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DATA REQUEST RESPONSE

LIBERTY UTILITIES (LIBERTY)

Data Request No.:	OEIS-P-WMP_2026-Liberty-003
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Date Received:	September 16, 2026
Due Date:	September 21, 2026
Subject:	Q01. Regarding Sensitive Analysis and Parameter Uncertainty Q02. Regarding Sub-Driver Effectiveness of Overhead Hardening with Covered Conductor Q03. Regarding Liberty's Empirical Effectiveness Estimate of Overhead Hardening Without Covered Conductor Q04. Regarding Activity Prioritization Schematic Q05. Regarding Figure 6-3: Waterfall Diagram of Liberty's Risk Model

Q01. Regarding Sensitive Analysis and Parameter Uncertainty:

a. On page 121 of its 2027 Base WMP,[1] Liberty states that it, "defers quantification of model uncertainty in its current version of the risk model, which would involve alternate specifications of the probability of outage model or the use of other wildfire spread models beyond Technosylva's provided outputs."
   i. Provide a timeframe with key milestones for assessing the uncertainty of Liberty's risk model.
   ii. Describe how Liberty considers risk model uncertainty during its risk informed decision-making process.

b. On page 121, Liberty also states that it, "can provide examples of parameter uncertainty, which includes inputting alternative mitigation effectiveness or cost parameters and comparing the results to the default parameter choices."
   i. Describe how Liberty analyzed the sensitivity of parameters. Provide the sensitivity analysis notes, SME review or calibration notes, meeting notes, and other relevant documentation.
   ii. Identify any findings from the parameter sensitivity analysis and explain how Liberty considers the sensitivity of parameters during its risk informed decision-making process

<u>Response:</u>

a)

i) Liberty clarifies it defines model uncertainty as the underlying methodological uncertainty with quantitative risk modeling, and that parameter uncertainty reflects the varying deterministic values that can be inputted into a risk model. Liberty interprets the data request regarding "uncertainty of Liberty's risk model" to refer to "model uncertainty," not "parameter uncertainty," given the citation associated with page 121.

Liberty does not propose a timeline or milestones with assessing "model uncertainty" at this time. As described in the citation to page 121, addressing model uncertainty may involve leveraging multiple wildfire simulation vendors, and assessing how risk changes based on the use of different vendors (and thus different methodologies). This would be an inefficient use of resources to contract with multiple wildfire simulation vendors.

One way Liberty already addresses model uncertainty is on the probability

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1 Liberty 2027 Base WMP R0, published Aug. 31, 2026,
URL: (https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=61181&docket=WMP-LU&shareable=true).

of outage side of the risk modeling equation. Liberty describes model specification and cross-validation in detail on pages 47-48, including Random Forest, Light Gradient Boosting (LightGBM), Extreme Gradient Boosting (XGBoost) and a Bayesian State-Space model.

ii) Liberty's current risk model provides a signal for which areas and assets within its service territory face higher wildfire and outage program risk. However, the signal can also be complicated by noise from the data-generating process. A four-year outage dataset to train the model likely introduces more noise than an eight-year outage dataset that can more adequately filter out near random occurrences. To address uncertainty in the risk model, Liberty approaches model results with healthy skepticism and questions counterintuitive conclusions. While quantitative measures of risk are foundational to investment decisions, caution must be exercised and cross-functional collaboration is critical, given the noise and extreme tail of wildfire risk.

b)

i) Liberty uses its risk model dashboard to change parameter values within the Power BI application within Microsoft Teams. By changing the parameter values, such as the capital cost of overhead hardening with covered conductor, or the likelihood of PSPS on the highest risk circuits, Liberty can understand how sensitive the model is to key parameter choices. Key parameter choices that are relevant to understanding the impact of uncertainty on model outputs include capital costs of grid hardening measures, the mitigation effectiveness of mitigation alternatives, monetized consequence parameters (*e.g.*, $/CMI assumption), and the likelihood and duration of PSPS events.

ii) At present, as discussed in the WMP, Liberty's risk model currently focuses on estimating benefit-cost ratios for overhead hardening with covered conductor and undergrounding. In addition, Liberty's risk models' capabilities are well-suited towards understanding overall utility risk, wildfire risk, and PSPS risk at the circuit level. Therefore, the parameter sensitivity tests that Liberty has explored using the dashboard focus on what parameter values yield materially different results for covered conductor vs. undergrounding, as well as risk ranks at the circuit level. Liberty has found that despite the lower mitigation effectiveness value for covered conductor, the lower capital cost yields higher benefit-cost ratios for this mitigation vs. undergrounding. Liberty has varied the capital cost of undergrounding to see where this conclusion would be materially different. In addition, Liberty has varied the $/CMI assumption, given the inherent challenges in measuring the value of lost load. Varying this monetized reliability consequence parameter can affect the risk ranking, given the analysis is at the circuit level and circuits with higher customer counts and higher PSPS likelihood would result in higher PSPS risk. Liberty does not have a formal workpaper or documentation for the parameter sensitivity analysis because it lives within the recently developed risk model dashboard.

Q02. Regarding Sub-Driver Effectiveness of Overhead Hardening with Covered Conductor:

a. On page 118 of its 2027 Base WMP, Liberty states, "For overhead hardening with covered conductor, Liberty's mitigation effectiveness parameters ranging from highest to lowest are 0.77 for animal contact, 0.72 for vegetation contact, 0.70 for third-party contact, 0.64 for vehicle contact, and 0.60 for equipment failure."

i. Describe how Liberty determined these sub-driver effectiveness parameters. Provide the SME input or notes, survey responses, meeting notes, and other relevant documentation.

<u>Response:</u>

a.

i. Liberty describes how it determined sub-driver effectiveness values for overhead hardening with covered conductor on page 119. For additional detail, including the full list of sub-drivers, effectiveness parameters, and the mapping to PG&E's WDRM, please refer to Technical Appendix B, specifically the section on mitigation effectiveness. Liberty relies on this benchmarking analysis for mitigation effectiveness parameters, rather than SME input.

Q03. Regarding Liberty's Empirical Effectiveness Estimate of Overhead Hardening Without Covered Conductor:

a. On pages 120-121 of its 2027 Base WMP, Liberty explains its methodology for the empirical analysis of overhead hardening without covered conductor.

i. Liberty states that it, "leveraged the outage dataset relied upon for training the probability of outage model, which includes outage records for the four-year period 2022-2025."

1. How many outages are included in this dataset?
2. Explain how Liberty accounted for weather conditions for the outage data in the empirical analysis.

Response:

a.

i. Liberty describes the outage dataset on page 44 of its 2027 WMP: "The model is trained on four years of historical outage records (January 1, 2022– December 31, 2025), producing an initial dataset of approximately 3,400 outage records." The precise number of outages included in the dataset is 3,474.

ii. The differences-in-differences analysis relies on a common trends assumption, or sometimes called parallel trends. The comparison is between a treatment group and a control group over the same time period, so any weather that affects both groups simultaneously during the time period will be accounted for in the relative differences in outage outcomes. For example, if it was particularly mild in terms of wind in 2023, and then exceptionally windy and hot in 2024, that would likely enter the estimation by driving up outage counts in 2024 relative to 2023. The advantage of the differences-in-differences analysis is that both treated and control groups would be subject to those common weather conditions, so the estimator acts by taking the relative change in outage counts between treatment and control group during the time period. As Liberty notes in its risk assessment improvement plan, Liberty will more robustly build out the methodology for empirically measuring mitigation effectiveness from this initial estimator.

Q04. Regarding Activity Prioritization Schematic:

a. On page 67 of the Energy Safety WMP Guidelines,2 Energy Safety requires electric corporations to provide, "A high-level schematic showing the procedures and evaluation criteria used to evaluate potential activities. At a minimum, the schematic must demonstrate the roles of quantitative risk assessment, resource allocation, evaluation of other plan objectives (e.g., cost, timing) identified by the electrical corporation, and SME judgment. Where specific local factors, which vary across the service territory, are considered in the decision-making process (e.g., the primary risk driver in a region is legacy equipment), they must be indicated in the schematic. The electrical corporation must explain why those local conditions are part of the decision process (i.e., there should not be simply one box in the schematic that is labeled 'local conditions,' which is then connected to the rest of the process)."

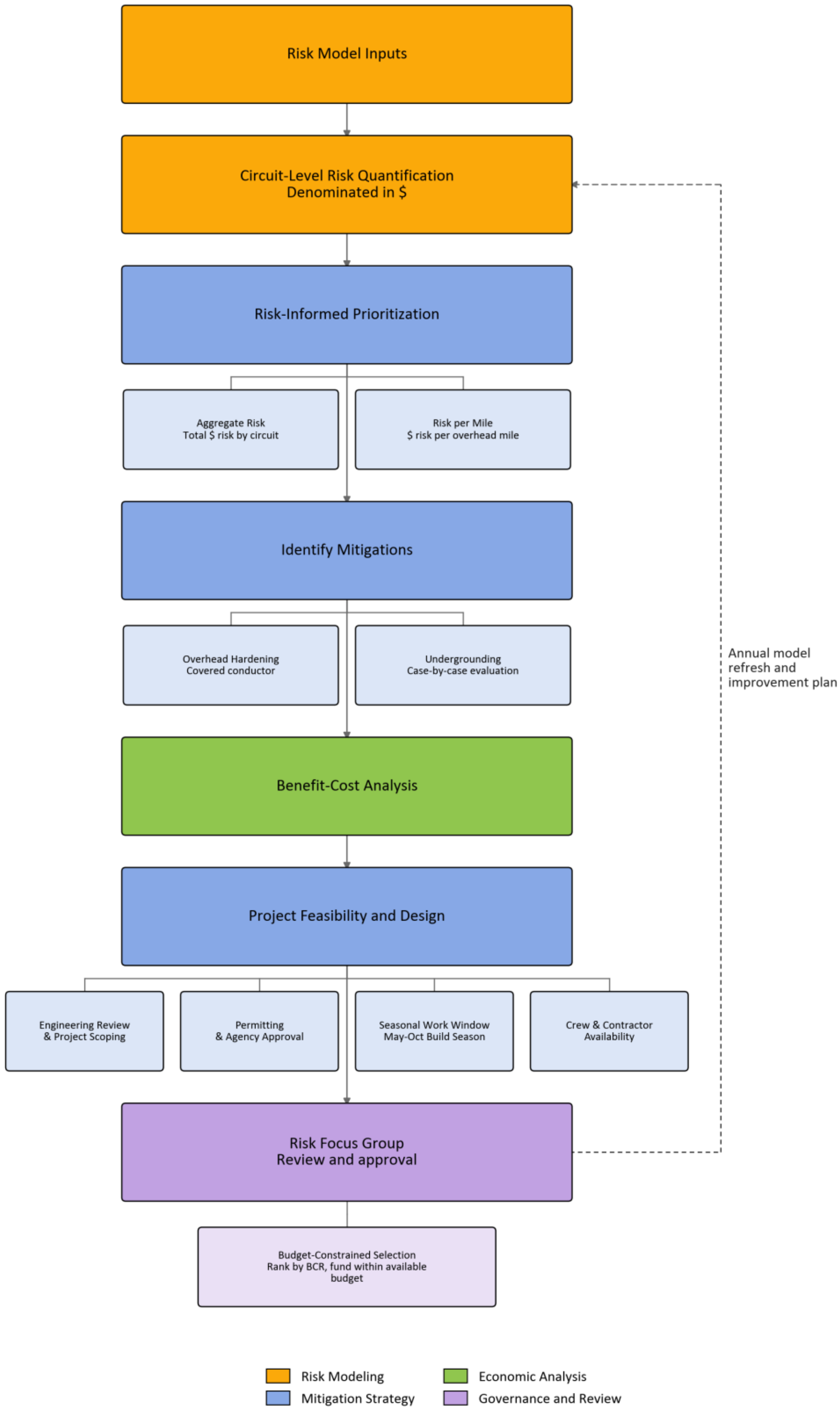
i. Provide the schematic as required by the WMP guidelines. If Liberty cannot produce the schematic at this time, explain why Liberty is unable to produce the schematic and provide a timeline with key milestones for when Liberty will be able to produce the schematic.

<u>Response:</u>

a.

i. Refer to Figure 6-1 of Liberty's 2027 WMP for a schematic that shows Liberty's risk informed decision-making process. Quantitative risk assessment is a component of Steps 1-5. Resource allocation, evaluation of other plan objectives (e.g., cost, timing), and SME judgement are components of Steps 6-7. Liberty provides an updated schematic below to specify these components of each step in the Figure 6-1 schematic.

Updated Schematic for Liberty's Risk Informed Decision-Making Process



Q05. Regarding Figure 6-3: Waterfall Diagram of Liberty's Risk Model:

a. On page 133 of its 2027 Base WMP, Liberty provides Figure 6-3: Waterfall Diagram of Liberty's Risk Model.

   i. Explain how Liberty calculated the 16M risk reduction for Overhead Hardening Mitigation.

      1. Identify which Overhead Hardening Mitigation activities were included in this total and which were not.
      2. Identify the time range of implementation for the activities included in this risk reduction total.
      3. Provide any relevant calculations or datasets.

   ii. Explain how Liberty calculated the 569M risk reduction for PEDS/PSPS Mitigation.

      1. Explain how Liberty calculated and considered the joint effectiveness of these two mitigation activities.

   iii. Explain how Liberty calculated the 109M risk for PSPS Risk.

   iv. Liberty states, "The risk reduction modeled by 'CC or UG Mitigation' assumes all circuits with a BCR greater than or equal to one are hardened." Does the 72M risk reduction for CC or UG Mitigation assume Covered Conductor is applied to all circuits with a BCR greater than or equal to one? Provide an explanation for this assumption.

<u>Response:</u>

a.

   i. Liberty calculates the $16M in risk reduction for overhead hardening without covered conductor in a similar manner as it calculates the risk reduction for undergrounding and overhead hardening with covered conductor. Refer to LU Table 6-1 for the mitigation effectiveness parameter. As described in the table, the mitigation effectiveness parameter applies to asset-related outages. For each applicable circuit (see below), Liberty calculates the risk reduction by reducing outage and ignition rates, accounting for the proportion of asset-related outages relative to other outage types.

      1. Overhead hardening without covered conductor includes replacement of at-risk poles and hardware, and may include wider crossarms, shorter spans, new conductor, and upgraded brackets, insulators, fuses, and arrestors.
      2. The time range includes 2022 through 2025.
      3. See attachment: "DR-003-Q05a.i.3 Response."

   ii. Liberty estimates the risk reduction associated with PEDS and PSPS using the mitigation effectiveness parameters listed in LU Table 6-1. The risk reduction is calculated by multiplying wildfire risk by the mitigation effectiveness parameter. For example, if initial wildfire risk is $100M, then residual risk after PEDS/PSPS is $100M * (1-X) * (1-Y), where X and Y represent mitigation effectiveness parameters in LU Table 6-1. Whether X or Y is applied first yields the same residual risk (idempotent).

1. Liberty does not consider the joint effectiveness of PSPS and PEDS. When a PSPS event occurs, Liberty does not credit SRP/PEDS with risk reduction. When SRP is enabled, Liberty does not credit PSPS with a risk reduction.

iii. Liberty provides a detailed set of equations to calculate PSPS risk in WMP Section 5.2. This includes multiplying PSPS likelihood by PSPS consequence. PSPS likelihood is modeled using a 17-hour duration and circuit-level customer counts. PSPS consequence includes reliability impacts, valued using the Berkeley Lab ICE calculator. Please refer to the PSPS likelihood section (page 55) and the PSPS consequence section (pages 63-65, and page 67). Equations are provided in the cited sections alongside parameter values.

iv. The risk reduction assumes all covered conductor projects with a BCR greater than one are deployed. The basis for the assumption is conventional benefit-cost methodology that investments are efficient when the expected benefits exceed the expected costs. In practice, quantifying benefits and costs is inherently challenging, especially in a setting like wildfire risk where risk is concentrated in the extreme tail of the distribution. Showing the residual risk when all covered conductor projects with BCRs greater than one is informative for planning purposes to visualize potential residual risk once covered conductor projects are deployed. Throughout Section 6 of the 2027 Base WMP, Liberty presents analysis and provides discussion on the practical nature of completing all modeled projects (please refer to Figure 6-2).