuses, in order to risk rank their circuits for mitigation prioritization. This method does not factor in the age or operating conditions of these and other assets, meaning that grid hardening prioritization does not take into account these risk factors. It also means that the risk assessment is static – replacing the assets that are deemed high risk in the Fire Safety Circuit Matrix will result a static, low wildfire risk score, when in reality asset and system degradation begins anew as soon as an asset is replaced. That is, BVES's Fire Safety Circuit Matrix does not have a way to measure system degradation or alert as to when an asset risk threshold (e.g. age, health metric) is reached. This is in contrast to an IOU PoF/PoI model that can flag a location as having elevated risk when an asset reaches a risk threshold (e.g. a certain age).

Tracking ignition risk as a function of system condition requires a database of current asset condition/heath factors and a correlation between asset condition and risk. At the June 16, 2023, SMJU WMP workshop BVES reported that they did not previously keep a record of asset installation date/age though they have started developing this capability as part of a system inventory that can support risk-informed decision making. Their WMP does point to age-informed asset replacements such as their capacitor replacement plan:

> BVES plans to replace six capacitor banks per year beginning in 2023. The project aims to replace 24 capacitor banks from 2023 – 2026. The new capacitor banks will replace significantly aging (>40 years old) manually operated capacitor banks. The existing capacitor banks are beginning to

> show signs of possible future failure, which in the worst case could result in explosion of the capacitor and the potential for ignition.[34]

BVES's risk-informed mitigation prioritization and proactive equipment replacement suggest they are developing the capability to track asset health, yet their ability to track risk based on asset health (e.g. age and operating conditions, number of overloads) is still in progress.

GPI is *not* recommending that SMJUs independently develop complex risk models to quantify granular probability of risk based on equipment age and/or wear and tear. Rather, the SMJUs may be able to leverage insights from IOU probability if failure risk model results and/or other resources to build out their understanding of asset probability of failure risk as a function of asset condition. PacifiCorp's Technosylva WRRM suite documentation also lists asset characteristic inputs including age and material. It is not clear how the models factor these attributes into the risk model, though SMJUs may be able to use these models to close their risk assessment gap. GPI recommends requiring that the SMJUs describe how they are currently taking into account factors such as asset age and operating conditions (e.g. beyond inspections) to prevent asset run-to-failure when determining mitigation selection, prioritization, and/or in order to pro-actively replace assets now and in the future.

Risk Assessment and Modeling: Design Basis Scenarios

Design Basis is critical to defining wildfire ignition and consequence risk. We were unable to compare this facet of utility wildfire risk modeling due to time constraints. In general, we appreciate Liberty's Weather Condition 1 and 2 comparison, stating:

> Monthly statistics were compared with analogous statistics developed from 12 years (2011-2022) of RTMA data, and it was determined that within Liberty's service territory the last 12 years of weather are more severe from a fire weather standpoint than the last 44 years due to the non-stationary nature of climate. For that reason, weather condition 2 (long term conditions over the last 30 years) was not analyzed because it is less conservative than Weather Condition 1.[35]

[34] BVES 2023-2025 Base WMP, p. 153

[35] Liberty 2023-2025 Base WMP, p. 89

This level of design basis understanding and informed refinement is required to improve design basis standards and unify utility risk modeling. GPI recommends refining and eventually standardizing wildfire risk modeling design bases.

Risk Assessment and Modeling: Ingress/Egress risk mitigation

BVES's egress/ingress risk assessment includes identifying evacuation routes in their service territory. Per CalFIRE, BVES does not have any subdivisions with limited or no secondary egress.[36] They used established primary and secondary evacuation routes to inform risk mitigation selection (e.g. wire mesh wrapped poles and Covered conductor) and prioritization. This constitutes an egress risk assessment and application that informed mitigation selection and prioritization.

PacifiCorp reports that their territory does not currently have any Office of the State Fire Marshall (OFSM) surveys completed to identify subdivisions with limited or no secondary egress. They identified nine planned subdivision surveys. Liberty has 35 subdivisions with limited or no secondary egress in their territory. It's not clear whether additional locations will be identified as the CalFIRE survey progresses. The Technosylva WRRM modeling suite that the SMJUs are adopting includes an egress risk model. In their 2024 WMP Updates Liberty and PacifiCorp should discuss the results of the Technosylva egress model for their territory and whether/how they will utilize the results to inform wildfire risk mitigation planning.

Grid Design, Operations, and Maintenance: Liberty is slowing their Covered Conductor program due to uncertainty and in exchange for slower undergrounding mitigations

Liberty is shifting its wildfire mitigation strategy to slow its rate of covered conductor installations and focus on sensitive relay profiles (SRP), traditional overhead system hardening, and undergrounding. Liberty has scoped 9.22 miles of covered conductor installations for the current 3-year WMP cycle, averaging a build rate of 3.1 miles per year.[37] This is in contrast to their previous build rate of 9.6 miles of covered conductor installed per year in 2022, and a total

[36] BEVS 2023-2025 Base WMP, p. 40

[37] Liberty 2023-2025 Base WMP, p. 147

of 20.44 circuit miles installed during the 2020-2022 WMP cycle.[38,39] Liberty references ongoing uncertainty about the effectiveness of covered conductor as a mitigation:

> While the utility industry continues to measure the effectiveness of covered conductor, Liberty is currently planning to slow the rate of covered conductor installation while increasing the implementation rate of sensitive relay profiles ("SRP") and system segmentation. By making this adjustment to Liberty's wildfire mitigation efforts, a larger portion of Liberty's system will have measures that help address wildfire mitigation in a shorter timeframe than installing covered conductor alone.
>
> Due to the relatively small amount of covered conductor that has been installed in the system and the short period of time that it has been in use, the actual effectiveness of covered conductor in Liberty's system cannot yet be accurately determined. By collecting more data over time and by continuing to participate in the joint IOU workshops and efforts to evaluate covered conductor effectiveness, Liberty plans to refine its assessment on both covered conductor effectiveness and when it is the best alternative for system hardening.

Liberty has not provided sufficient justification for slowing its covered conductor deployment program due to a lack of field data. The joint utility covered conductor study and working group is an ongoing assessment of covered conductor effectiveness with multiple reports showing consistent effectiveness outcomes through the most recent ignition risk reduction effectiveness data update in 2023.[40] Since Liberty's territory is relatively small and their mitigation deployment rate is much slower than the IOUs, it is, and was, expected that individual utilities and especially the SMJUs would have smaller covered conductor footprints resulting in slower accumulation of field-based data necessary to determine *in situ* effectiveness. This known fact was in part the purpose of the joint covered conductor effectiveness study – to combine data from covered conductor deployments to better assess effectiveness in a timely manner across a wider range of systems and conditions.

If the average covered conductor effectiveness results are not directly applicable to Liberty's territory, or similar high-elevation locations, then the Utilities should make an effort to mine the existing covered conductor performance data to answer questions about its performance under

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[38] Liberty 2022 Q4 QDR, Table 1

[39] Liberty 2023-2025 base WMP, p. 154

[40] PG&E 2023-2025 Base WMP R1, p. 897

regional conditions (e.g. above 5,000 feet elevation, wind conditions, vegetation density). These condition-specific studies would likely provide value to multiple utilities in the mitigation selection process.

In addition to leveraging existing data to the maximum extent possible, Liberty should develop an estimate for the duration of time needed to collect sufficient field data to inform their covered conductor installation plan. For example, this should be estimable based on their current covered conductor footprint, the rate of failures or outages prior to covered conductor installation, the current rate of outages and failures, the average estimated effectiveness of covered conductors, and the probabilistic exposure to high-risk conditions (e.g. RFW) as an indicator of risk driver exposure over time. This estimate does not need to be precise. Minimally, "back of the envelope" estimates should be developed as an indicator of how long Liberty would need to "wait" to collect sufficient field data to inform covered conductor effectiveness in their territory. It could be the case that they will not independently acquire sufficient data necessary to determine local effectiveness rates over the 3-year planning cycle. If that is the case, Liberty must come up with an alternative and more broad-thinking approach to determining covered conductor selection, estimated local effectiveness, cost-benefit, and risk-spend efficiency.

Liberty's alternative mitigations include accelerated investments in SRP and sectionalizing, traditional overhead grid hardening, and undergrounding. Fast Trip and sectionalizing are interim and backup mitigations that complement long-term grid hardening strategies and reduce customer impact. While these mitigations have independent merit, GPI is concerned that Liberty's limited grid-hardening workforce will be diverted to the aggressive build-out of interim and backup mitigations to the detriment of long-term risk reduction solutions.

References to the SRP program, including its timeline and build-out plan are scattered throughout Liberty's WMP. SRP program plans are included in Sections 8.1.2.8 Installation of System Automation Equipment and 8.1.2.6 Emerging Grid Hardening Technology Installations and Pilots:

> Additionally, in 2023, Liberty will be expanding the 2022 Fast Trip, or SRP, pilot project because of its effectiveness in reducing ignition risk, and due to its low capital cost, it will allow Liberty to cover a large amount of its system primary conductor in 2023.

SRP effectiveness evaluation is refenced in Table 9-3 Liberty PSPS Objectives (10-year plan).[41] The SRP program coupled with recloser and fault indicator installations are also briefly summarized in the three-year Objectives Table 8-1 and Targets Table 8-3.[42] Objectives schedule program completion for the end of the 3-year WMP cycle, in December 2025. The SRP program is also simultaneously referred to as a pilot and as a top priority for broad rollout to 10 circuits covering 300 circuit miles intended to serve as a critical wildfire mitigation strategy within the 2023 WMP.[43,44]

GPI recommends requiring Liberty to provide a summary of its 2022 SRP pilot program results in the 2024 WMP Update, as well as lessons learned and implementation guidelines that are established to reduce the impact on customer service such as SRP settings, time of use, additional outage response crews, and additional targeted vegetation inspections and management. Liberty should also clarify whether the SRP program is a pilot or a standard distribution system mitigation. In either case, given the prioritization put on the SRP program, Liberty should also consolidate its discussion of the SRP program in its WMP and include a more comprehensive timeline that includes all aspects of the program from hardware installation to software enablement/setting selection, complementary mitigations to reduce customer impact, and results reporting within the 3-year WMP.

Undergrounding targets have increased to 3.87 miles for the 3-year WMP cycle, averaging 1.3 miles per year.[45] This is a substantial increase from the 0.36 miles planned for 2022, for which only 0.24 miles were completed. This work includes the Tahoe Vista Rule 20 project located along the north shore of Lake Tahoe in a low wildfire-risk area, and the Apache Ave Rule 20 project in a high-risk area, per Liberty's own risk analysis. Rule 20 undergrounding is completed largely for beautification and based on public interest.[46] The Stateline resiliency

[41] Liberty 2023-2025 Base WMP, p. 379

[42] Liberty 2023-2025 Base WMP, pp 143-148

[43] Liberty 2023-2025 Base WMP, p. 109 Footnote 42

[44] Liberty 2023-2025 Base WMP, p. 164

[45] Liberty 2023-2025 Base WMP, p. 147

[46] Rule 20 https://california.libertyutilities.com/uploads/Rule_20%20updated.pdf

underground project is located at the intersection of high and low-risk areas, the Brockway 4202 undergrounding project is located in a medium-risk area, and the MEY3400 undergrounding project is located in a medium-risk area that was chosen primarily due to it being a sensitive scenic area.[47] Liberty's undergrounding narration generally suggests that more remote locations with lower customer counts may prove a good fit for undergrounding. However, it appears that most planned undergrounding circuit miles are predicated on Rule 20 and scenic purposes, with a substantive portion located in low to moderate wildfire-risk circuits.[48]

Liberty has also a newly scoped Traditional Grid Hardening program that totals 8 circuit miles in the 3-year WMP cycle. Much of this work is located in moderate to high-risk areas in the Topaz Lake and Walker, CA area. During the June 16, 2023, workshop, Liberty panelists further explained that traditional grid hardening was selected for the very high-risk Walker area to quickly remove and replace less robust conductor that experiences frequent system reliability issues. GPI appreciates these granular insights on mitigation selection to showcase how the SMJUs are developing customized solutions that link risk modeling outputs with local system conditions and knowledge. Liberty also suggests that traditional overhead hardening can include: "… such things as stronger poles, stronger wire, shorter spans, more space between phases, less sag, greater vegetation clearance, and use of CALFIRE-exempt hardware."[49] Liberty should build out its Traditional Grid Hardening program package to include a more definitive suite of complementary grid hardening and vegetation management mitigations.

GPI is perhaps most concerned with the lack of long-term risk mitigation progress in Liberty's high- and very-high-risk circuits located in the southern and northern areas of the Tahoe Basin.[50] Much of their line rebuild projects have been located in lower-risk areas within the Tahoe Basin, leaving line rebuilds in many high-risk circuits unplanned since work began in 2020. It appears this trend will largely continue through the current 3-year WMP cycle. Long-term risk reduction

[47] Liberty 2023-2025 Base WMP, p. 169

[48] Liberty 2023-2025 Base WMP, Appendix C

[49] Liberty 2023-2023 Base WMP, p. 160

[50] Liberty 2023-2025 Base WMP, Appendix C

progress may even slow with work diverted to SRP build-out as well as Rule 20 and scenic-based undergrounding projects in low to moderate risk areas.

Grid Design, Operations, and Maintenance: Interim Mitigations

Interim wildfire risk mitigation strategies are critical to reducing risk while the utilities roll out their decade-long system hardening efforts. These same interim risk mitigation strategies, such as fast trip settings or more frequent inspections, will continue to serve as risk mitigation "backup" systems after the primary grid hardening systems are in place. For example, a hardened overhead system may experience fewer outages and resultant ignitions, lowering the relative need for fast trip settings to mitigate ignition risk. However, enabling more sensitive fast trip settings during high wildfire risk conditions on a hardened line can still serve as a backup risk mitigation system even though it likely to be triggered less frequently. Despite the important role interim mitigations have given the current state of California's aging grid infrastructure, the SMJU's interim mitigation plans are generally not well developed, or are scattered throughout the WMP narration. GPI recommends requiring the SMJUs to provide additional detail on their wildfire risk interim mitigation strategies, minimally in their 2024 WMP Update, and in all future WMP filings.

BVES's response to WMP Section 7.2.3 Interim Mitigation Strategies states in full:

> BVES assesses each mitigation that requires more than one year to implement for the potential need for interim mitigation strategies to reduce risk until the primary mitigation is complete. BVES develops and implements interim strategies if determined necessary. BVES utilizes the approach discussed in Section 7.1.4.1 to evaluate the need for interim risk reduction, determining which mitigations to implement, and the characterization of each interim risk reduction action.51

This description suggests BVES is making an active effort to identify interim risk mitigation solutions for many of their grid hardening programs that are slated to span through the near (0-3 year), mid- (4-6 year), and long-term planning horizons (7+ year). However, its unclear from the narration what these interim solutions are and if, where, what, and when they have been determined "necessary." The reference to Section 7.1.4.1 only generally discusses BVES's

[51] BVES 2023-2025 Base WMP p. 107

exclusion from developing a MAVF or MARS framework per the CPUC and their required "Risk-Based Decision-Making Framework" per CPUC D.19-04-020.[52] This section does not adequately inform if, when, how, where, or what interim mitigations BVES has deemed necessary to reduce risk while they implement their 10-year grid hardening plan. GPI recommends requiring that BVES provide additional narrative detailing their interim mitigation strategies via an Area for Continued Improvement (ACI) action in the OEIS Final Decision on the 2023-2025 Base WMP.

Liberty's Section 7.2.3 Interim Mitigations Initiatives narration focuses on a forthcoming 2023 interim risk analysis and vegetation management activities, as well as expanding their interim mitigations to include sensitive relay protocol programs and early fault detection.[53] GPI is largely concerned with the decision to heavily invest in their Fast Trip or "SRP" pilot project during 2023 while throttling back their rate of long-term mitigation build-out (e.g. covered conductor). Liberty states:

> Liberty will be expanding the 2022 Fast Trip, or SRP, pilot project because of its effectiveness in reducing ignition risk, and due to its low capital cost, it will allow Liberty to cover a large amount of its system primary conductor in 2023.

Liberty should be required to clarify whether their Fast Trip program is still considered a pilot, or if it will become a standard WMP mitigation program in 2023 and the associated program timeline for capability build-out and widespread implementation. Fast Trip capability build-out may be a more rapid pathway to wildfire risk reduction than other long-term grid hardening solutions (e.g. covered conductor, OH system hardening, undergrounding). However, this risk reduction method is an interim and/or backup solution to grid hardening. Liberty should therefore be required to explain how their risk mitigation initiatives will balance fast trip investments, including time and resource investments, with the need to continue advancing long-term grid hardening upgrades.

PacfiCorp does not have any interim risk mitigation solutions, stating:

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[52] BVES 2023-2025 Base WMP, p. 93

[53] Liberty 2023-2025 Base WMP, pp. 138-140

> Interim solutions are not a consideration for initiatives that span multiple years.[54]

And

> Pacific Power does not evaluate or implement interim mitigations but focuses resources on the mitigations summarized in Section 7.2.1 and detailed in subsequent sections.[55]

PacifiCorp's overhead system hardening "line rebuild" mitigation program is anticipated to span a 10-year planning horizon.[56] Their Elevated Fire Risk Setting program is slated for continued deployment during and after the 3-year planning horizon.[57] GPI recommends requiring that PacifiCorp establish interim mitigations, and/or explain how their EFR settings and capabilities can/are serving as an interim mitigation, that close the risk gap associated with their 10-year overhead system hardening plan. Given PacifiCorp's complete lack of an interim risk mitigation strategy we recommend including this as an ACI that requires a response in 2023 and an update in 2024.

Grid Design, Operations, and Maintenance: Expulsion fuse replacement ignition risk

Non-exempt expulsion fuses are a known ignition risk and their replacement with CalFIRE approved non-expulsion fuses has constituted a standard and targeted wildfire risk mitigation program since the early years of the updated WMP process. However, in their 2023-2025 Base WMP Liberty states:

> *Expulsion Fuse Program*: This program explores alternatives to traditional expulsion fuses with engineered fault current limiting fuses. The idea is that the engineered fault current limiting fuses produce less energy, which then reduces wildfire risk. Another approach is to reduce the chance the expulsion fuse will operate during fire season through overreaching sensitive relay profiles or fast trips, and grubbing poles, clearing vegetation around poles with fuses so, if they do operate, there is less fuel creating less ignition risk. Liberty is exploring all of these alternatives.[58]

And

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[54] PacifiCorp 2023-2025 Base WMP, p. 123

[55] PacifiCorp 2023-2025 Base WMP, p. 129

[56] PacifiCorp 2023-2025 Base WMP, p. 131

[57] PacifiCorp 2023-2025 Base WMP, p. 131

[58] Liberty 2023-2025 Base WMP, pp. 166-167

> *Expulsion Fuses:* At the end of 2022, Liberty became aware that one of the current-limiting fuse options on the market was experiencing failures in the field. Liberty halted expulsion fuse replacements because these current-limiting fuses failed to provide ignition risk reduction. The current-limiting fuse vendor suggested that no more fuses should be installed, and any that were installed needed to be continuously checked to confirm they did not have any air gaps that would lead to excessive heat buildup. In collaboration with other utilities and experts in the field, Liberty determined that removing this particular current-limiting fuse altogether and replacing it with a traditional expulsion fuse—along with adding overreaching sensitive relay profiles to prevent the likelihood of the expulsion fuses operating, grubbing the poles, and clearing vegetation around the expulsion fuses—will reduce ignition risk more than keeping the current-limiting fuses in place.[59]

GPI was unable to find any similar references to issues with faulty and at-risk alternative fuses mentioned in PacifiCorp or BVES's 2023-2025 Base WMP. PacifiCorp is moving forward with a proactive and expedited expulsion fuse replacement program scheduled for completion in 2025.[60] BVEs reports having completed all expulsion fuse replacements by the end of 2022 and has shifted their: "… fuse replacement program from a system hardening type initiative to a normal operations and maintenance initiative, with the focus of maintaining the updated fuses in the system."[61]

Similarly, the IOUs do not raise the same concerns that Liberty expresses in their 2023-2025 Base WMP. PG&E's expulsion fuse replacement plan is proposed to proceed at the current rate of 3,000 fuses replaced per year.[62] They do however propose coupled installation of non-exempt switches that they are seeking exemption status for.[63] In SCE's 2023-2025 Base WMP, they state: "From 2020-2023, SCE's focus for the fusing program shifted to branch line fuse replacements, particularly for Cal Fire non-exempt expulsion fuses and other fuses with operational concerns."[64] SDG&E plans to complete their expulsion fuse replacement program in December 2023. Their own efficacy study showed that "When CAL FIRE-approved fuses were

[59] Liberty 2023-2025 Base WMP, p. 167

[60] PacifiCorp 2023-2025 Base WMP, p. 130, 143

[61] BVES 2023-2025 Base WMP, p. 4, 155

[62] PG&E 2023-2025 Base WMP, p. 378

[63] PG&E 2023-2025 Base WMP, p. 378

[64] SCE 2023-2025 Base WMP, p. 262

used, there was a reduction in ignition rate percentage from 0.12 percent to 0 percent (see SDG&E Table 8-25)" though the results are not yet statistically significant.[65]

GPI recommends the OEIS conduct an investigation into expulsion fuse replacements given the discrepancies between other utility expulsion fuse programs and Liberty's decision to halt their expulsion fuse replacement program out of concern that the replacement devices effectively exchange one wildfire risk for another. It is prudent for the utilities to report on: (1) whether or if their expulsion fuse replacements and strategies are reducing wildfire risk; (2) whether faulty or high-risk replacement devices, including from a specific manufacturer, can be replaced with alternative devices with lower ignition risk; (3) and/or if locations with CalFIRE exempt fuses need to be supplemented with other cost-effective and complimentary ignition risk reduction strategies.

Grid Design, Operations, and Maintenance: Liberty should correct discrepancies regarding tree attachment removals completed

Liberty's update regarding tree attachment removal targets and work completed to date have discrepancies. Liberty then reports 60 and/or 145 tree attachments removed in 2022 in Section 8.1.2.12, and reports 145 tree attachments removed in their Q4 QDR Table 1.[66] Liberty should correct this discrepancy.

Grid Design, Operations, and Maintenance: BVES should clarify its undergrounding and traditional overhead hardening targets

BVES provides targets for their 3-year "undergrounding of electric lines and/or equipment" (GD-8) in units of "Initiate Underground Projects as needed (% of budget)," and lists 100% targets for years 2023-2025 with a corresponding percent risk impact reduction of 4.98%.[67] This same target format is used for their Traditional overhead hardening program (GD-8).[68] This target format does not provide a clear or measurable gauge of BVES's current plans to

[65] SDG&E 2023-2025 Base WMP, p. 216

[66] Liberty 2023-2025 Base WMP, pp. 166 - 167

[67] BVES 2023-2025 Base WMP, p. 117

[68] BVES 2023-2025 Base WMP, p. 118

implement undergrounding or traditional overhead hardening. GPI recommends that BVES report undergrounding and traditional overhead hardening program targets in miles, using the same format as they provide for their covered conductor installation activities. If they currently do not have plans to implement any undergrounding or traditional overhead hardening line miles (i.e. 0 circuit miles) they should list this in their initiative activity target tables. Any changes to this plan should be provided in WMP Updates or through appropriate change request pathways.

BVES's Table 8-1, "Grid Design, Operations, and Maintenance (3-Year Plan)" provides objectives for four covered conductor programs, GD_1 and GD_2, and GD_3 and GD_4 that map to sub-transmission overhead conductor replacement and specifically Radford line replacement and covered conductor replacement. These table entries further reference plan Section 8.1.2.1 p. 103 and 8.1.2.2 p. 104, respectively.[69] These page number references contain sections 7.2.1 and 7.2.2, and appear to be incorrect.

Table 8-3 "Grid Design, Operations, and Maintenance Targets by Year" includes two covered conductor initiatives, GD_1 and GD_2, and provides different circuit mile targets for each.[70] Corresponding section 8.1.2.1 Covered Conductor Installation (GD_1 &GD_2) describes a total of 12.9 circuit miles of covered conductor planned, at a replacement rate of 4.3 35.5 kV circuit miles per year and 8.6 4kV circuit miles per year.[71] This appears to align with BVES's covered conductor targets for GD_1 in BVES Table 8-3. In general it appears that the tracking IDs for covered conductor versus undergrounding (Section 8.1.2.2), as well as the page number references and circuit mile targets are jumbled. GPI respectfully requests that BVES update their WMP to resolve the inconsistencies in their objectives and target tables regarding covered conductor and undergrounding initiatives and clarify what the 2023, 2.7 circuit mile target corresponds to in Table 8-3.[72]

[69] BVES 2023-2025 Base WMP, p. 109

[70] BVES 2023-2025 Base WMP, p. 117

[71] BVES 2023-2025 Base WMP. pp. 126-129

[72] BVES 2023-2025 Base WMP, p. 117

Grid Design, Operations, and Maintenance: PacifiCorp Shows aggressive mitigation goals in 2023 that taper substantially in 2024 and 2025

PacifiCorp proposed aggressive targets for long-term wildfire mitigation system hardening objectives in 2023 that substantially taper off in 2024 and 2025. For example, they propose the following grid hardening targets:

- Covered conductor: 130 mi, 2023; 80 mi, 2024; 80 mi, 2025[73]
- Distribution System Pole Replacement, poles: 2600 in 2023; 1600 in 2024; 1600 in 2025[74]
- Expulsion fuse replacement, fuses: 5000 in 2023; 500 in 2024; 0 in 2025[75]
- Install System Automation equipment, devices: 40 in 2023; 20 in 2024; 10 in 2025[76]

In their narration on Section 8.1.2.1 Line Rebuild program, PacifiCorp states:

> Since initiation in 2019, the company has delivered fewer miles of line rebuild in California than planned and is currently faced with the continued challenge of ramping up to achieve 2023 targets. Line rebuild projects using covered conductor were initially viewed similar to other distribution projects with short lead times and moderate construction needs. However, these projects generally require a 12-24 project pipeline, depending on permitting and right of way requirements. Additionally, construction resources can often compete within the region, resulting in construction bottle necks. Pacific Power acknowledges that these challenges are likely to continue and impact the delivery of line rebuild.[77]

This section goes on to propose plans to engage a third-party construction management partner. The 2023 WMP was released in May 2023 though this report suggests that PacifiCorp is experiencing the same barriers to covered conductor grid hardening projects as in prior years, and the language suggests they have not yet secured the third-party construction partner. Targets for 2022 Covered Conductor installation totaled 112 circuit miles, though only 62 circuit miles were completed by year end.[78] PacifiCorp's proposal to complete 130 circuit miles of covered

[73] PacifiCorp 2023-2025 Base WMP, p. 132

[74] PacifiCorp 2023-2025 Base WMP, p. 132

[75] PacifiCorp 2023-2025 Base WMP, p. 133

[76] PacifiCorp 2023-2025 Base WMP, p. 133

[77] PacifiCorp 2023-2025 Base WMP, p. 139

[78] PacifiCorp 2022 Q4 QDR Table 1, filed in 2023

conductor installation in 2030 does not track with their 2022 accomplishments or their Line rebuild Program description.

Similar, although somewhat less egregious discrepancies are present for the system automation equipment installation targets with 50 units scoped for 2023 and much lower installation targets for 2024 and 2025, despite an initiative narration that notes activity barriers and delays are persistent.[79] Actual work completed in 2022 totaled 44 installations, according to PacifiCorp's 2022-Q4 QDR. With respect to PacifiCorp's expulsion fuse replacement program, they anticipated replacing 2,269 fuses in 2022 and only completed 2,113.[80] The narration provided in Section 8.1.2.12 Expulsion Fuse Replacements, does not provide any indication that PacifiCorp has increased their workforce or changed any other aspect of their implementation plan that would support a near doubling of their annual expulsion fuse replacement rate.

PacifiCorp's response to Section 8.1.9. Workforce Planning does not provide any indication that they are bolstering their in-house workforce or discuss any existing, new, or planned contractor agreement to ensure the grid hardening targets are met.[81]

We are further concerned that PacifiCorp's target shortfalls in 2022 and prior years, as well as the lack of apparent alignment between 2023 initiative targets, and timely solutions that include workforce planning may signify a general project management and planning issue underlying PacifiCorp's system hardening initiatives. GPI recommends issuing an ACI that addresses PacifiCorp's system hardening progress and planning discrepancies towards right-sizing their targets and providing a more accurate forecast of risk buydown rate. PacifiCorp should justify, or readjust, its proposed system hardening work targets for 2023 along with how they intend to achieve these aggressive goals despite ongoing barriers and delays.

[79] PacifiCorp 2023-2024 Base WMP p. 142

[80] PacifiCorp 2022 Q4 QDR Table 1, filed in 2023

[81] PacifiCorp 2023-2025 Base WMP, p. 178-179

Grid Design, Operations, and Maintenance: PacifiCorp must provide Performance Metrics for 2022 and in their WMPs thereafter

PacifiCorp did not provide performance metrics for its Grid Design, Operations, and Maintenance Performance.[82] PacifiCorp should be required to update their WMP with a completed Table 8-5 Grid Design, Operations, and Maintenance Performance Metrics Results by Year, or provide a narration regarding why they cannot provide data on the suggested performance metrics and how they will remedy this deficit in their 2024 WMP Update. The data requested in Table 8-5 are relatively standard WMP metrics that PacifiCorp should be able to readily supply. The omission of these data and/or the ability to supply them in their Public WMP and to the OEIS should be grounds for plan rejection.

Grid Design, Operations, and Maintenance: Liberty did not complete its 2022 inspection coverage goals and is halting its Detailed Inspections program to work down their work order backlog caused by a system level inspection

Liberty states:

> Liberty's open work orders have steadily grown since completing the full system survey in 2020. Liberty will halt its detailed inspections in order to catch up with its open maintenance work orders and resume detailed inspections in 2024.[83]

Liberty reports an increasing number of open work orders since 2021 and a persistent backlog of overdue work orders since 2020.[84, 85] GPI is particularly concerned that they have elected to halt their Detailed Inspection program, the mitigation activity that identifies asset risk on existing and hardened lines, in order to work down the backlog. Avoiding identifying the asset conditions that require corrections to reduce wildfire risk because the company is unable to keep up with findings is poor practice.

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[82] PacifiCorp 2023-2025 Base WMP, p. 136

[83] Liberty 2023-2025 Base WMP, p. 183

[84] Liberty 2023-2025 Base WMP, p. 184

[85] Liberty 2023-2025 Base WMP, p. 151

This decision also follows their Patrol Inspection shortfall in 2022, completing only 503 of 706 planned circuit miles.[86] In their narration Liberty suggested the target of 706 circuit miles was erroneously established. However, their distribution patrol inspection targets for the current WMP cycle range from 592 to 540 circuit miles per year, suggesting they would have fallen short of these lower targets as well. In addition to both detailed inspection and patrol inspection shortfalls, they implicate plans to complete full system surveys: "on a periodic basis yet to be determined."[87] GPI is concerned that the halted inspections and work order backlog suggest that Liberty's workforce is not well aligned to their system inspection approach and maintenance needs.

GPI is also concerned that Liberty's election to conduct system-level inspections in the future will repeatedly result in detailed inspection cycle delays in order to work down open work order backlogs. A system-level inspection effort is a discretionary approach above and beyond GO standards. However, this approach may create an inspection cycle that results in large waves of work orders. While the open work order "waves" are worked down, asset risk conditions may go unidentified if cyclic inspections are delayed, resulting in a subsequent system risk build-up and longer risk-exposure times. This is in contrast to consistent and risk-prioritized inspection cycles, including additional risk-informed inspections above and beyond GO standards, which result in a steadier stream of open work orders. It may be more prudent for Liberty to conduct detailed inspections on shorter/ more frequent cycles versus periodic system-level inspections.

GPI recommends requiring that Liberty provide a plan either to expand its workforce or adjust its inspection cycles and approach to eliminate the need for inconsistent, incomplete, or halted inspection cycles. Liberty should also be required to provide a plan for how it will close the asset risk gap that is created by halting detailed inspections in its territory prior to wildfire season. For example, they will complete additional patrol inspections in locations where planned detailed inspections have been canceled.

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[86] Liberty 2022 Q4 QDR

[87] Liberty 2023-2025 Base WMP, p. 174

Grid Design, Operations, and Maintenance: Pilot programs should be right-sized to produce timely meaningful data.

GPI supports the use of pilot programs to test new technologies and mitigation solutions for effectiveness in the field. However, we generally encourage the utilities to provide a summary of how they selected the scope and location of the pilot in order to right-size the effort to produce meaningful results within a timely fashion. In general, utility pilots do not describe how they were right-sized, or provide an estimate of how long they anticipate the pilot will need to run before gathering sufficient data to inform program closeout or expansion.

Grid Design, Operations, and Maintenance: PacifiCorp's open and overdue work order backlog is increasing

PacifiCorp reports an increase in past-due work orders for each overdue time bin. While the majority of the overdue open work orders are located in non-HFTD areas, these trends also tentatively apply to their HFTD Tier 2 and 3 areas.[88] While they only provide 2 years of data, GPI recommends tracking this potential trend closely and establishing an expectation that PacifiCorp addresses any increase or trending overdue work order backlog in their 2024 WMP Update.

Grid Design, Operations, and Maintenance: BVES inspection scheduling

GPI appreciates BVES's asset and vegetation inspection program that exceeds the mandatory inspection cycles in terms of both inspection frequency (e.g. 2 patrol inspections per year) and methodology (e.g. LiDAR, UAV, etc.). BVES's planned asset and vegetation inspections follow the same cycle schedule and all are scheduled for Q3.[89] While Q3 precedes the Santa Ana wind season, their fire season is referred to as spanning year-round.[90] BVES may consider performing one of their two annual system-wide patrol inspections in a different quarter in order to increase the potential risk mitigation impact of this activity.

[88] PacifiCorp 2023-2025 Base WMP, p. 164-165

[89] BVES 2023-2025 Base WMP, pp. 124 and 196-197

[90] BVES 2023-2025 Base WMP, p. 150

Grid Design, Operations, and Maintenance: BVES should provide additional details on their Grid Design, Operations, and Maintenance QA/QC results

BVES describes a QA/QC program for grid deficiency outcomes and inspection protocols.[91] However, they do not provide QA/QC results. The example of asset Quality Control Program Tracking in Table 8-3 does not inform pass rates for the work completed.[92] BVES should establish more clear QA/QC targets for individual asset inspection types and provide the QA/QC pass rates for their Grid Design, Operations, and Maintenance programs including inspection programs.

Vegetation Management: Liberty and BVES approaches to VM fuels and slash removal may facilitate timely access to private property for VM activities

Discussions during the June 16, 2023, SMJU WMP workshop brought to light additional insights on how SMJUs are leveraging their small territory size to provide direct, one-on-one customer service with respect to VM property access issues and VM slash and fuels removal. BVES's VM managers in particular noted that their small department size required that they work directly with customers to resolve any concerns over scoped vegetation management work such as property access and material removal. Due to this one-on-one engagement many issues were resolvable. This type of direct customer service and relationship building is critical to facilitating private property access that utilities list as a barrier to completing timely VM work. While IOU VM departments are much larger, the customer embracing efforts of SMJUs like BVES are a testament to the criticality of customer service and communication style as a tool for reducing barriers to VM work on private property, and how this work can provide a pathway to improving company image for the purpose of broad VM and wildfire mitigation activity support. In the next WMP filing, GPI encourages BVES and the SMJUs in general to expand on whether and how their unique position as small utilities allow them to deliver a customer service model that effectively manages customer concerns regarding VM work and supports VM work access and other factors such as advancing right-tree right-place principles.

[91] BVES 2023-2025 Base WMP, p. 160-162

[92] BVES 2023-2025 Base WMP, p. 161

BVES also outlines a customer oriented VM residue service that places high importance of fuels management:

> Fuels reduction is a key element to wildfire mitigation. BVES's vegetation clearance contractor clears vegetation and removes all vegetation waste and slash from the area every day. If the property owner wants the vegetation waste (for firewood, chipping, etc.), the contractor will assist the property owner in removing the vegetation waste from the rights-of-way for their use. BVES also collaborates with the US Forest Service to remove trees near lines and removes the slash as agreed upon by the local US Forest Ranger.[93]

These same principles are included as part of their VM clearance program and overall vegetation management plan which they describe as having: "created the vegetation management plan with wildfire prevention in mind, collaborating with the City of Big Bear Lake, local Fire Departments, and the USFS."[94]

Liberty's WMP describes how they adopted a VM approach that includes default wood removal services for all residential customers beginning in 2022. Before 2022 Liberty offered "wood removal" on request. They have also integrated the option for wood removal in their Tree Work Notification Form and at the time of inspection work.[95] During the workshop Liberty noted how this change in notification approach and the default removal services facilitated property access and improved customer satisfaction. GPI further notes that default VM slash and wood removal services combined with customer request opportunities at the time of inspection and tree work notification, such as those provided by Liberty, can reduce the need to establish separate wood removal programs, customer sign-up/request pathways, outreach efforts, or additional customer communications in order to provide and subsequently complete the VM work cleanup. GPI suspects this integrated and default approach can also mitigate customer communication fatigue while establishing clear standards and service offerings before the VM work is even completed.

Liberty also has a Fuel Management program:

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[93] BVES 2023-2025 Base WMP, p. 207

[94] BVES 2023-2025 Base WMP, p. 209

[95] Liberty 2023-2025 Base WMP, p. 212

> This program is intended to align more closely with joint goals of agency partners and the local community, so vegetation management fuel load is treated in a manner that reduces both the risk of fire ignition and the potential for increased fire intensity.[96]

This program completed 550 acres of slash and fuel management from VM activities, which exceeded their target for 280 acres of fuel management, and removed nearly 2,000 tons of biomass. Liberty also describes engaging in sustainable VM residue disposal pathways with value-added end uses:

> Updates to the initiative: Liberty is working toward coordinating fuel treatments in a timely manner. Liberty is seeking alternatives to repurpose biomass, such as wood chips, compost, and firewood.[97]

GPI commends Liberty's fuel management program, as well as their WMP reporting efforts. Liberty's Table 8-22, "Tons of Biomass Removed," is a clear example of how utilities can begin to provide estimates of woody biomass production and removal towards greater transparency of fuels management for the purpose of wildfire risk mitigation around utility assets, as well as in support of developing sustainable value-added end-use pathways for these VM residues. Liberty's Table 8-21: Fuel Management Projects Acres Treated, details the scope of fuels management work completed with local stakeholders and agencies, providing transparency into utility VM collaborations and coordination efforts. It is currently the only utility to provide this level of transparency into VM fuels management efforts and local collaborations.[98] Liberty's default residential VM residue removal service, Fuels Management program, and WMP reporting Tables 8-21 and 8-22 provide examples for how utilities can improve their VM practices and WMP reporting. GPI recommends updating the WMP template to include more rigorous expectations and best practices for reporting utility VM and fuel management work, including collaborative efforts with agencies and stakeholders.

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[96] Liberty 2023-2025 Base WMP, p. 218

[97] Liberty 2023-2025 Base WMP, p. 219

[98] SCE's VM program is also proactively engaging in sustainable woody biomass end-uses. See Comments of GPI on the IOU 2023-2025 Base WMPs, May 26, 2023

In general, the WMPs would benefit from a deeper understanding of current and planned VM slash removal best practices in terms of customer services, service model, removal practices, and sustainable woody biomass end-uses. In the next WMP update, GPI encourages Liberty and the SMJUs to expand on whether and how their VM slash and fuels removal services and methods improve VM work access and customer satisfaction. These aspects are critical to ensuring VM work is completed in a timely manner in order to reduce wildfire risk. We also request that Liberty and other SMJUs describe if and to what extent adjustments to their VM slash and fuels removal services have affected the amount of woody material removal, and how they are managing any increase in material. GPI also requests that Liberty and the SMJUs clarify material size cutoffs in their next WMP, such as whether the "wood removal" services include slash, defined as woody debris < 6 inches, as well as fuels, defined as woody debris > 6 inches.

Vegetation Management: California must begin to take a long view on utility vegetation management methods, woody biomass end-uses, best practices, and transparency

The nearly 2,000 tons of biomass removed during Liberty's Fuel Management program is only a portion of the woody biomass produced and removed during Liberty's VM activities, and it is an even smaller fraction of the statewide woody biomass produced on an annual basis from utility vegetation management work alone. In our comments on the IOU 2023-2025 Base WMPs we estimate that the IOUs will remove upwards of 1.2 million trees over the 3-year WMP cycle on account of electric utility vegetation management activities. IOU tree removal estimates may or may not take into account the observed increase in tree die-offs in 2022, estimated at over 36 million trees across California.[99] During the June 16, 2023, SMJU WMP workshop, SMJU VM representatives provided anecdotal evidence that their territories, asset right of ways, and resultant VM workloads were strongly affected by this trend. BVES reported that tree die-off rates were impeding the ability of their workforce to keep pace with tree removal needs. GPI appreciates the insights provided by the SMJUs on this issue during the June 16, 2023, SMJU WMP workshop.

[99] USFS AERIAL DETECTION SURVEY: 2022 SUMMARY REPORT
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd1088611.pdf

Standard utility VM inspection, work cycles, and woody biomass management methods developed decades ago are not calibrated to address the affects of climate change on California's vegetation, including both long-term environmental condition trends (e.g drought), as well as stochastic weather event patterns, severity, and frequency (e.g. flooding and record precipitation).

Tree die-off rates have multiple implications for all utilities, including but not limited to: (1) VM tree removal rates may increase relative to projected removals for the 3-year WMP; (2) The resulting amount of slash and fuel generated from these VM activities would have a concomitant increase; and (3) The increase in tree die offs may stretch VM utility workforces thin if not taken into account in VM workload forecasts. Each of these factors has the capacity to effect slash and fuel build up rates associated with VM work and leave-in-place standards, and/or result in accelerated biomass disposal in landfills. An inadequate VM workforce could lead to delayed tree removals or other backlogged VM work, as well as a reduction in the removal of the resulting woody residues, or even a decrease in VM work quality.

The 2022-2023 winter saw record-breaking snowfall and precipitation across California. This is liable to enhance the vegetation growth rate, density and perhaps vegetation type over the coming summer.[100,101] Vegetation growth rates and densities may call for additional or more frequent VM fuel management activities such as VM inspections and mitigations like pole brushing and other efforts that reduce the likelihood of an ignition and/or wildfire consequence.

Based on recent tree die-off rates in California, possible near-term/periodic vegetation (e.g. grass) growth rate increases, the already substantive task of utility VM work, and the resultant slash and fuel production these programs generate, we urge the OEIS to update WMP reporting standards and best practices for VM programs. We recommend more transparent VM workload forecasting that takes into account both vegetation growth and die-off trends and concomitant

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[100] LA times, California 'weather whiplash' fuels uncertainty in upcoming wildfire season https://www.latimes.com/california/story/2023-05-12/california-wildfire-season-grass-fires-are-the-wild-card

[101] The Guardian, 'Double-edged sword': why the badly needed rains in California could fuel catastrophic fires https://www.theguardian.com/us-news/2023/feb/13/california-storms-rains-drought-fires

workforce planning and/or programmatic updates (e.g. need-based inspections). Utilities should also begin to develop more sustainable pathways to woody biomass management, such as Liberty and SDG&E, in order to align with state policy and goals.[102,103,104] In order to increase transparency into utility fuel and slash production rates and management approaches we recommend requiring that all utilities report standard VM metrics including the number of trees removed, an estimate of the amount of biomass both removed and left in place during VM activities, and the disposal method(s) for biomass that is removed.

GPI urges the OEIS to take the long view on utility VM practices in relation to the already present challenges and in line with state policy that addresses climate change and sustainable fuels management approaches.

Vegetation Management: SMJUs should expand on IVM progress to date

Liberty and PacifiCorp both include Integrated Vegetation Management (IVM) programs as part of their VM strategy for Fire-Resilient Rights of Ways.[105,106] Program goals include replacing incompatible vegetation with sustainable, native, and compatible low growing vegetation along utility rights of way. During the June 16, 2023, SMJU WMP workshop, Liberty provided additional insight on their IVM program and pilot testing within previously cleared fire breaks. Despite being initiated years ago, the SMJUs and IOUs have provided scant details on IVM pilot project results. While we understand that these programs may take time to establish, the methods used and scope of current and planned work (e.g. circuit miles or acres) are prudent details that will provide insights into the viability of IVM for different regions across California. GPI encourages the SMJUs to provide additional details on their IVM pilots, including results to date, in future WMPs.

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[102] California Governor's Office, Sustainable Woody Biomass Industry Development in California, February 2022 https://static.business.ca.gov/wp-content/uploads/2022/02/GO-Biz-Interagency-Biomass-Market-Development-Framework.pdf

[103] AB 625, Amended March 27, 2023

[104] SB 901 https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB901

[105] Liberty 2023-2025 Base WMP, pp. 227-228

[106] PacifiCorp 2023-2025 Base WMP, p. 202

Vegetation Management: Open work order backlogs

Liberty reports over 3,407 overdue vegetation management work orders, 95 percent of which are located in Tier 2 and Tier 3 HFTD. Within the HFTD, nearly 80 percent of VM open work orders are more than 181 days overdue.[107] GPI is concerned with this trend and in light of Liberty's concurrent challenges with working down their asset maintenance work order backlog, which has resulted in halted detailed inspections. The combined asset management and vegetation management backlogs indicate that Liberty is struggling to keep up with system maintenance. Additional challenges that may compound this issue include increased tree die-offs across California in 2022 that the SMJUs reported during the June 16, 2023, workshop were affecting tree removal rates in their territories.[108] The vegetation management workforce planning narration states that Liberty hired additional in house VM staff in 2022. It remains to be seen if the recent hires and workforce plan are sufficient to eliminate the VM backlog. GPI recommends issuing an ACI that requires Liberty to develop a plan and timeline for eliminating their VM past-due work order backlog.

Vegetation Management: PacifiCorp must provide performance metrics for their VM activities relevant to the 2023 WMP and in all following WMPs

PacifiCorp does not provide any performance metrics (Section 8.2.1.3) for Section 8.2 Vegetation Management and Inspections.[109] This is a WMP requirement and failure to provide these data in the required table is impermissible. GPI recommends issuing an ACI that requires PacifiCorp to provide this data in the required table, or to provide an explanation as to why they are unable to provide the data at this time.

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[107] Liberty 2023-2025 Base WMP, p. 242-243

[108] USFS AERIAL DETECTION SURVEY: 2022 SUMMARY REPORT
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd1088611.pdf

[109] PacifiCorp 2023-2025 Base WMP, p. 185

Vegetation Management: PacifiCorp's WMP vegetation management inspection section is incomplete

PacifiCorp's WMP references their Distribution Pole Clearing program in Table 8-18.[110] However, five VM inspection programs are listed in the table though only four subsection narrations are provided. There is no corresponding narration detailing the distribution pole clearing program parameters. GPI recommends issuing an ACI that requires PacifiCorp to provide a narration of their pole clearing program and include it in an updated WMP.

Vegetation Management: PacifiCorp should provide a clarified VM QA/QC narration and results table

PacifiCorp post-audits on vegetation management work are conducted by both in house staff and contractors as needed.[111] The issue of possible conflict-of-interest contractor auditing was raised in the June 16, 2023, workshop. PacifiCorp should clarify in their WMP that contractor-completed post-audit work is conducted in a way that avoids a conflict of interest due to self-auditing.

PacifiCorp provides a table detailing their VM QA/QC program.[112] It is not clear whether data listed as "Audit Results 2022" is referring to the pass rate or the percent of total work completed that was audited. PacifiCorp should provide an updated table with audit pass rates, audit pass targets, and percent of work that was audited.

Vegetation Management: PacifiCorp should assign levels to VM open work orders and track their progress

PacifiCorp does not provide data in Table 8-20 Number of Past Due Vegetation Management Work Orders Categorized by Age, stating "Pacific Power does not have specific due dates for each condition at the time of this filing."[113] GPI recommends issuing PacifiCorp an ACI that requires them to establish VM work order due dates based on infraction type and risk. The ACI

[110] PacifiCorp 2023-2025 Base WMP, p. 186

[111] PacifiCorp 2023-2025 Base WMP, p. 204

[112] PacifiCorp 2023-2025 Base WMP, p. 206

[113] PacifiCorp 2023-2025 Base WMP, p. 207

should also require PacifiCorp to provide a table summarizing all incomplete work orders, the date the work order was opened, the days lapsed since the work order was opened, and when they are scheduled for completion. It may be prudent to request a complete table of work orders with issue description in order to better understand whether and how PacifiCorp currently works down their VM open work order based on non-compliance type or risk condition.

PacifiCorp's Vegetation Management Enterprise system only recently went digital in 2020. Their system description focuses on the use of a mobile app in the field. Listed system limitations include:

> Pacific Power does not maintain an inventory and work history of specific trees with unique identifiers, but rather collects an inventory of the work identified at a location to be conducted within the calendar year by powerline and retains this work history for future reference. Pacific Power's MDMS is not integrated with other systems in other lines of business within Pacific Power.[114]

Based on the VM Enterprise System narration, listed limitations, and lack of work order deadlines, it's not readily apparent whether PacifiCorp has the capacity to track or easily know the time since a work order was opened, when work was scheduled, and when the work was completed. That is, it's not clear if PacifiCorp is able to set and track work order deadlines and past-due flags with their existing VM Enterprise System. GPI recommends that the ACI include a requirement to provide additional detail on the capabilities of their VM Enterprise System, including its functionality for tracking open work order age.

Conclusions

We respectfully submit these comments on the 2023-2025 WMPs of the SMJUs. The SMJUs are much smaller than California's IOUs, and hence are unable to apply the same level of resources to their wildfire mitigation efforts compared to the IOUs. On the other hand the more homogeneous service territories of the SMJUs allow them to concentrate their efforts on the particular features of their systems, and to work in greater partnership with the needs and interests of their customers. Our analysis of the 2023-2025 WMPs of the IOUs and the SMJUs

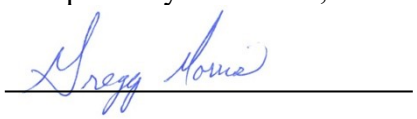
[114] PacifiCorp 2023-2025 Base WMP, p. 204

show that the IOUs are significantly ahead in terms of their use of risk modeling information, and in the execution of their grid-hardening efforts, while the SMJUs are ahead in terms of transparency and successfully interacting with their customer base to reach common goals. We provide herein a series of critiques and suggestions for the SMJUs and OEIS to improve their 2023-2025 WMPs. It is our hope that the SMJUs will continue to absorb the lessons learned by the IOUs with respect to the strengths in their WMPs, and equally that the IOUs will learn from the SMJUs in the areas of the SMJUs' strengths.

For the reasons stated above, we urge the OEIS to adopt our recommendations herein.

Dated June 29, 2023.

Respectfully Submitted,



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