Application No. 18-04-___
Exhibit PAC/1000
Witness: Brett S. Allsup

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

PACIFICORP

Direct Testimony of Brett S. Allsup

Implementation of a Risk-Based Investment Decision Making Framework

April 2018

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ATTACHED EXHIBITS

Q. Please state your name, business address, and present position with PacifiCorp d/b/a Pacific Power (PacifiCorp).

A. My name is Brett S. Allsup. My business address is 825 N.E. Multnomah, Suite 1600, Portland, Oregon 97232. My present position is Director–Engineering Strategy and Cost Control, a department within the Transmission Services and Asset Management business unit.

I. QUALIFICATIONS

Q. Please briefly describe your education and business experience.

A. I am a professional engineer, licensed in the states of California and Oregon. I received a Bachelor of Science in Electrical Engineering from California State University Sacramento in 1986 and a Master of Science in Electrical Engineering from San Diego State University in 1991. I have been employed by PacifiCorp since 1991, during which time I have held numerous positions including Lead Engineer–Substation Engineering, Engineering Services Manager, Manager–Field Engineering, Acting Director–Distribution System Engineering, Director–Asset Policy, Managing Director–T&D Operations and Maintenance, Managing Director–T&D Engineering, and Vice President–T&D Engineering and Asset Management. Before working for PacifiCorp, I held positions in District Engineering, Substation Engineering, and Generation Engineering with San Diego Gas and Electric Company.

Q. Please describe your present duties.

A. My primary responsibilities include assessing risk and developing strategies for transmission and distribution assets, developing and maintaining inspection and maintenance policies, assisting the prioritization of capital and maintenance

investments, and conducting special studies and analyses in response to changing internal and external requirements and conditions.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the risk management process PacifiCorp developed to implement a risk-based investment decision making framework in its general rate case (GRC) application filing as required by the Commission in its December 4, 2014 issuance of Decision (D.) 14-12-025.[1] I will further discuss how this approach evolves to incorporate new risks that are identified, including, for example, wild fire risk which was the subject of D.17-12-024.

III. PACIFICORP'S RISK ASSESSMENT OVERVIEW AND DEVELOPMENT OF NEW FRAMEWORK

Q. Before D.14-12-025, did PacifiCorp have a process for assessing risk for its transmission and distribution asset base and, if so, please describe this process?

A. Yes. In addition to conducting core asset management processes, such as inspection and maintenance programs, PacifiCorp historically performed annual risk assessments of its key transmission and distribution asset base (which includes pole inventory, substation transformers, and substation breakers). These assessments were performed using the company's asset serviceability review (ASR) procedures. Using the ASR process, PacifiCorp identified the issues, investment drivers, and risks affecting its existing assets and was able to target a number of short-term and long-term areas of potential risk to the business for strategic analysis of available options.

[1] *See* D.14-12-025 at page 18–19.

This process informed the company's capital, maintenance, and operational spending decisions.

In 2014, PacifiCorp began using the Berkshire Hathaway Energy Company (BHE) Asset Health Index (AHI) methodology combined with certain key components of the ASR methodology, including asset utilization analyses, system reliability assessments, and asset condition inspections.

Using these combined methodologies, the company was able to assess the comparative health of assets such as substation transformers, circuit breakers, relays, and transmission and distribution poles. The BHE AHI is a relative index used to compare the assets against each other and to establish a baseline to determine the relative changes in health of individual units as well as the total population over time. The BHE AHI score assigned to an asset does not indicate or predict end of asset life or imminent failure; however, units identified with poor BHE AHI scores are generally targeted for further risk evaluation. Such evaluations result in a recommendation that takes into account options for contingency plans, including developing remedial actions, ensuring availability of spares and/or advancing equipment replacements. The first edition of the BHE AHI developed in 2014 served as a baseline against which the condition of the assets has since been evaluated.

Q. Please provide a brief overview of PacifiCorp's new risk-based investment decision-making framework developed in compliance with D.14-12-025.

A. As discussed in more detail below, PacifiCorp's new risk-based investment decision-making framework consists of a six-step investment planning process that integrates

an algorithm known as a risk evaluation tool (RET). Specifically, PacifiCorp's investment planning process includes the following six steps:

- Risk identification (Step 1);
- Risk analysis (Step 2);
- Risk evaluation and prioritization (Step 3);
- Mitigation plan development (Step 4);
- Risk-informed investment decisions and risk mitigation implementation (Step 5); and
- Risk monitoring (Step 6).

The RET, applied in Step 3, uses frequency and impact scores for each specific risk event or scenario, *e.g.*, a substation transformer failure, *etc.* (Risk Event) to calculate an overall risk score for the Risk Event (Risk Score). As discussed in detail below, the primary variables that impact the Risk Score for a specific Risk Event are the frequency and impact scores established for the specific Risk Event in Step 2. PacifiCorp then focuses on its Risk Events with the highest Risk Scores in Steps 4 through 6.

Q. Please summarize the process PacifiCorp implemented in its efforts to develop a risk-based investment decision-making process in compliance with the requirements of D. 14-12-025.

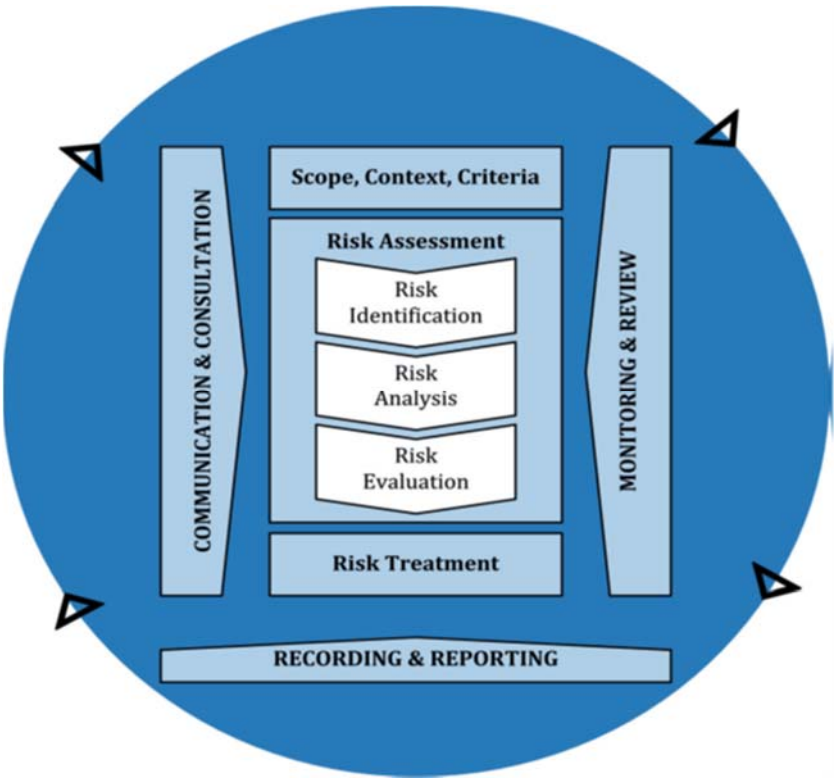
A. PacifiCorp reviewed the documents filed by Pacific Gas & Electric Company (PG&E), San Diego Gas and Electric Company, and Southern California Edison (large California utilities) in their risk-based decision making proceedings. PacifiCorp also reviewed the filing by Bear Valley Electric Service (BVES).

PacifiCorp took note of the comments the Safety and Enforcement Division (SED) provided in those proceedings. PacifiCorp leveraged this information, along with input from its business units, to develop its own risk-based investment decision-making process.

Like the large California utilities, PacifiCorp included some of the basic principles of the International Standardization Organization's "Risk Management—Principles and Guidelines" (ISO 31000)[2] into its six-step risk management methodology, including the ISO 31000 principles. Specifically, Clause 6 of ISO 31000 explores the systematic application of policies, procedures and practices for establishing the context and assessing, treating, monitoring, reviewing, recording, and reporting risk, as shown in Figure 1 below.

[2] ISO 31000 is an internationally recognized standard for risk management, and adopting the principles and guidelines of ISO 31000 positions an organization to be able to achieve objectives, improve the identification of risks, and more effectively allocate resources for risk reduction.

Figure 1: ISO 31000 Risk Management Process



PacifiCorp's six step process includes all of the elements of Clause 6 of ISO 31000 as depicted above.

Similarly, like other utilities' risk-based decision frameworks and consistent with the Commission's guidance, PacifiCorp tracks the principles and processes developed by Cycla Corporation (Cycla) in the company's six-step risk management program. The Cycla approach has been introduced in earlier proceedings and has been endorsed by the Commission.[3]

Q. What is Cycla's Risk-Informed Resource Allocation Process?

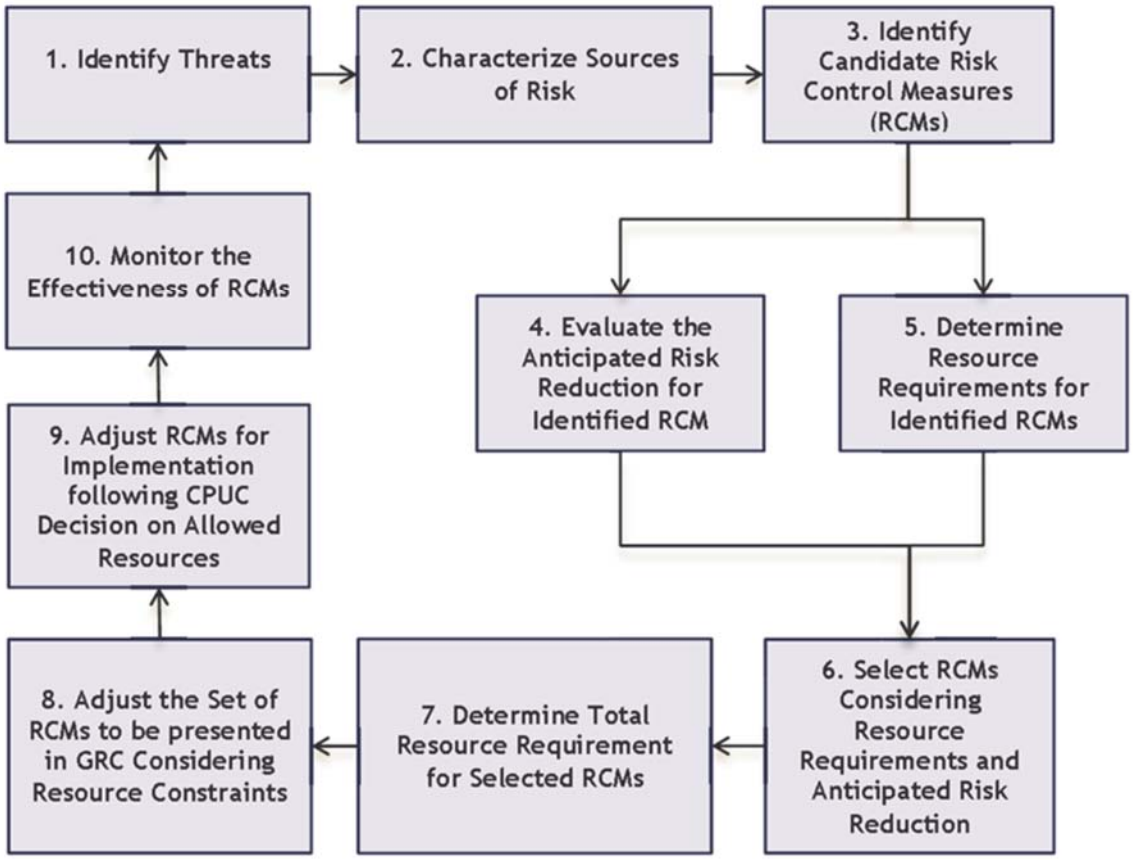
A. There are 10 distinct elements of Cycla's risk-informed process. As illustrated in

[3] In D.16-08-018, the Commission approved the 10-step Cycla model as a "common yardstick of the maturity" of risk assessment and mitigation models. p. 18.

Figure 2 below, the Cycla process includes the following steps:

1. Identify the threats having the potential to lead to safety risk;
2. Characterize the source of risk;
3. Characterize the candidate measures for controlling risk;
4. Characterize the effectiveness of the candidate risk control measures (RCMs);
5. Prepare initial estimates of the resources required to implement and maintain candidate RCMs;
6. Select RCMs the operator wishes to implement (based on anticipated effectiveness and costs associated with candidate RCMs);
7. Determine the total resource requirements for selected RCMs;
8. Adjust the set of selected RCMs based on real-world constraints such as availability of qualified people to perform the necessary work;
9. Document and submit the General Rate Case filing, on which the CPUC decides the expenditures it will allow, and, based on the CPUC decision, adjust the operator's implementation plan; and
10. Monitor the effectiveness of the implemented RCMs and, based on lessons learned, begin the process again.

Figure 2: Cycla's 10-Step Process Overview



Q. How does PacifiCorp's risk-informed process compare to Cycla's process?

A. PacifiCorp's new risk-based investment decision making-process is substantially similar to the Cycla process; however, PacifiCorp collapses several of the Cycla steps into single processes reducing the total number of steps from 10 to six. Table 1 below maps the steps in the PacifiCorp model to the applicable steps in Cycla's model.

Table 1: Mapping PacifiCorp Process to Cycla Process

PacifiCorp	Cycla
1. Risk Identification	Step 1
2. Risk Analysis	Step 2
3. Risk Evaluation and Prioritization	Step 2
4. Mitigation Plan Development & Documentation	Steps 3, 4, and 5
5. Risk-informed Investment Decisions and Risk Mitigation Implementation	Steps 6, 7, 8 and 9
6. Risk Monitoring	Step 10

IV. THE SIX STEPS OF PACIFICORP'S RISK-BASED INVESTMENT DECISION MAKING FRAMEWORK

Q. Please describe Step 1 (risk identification) of PacifiCorp's six-step process.

A. In order to identify risks, PacifiCorp compiled (1) a list of all of the company's transmission and distribution asset groups and (2) a list of all of the unique assets within each asset group, as shown in Table 2.

Table 2: Unique Assets Within Each Asset Group

Asset Group	Unique Assets
Transmission Substations	1. transformers, 2. circuit breakers, and 3. relays and other apparatus.
Distribution Substations	1. transformers, 2. circuit breakers, and 3. relays and other apparatus.
Overhead Transmission and Distribution Lines	1. poles, 2. wires, and 3. pole mounted equipment.
Underground Distribution Lines	1. cable, 2. subsurface equipment, and 3. pad mount equipment.

For each unique asset in each asset group, PacifiCorp identified multiple Risk Events that could occur, along with the possible consequences of the occurrence of each Risk Event, including safety, environmental, compliance, reliability, trust, or financial impacts. Examples of Risk Events associated with various unique assets include transformer failure, circuit breaker failure, bushing failure, radiator failure, relay failure, relay mis-operation, major oil spill, SF6 gas leak, pole fire, pole mounted equipment failure, age/deterioration, broken cross-arm, downed wire, etc. Consequences of the occurrence include, for example, downed wire, sustained outages, wildfires, pole failures, and transformer oil spills.

Q. Please describe Step 2 (risk analysis) of PacifiCorp's six-step process.

A. In Step 2, PacifiCorp analyzed the frequency and impact of each Risk Event. Specifically, the company gave each Risk Event both (i) a frequency factor grade, which corresponds to frequency score, and (ii) an impact score for each of six distinct impact areas. The frequency factor and impact scores for each Risk Event are used as inputs in calculating the Risk Score in Step 3. The frequency score is used to depict risk relative to PacifiCorp's top 10 Risk Events as shown in the 7x7 heat map shown in Figure 6 below.

Q. Please describe how frequency factors and frequency scores are determined in Step 2.

A. Using applicable historical data and operational knowledge, PacifiCorp assigned a frequency factor to each Risk Event based on the number of times per year a Risk Event is likely to occur, where a frequency factor of 1 equates to 1 occurrence per year. PacifiCorp then determined the frequency score for the Risk Event, on a scale

of one (remote) through seven (common), using the frequency factor ranges set forth in Table 3 below. For example, PacifiCorp assigned a frequency factor of 1, resulting in a frequency score of 5 (where frequency is in the range of once every 1-2.99 years), to PacifiCorp's substation transformer failure Risk Event, the company's Risk Event with the highest Risk Score.

Table 3: Frequency Score

Frequency Level	Description	Frequency Factor Range	Frequency Score
Remote (1)	Once every 100+ years	F =< 0.01	1
Rare (2)	Once every 30-99.99 years	F = 0.01001 - 0.03333	2
Infrequent (3)	Once every 10-29.99 years	F = 0.0333445 - 0.1	3
Occasional (4)	Once every 3-9.99 years	F = 0.1001001 - 0.3333	4
Frequent (5)	Once every 1-2.99 years	F = 0.33444816 - 1	5
Regular (6)	>1-9.99 times per year	F = 1.001 - 9.99	6
Common (7)	>= 10 times per year	F => 10	7

As shown in Table 3 above, any Risk Event with a frequency factor estimated in the range of 0.334 to 1 events per year (*i.e.*, once every 1 to 2.99 years), for example, will be assigned a frequency score of 5 for purposes of depicting frequency in the 7x7 heat map shown in Figure 6 below. However, because the specific estimated frequency factor is used as the input in the RET algorithm, and not the frequency score, as discussed in Step 3 below, the impact of frequency on the Risk Score is variable among Risk Events with the same frequency score. For example, a frequency factor that is on the higher end of the range for the given frequency score will have a higher impact on the Risk Score than a frequency factor that is on the lower end of the range for the given frequency score.

Q. Please describe the impact scoring system used in Step 2.

A. To assign metrics to the consequences of the occurrence of each Risk Event,

PacifiCorp developed an impact scoring system. Using this system, PacifiCorp assigns an impact score (on a scale of one through seven) for each of the six impact groups (Impact Groups) for each Risk Event. The Impact Groups for which each Risk Event is scored include 1) safety, 2) environmental, 3) compliance, 4) reliability, 5) trust, and 6) finance. [4]

PacifiCorp adopted descriptions that correspond to scores that range from 1 (Negligible) to 7 (Catastrophic) for each Impact Group, as shown in Exhibit PAC/1001. Thus, within the Impact Groups the impact scores are calibrated to match the severity of the impact. Impact scores are also aligned across the six Impact Groups. For example, an impact score of 5 is equivalent in severity across the six Impact Groups. To illustrate this scoring system, the descriptions for the seven impact scores for the Safety Impact Group is shown in Table 4 below. *See* Exhibit PAC/1001 which sets forth descriptions for the seven impact level scores PacifiCorp established for each of the six of the Impact Groups.

[4] PacifiCorp's six Impact Groups and corresponding score descriptions mirror those used by PG&E.

Table 4: Safety Impact Group Scoring Scale

SAFETY IMPACT DESCRIPTION

Impact Level	Description
Catastrophic (7)	**Fatalities:** Many fatalities and life threatening injuries to the public or employees.
Severe (6)	**Fatalities:** Few fatalities and life threatening injuries to the public or employees.
Extensive (5)	**Permanent/Serious Injuries or Illnesses:** Many serious injuries or illnesses to the public or employees.
Major (4)	**Permanent/Serious Injuries or Illnesses:** Few serious injuries or illnesses to the public or employees.
Moderate (3)	**Minor Injuries or illnesses:** Minor injuries or illnesses to many public members or employees.
Minor (2)	**Minor Injuries or illnesses:** Minor injuries or illnesses to few public members or employees.
Negligible (1)	No injury or illness or up to an un-reported negligible injury.

PacifiCorp applied these descriptions to assign impact scores (*i.e.*, 1 through 7) to each Impact Group for each Risk Event.

Q. Please provide an example of how impact scores are assigned?

A. Based on the descriptions corresponding to the scoring system for the safety Impact Group, shown in Table 4 above, PacifiCorp assigned the following impact scores for the substation transformer failure Risk Event shown in Figure 3 as follows:

- Safety Impact Group: The impact score of 4 (Major) was assigned for potential permanent or serious injury to occur if the substation transformer fails with company personnel or members of the public in the general vicinity at the time of failure.
- Environmental Impact Group: The impact score of 4 (Major) was assigned due to a significant volume of oil that could potentially escape the company's oil containment system.

- Compliance Impact Group: The impact score of 4 (Major) was assigned due to the assumption that the Risk Event could potentially result in new regulations as a result of the event.
- Reliability Impact Group: The impact score of 5 (Extensive) was assigned due to the potential for a substation transformer failure to result in an extensive outage impacting a large percentage of PacifiCorp's customer base in California.
- Trust Impact Group: The impact score of 5 (Extensive) was assigned due to the potential for an outage caused by this Risk Event to lead to customer satisfaction survey deterioration.
- Financial Impact Group: The impact score of 4 (Major) was assigned due to the potential for this Risk Event to cause a financial impact of $5 million or higher in recovery costs.

After the frequency and impact scores were initially assigned to each Risk Event, the company reviewed the scores to ensure consistency across the Risk Events and Impact Groups. Figure 3 below shows the substation transformer failure Risk Event scoring populated with the frequency score and impact scores that are used to develop the 7x7 heat map shown in Figure 6 below (and as inputs in the RET calculation performed as part of Step 3).

Figure 3: Top Risk Event Scoring Sheet with Frequency Score and Impact Score

Risk Event:	**Substation Transformer Failure**	**Risk Plot Key:**	**A**
Reasonable Worst Case:	Substation transformer fails, releasing all oil in the transformer, resulting in a prolonged outage to all customers that requires the transformer to be replaced.		
Controls:			
Risk Scoring			
Frequency Score	**Impact Scores**		
5	**Safety**	4	
	Environmental	4	
	Compliance	4	
Frequency Factor	**Reliability**	5	
1	**Trust**	5	
	Financial	4	
Total Risk Score:			
Additional Mitigations Considered:			

Q. Please describe Step 3 (risk evaluation and prioritization) of PacifiCorp's six-step process.

A. In Step 3, the company uses the inputs developed in Step 2 to calculate Risk Scores to rank and prioritize Risk Events. The Risk Score is expressed in the following RET equation:

$$RS_{(Event)} = K^{[0.5 \text{ Log } (F_{(Event)}) + I_{(Event)}]}$$

Where:

$RS_{(Event)}$ is the Risk Score for the Risk Event
$F_{(Event)}$ is the number of occurrences expected to happen in a year (frequency factor) for the Risk Event

K is the scalar/index value fixed at 3.16 (the square root of 10)
0.5 is the standard factor used to calculate the variance of the aggregate impact of uncorrelated events
$\mathbf{I_{(Event)}}$ is the weighted impact score for the Risk Event calculated as follows:

$$I_{(Event)} = Log\left(\sum_{j=1}^{6} W_j * 10^{I_j}\right)$$

Where:

I_j = the impact score for the applicable Impact Group (1-6) for the Risk Event
W_j = the weight applied to the impact score for the applicable Impact Group (1-6) as determined by reference to the table shown in Table 5 below.
j = the applicable Impact Group Category Number (1-6)

Table 5: Impact Group Weighting[5]

Impact Groups	Weight	Category Number
Safety	30%	1
Environmental	5%	2
Compliance	5%	3
Reliability	25%	4
Trust	5%	5
Financial	30%	6
Total	100%	

The RET Risk Score calculation provides a net score that factors in the weighted impact of events over a range of potential outcomes that occur at differing frequencies. This facilitates the ranking and prioritization of Risk Events. The "k" scalar is used to calibrate risk scores over a range of 1 to 10,000 to create adequate

[5] The Impact Group weightings are subjective in nature and are subject to change in future general rate case risk assessments as PacifiCorp continues to evolve and improve its processes.

separation between risk events to facilitate management discussion and decision making.

Q. Please provide an example of how PacifiCorp calculates Risk Score for a Risk Event.

A. Using the RET equations shown above, PacifiCorp calculates the Risk Score for the substation transformer failure Risk Event as follows:

1. The first step is to calculate the weighted Impact Score (I_{Event}) for the event using the steps shown in Table 6 below. Table 5 Impact Group Weighting percentages are used and identified as W_j for each of the six Impact Groups. The calculations were performed in Excel using the equations shown in tabular form in Table 6 as follows:

Table 6: Weighted Impact Score Calculation for Substation Transformer Failure

$I_{Event} = Log(Sum(W_j*10^{\wedge Ij}))$						
Impact Groups	**Weight (W_j)**	**Impact Scores (I_j)**	**Impact Factor ($10^{\wedge Ij}$)**	**Weighted Impact (W_j*10^{Ij})**	**Sum Weighted Impacts ($Sum(W_J*10^{\wedge Ij})$)**	**Weighted Impact Score (I_{Event})**
Safety	0.30	4	10000	3000	37000	4.6
Environmental	0.05	4	10000	500		
Compliance	0.05	4	10000	500		
Reliability	0.25	5	100000	25000		
Trust	0.05	5	100000	5000		
Financial	0.30	4	10000	3000		

Another way to show the weighted impact score calculation is as follows:

$I_{Event} = Log[(0.30*10^4)+(0.05*10^4)+(0.05*10^4)+(0.25*10^5)+(0.05*10^5)+(0.30*10^4)] = 4.6$

PacifiCorp's substation transformer failure impact score is: $I_{Event} = 4.6$

2. The Risk Score (RS_{Event}) for the event can now be calculated using the weighted Impact Score (I_{Event}) calculated above and the number of occurrences expected to happen in a year (frequency factor) for this Risk Event. The estimated frequency factor ($F_{Event)}$ for substations transformers system wide is one failure per year. So for this case, $F_{Event} = 1$.

The Risk Score (RS) is calculated using the equation $RS_{Event} = k^{[0.5*\log(F_{Event})+I_{Event}]}$, where $k = \sqrt{10}$, $I_{Event} = 4.6$, and $F_{Event} = 1$. The Risk Score calculation for the substation transformer failure event is as follows:

$$RS_{Event} = \sqrt{10}^{\,*\,[0.5*\log(1)+4.6]} = 192.35$$

Completing the equation with the applicable impact score and frequency factor as shown above resulted in PacifiCorp's substation transformer failure event having a Risk Score of 192.35.

Figure 4 below shows the Risk Event Scoring sheet for the substation transformer failure Risk Event populated with the applicable Risk Score.

Figure 4: Top Risk Event Scoring Sheet Populated with Risk Score

Risk Event:	**Substation Transformer Failure**		**Risk Plot Key:**	**A**
Reasonable Worst Case:	Substation transformer fails, releasing all oil in the transformer, resulting in a prolonged outage to all customers that requires the transformer to be replaced.			
Controls:				
Risk Scoring				
Frequency Score	**Impact Scores**			
5	**Safety**	4		
	Environmental	4		
	Compliance	4		
Frequency Factor	**Reliability**	5		
1	**Trust**	5		
	Financial	4		
Total Risk Score:	192.35			
Additional Mitigations Considered:				

1 **Q. Please describe Step 4 (mitigation plan development & documentation) of**
2 **PacifiCorp's six-step process.**

3 A. PacifiCorp documented its top 10 Risk Events using the Risk Event scoring sheets
4 shown in Figures 3, 4, and 5 and Exhibit PAC/1002. The Risk Event scoring sheets
5 include the following information:

6 • Risk Event
7 • Risk Plot Key
8 • Reasonable Worst Case
9 • Controls
10 • Risk Scoring

- Frequency Score
- Impact Scores
- Total Risk Score
- Additional Mitigations Considered

PacifiCorp developed mitigation plans for Risk Events with the highest Risk Scores. These plans were developed by identifying existing controls in place and considering what additional mitigation measures could be taken to reduce or eliminate inherent risk (*i.e.*, the level of risk that exists without risk controls or mitigations) and residual risk (*i.e*., the risk remaining after current controls) so that only planned risk (*i.e*., the risk expected to remain after planned mitigations are implemented) remains.

For the substation transformer failure Risk Event, PacifiCorp's Risk Event with the highest Risk Score, controls and mitigation plans are documented in the scoring sheet as shown in Figure 5 below:

Figure 5: Top Risk Event Scoring Sheet Populated with Controls and Mitigations

Risk Event:	**Substation Transformer Failure**		**Risk Plot Key:**	**A**
Reasonable Worst Case:	Substation transformer fails, releasing all oil in the transformer, resulting in a prolonged outage to all customers that requires the transformer to be replaced.			
Controls:	• Preventive maintenance monitoring of the condition of transformers. • Install and maintain spill prevention devices. • Purchase spare transformers.			
Risk Scoring				
Frequency Score	**Impact Scores**			
5	**Safety**	4		
	Environmental	4		
	Compliance	4		
Frequency Factor	**Reliability**	5		
1	**Trust**	5		
	Financial	4		
Total Risk Score:	192.35			
Additional Mitigations Considered:	• Develop emergency generator deployment contract with service suppliers. • Increase number of mobile substations to minimize outage times. • Add redundant transformers at stations.			

Q. Please describe Step 5 (risk-informed investment decisions and risk mitigation implementation) of PacifiCorp's six-step process.

A. If the results of Steps 1 through 4 indicate that investments in any mitigation measures may be warranted, PacifiCorp will evaluate the cost of implementing a mitigation measure against the expected risk reduction. The results of that analysis would be weighed based on PacifiCorp's top Risk Events as determined in Steps 1 through 4.

Q. Please describe Step 6 (risk monitoring) of PacifiCorp's six-step process.

A. PacifiCorp monitors its risk mitigation measures using a number of tools within the business for planning and executing specific risk controls included in its annual

transmission and distribution capital and maintenance plans. In addition, PacifiCorp conducts periodic reviews to monitor the effectiveness of those measures. A number of different business units within PacifiCorp are responsible for monitoring risk controls for their respective transmission and distribution operations. These include, but are not limited to asset risk and strategy, asset maintenance planning, reliability performance, operational performance management, work planning, investment delivery, field inspections, operational performance management, safety, and environmental business units.

Q. Please discuss how PacifiCorp's Risk Assessment Process will evolve as new information becomes available.

A. The risk assessment process is an iterative process. As new information becomes available, it is evaluated in the context of risk and PacifiCorp incorporates this information into the six step process. For example, wildfire risk, which recently resulted in the state-wide fire threat map and fire safety regulations adopted in Rulemaking (R.) 15-05-006, will be integrated into PacifiCorp's six-step process and inform the future risk assessment processes.

V. PACIFICORP'S TOP RISK EVENTS AND INVESTMENT DECISIONS FOR THE GENERAL RATE CASE

Q. What are PacifiCorp's top 10 Risk Events identified using the RET?

A. The 10 top Risk Events that PacifiCorp identified using RET, *i.e.*, those with the highest Risk Scores, including the following events:

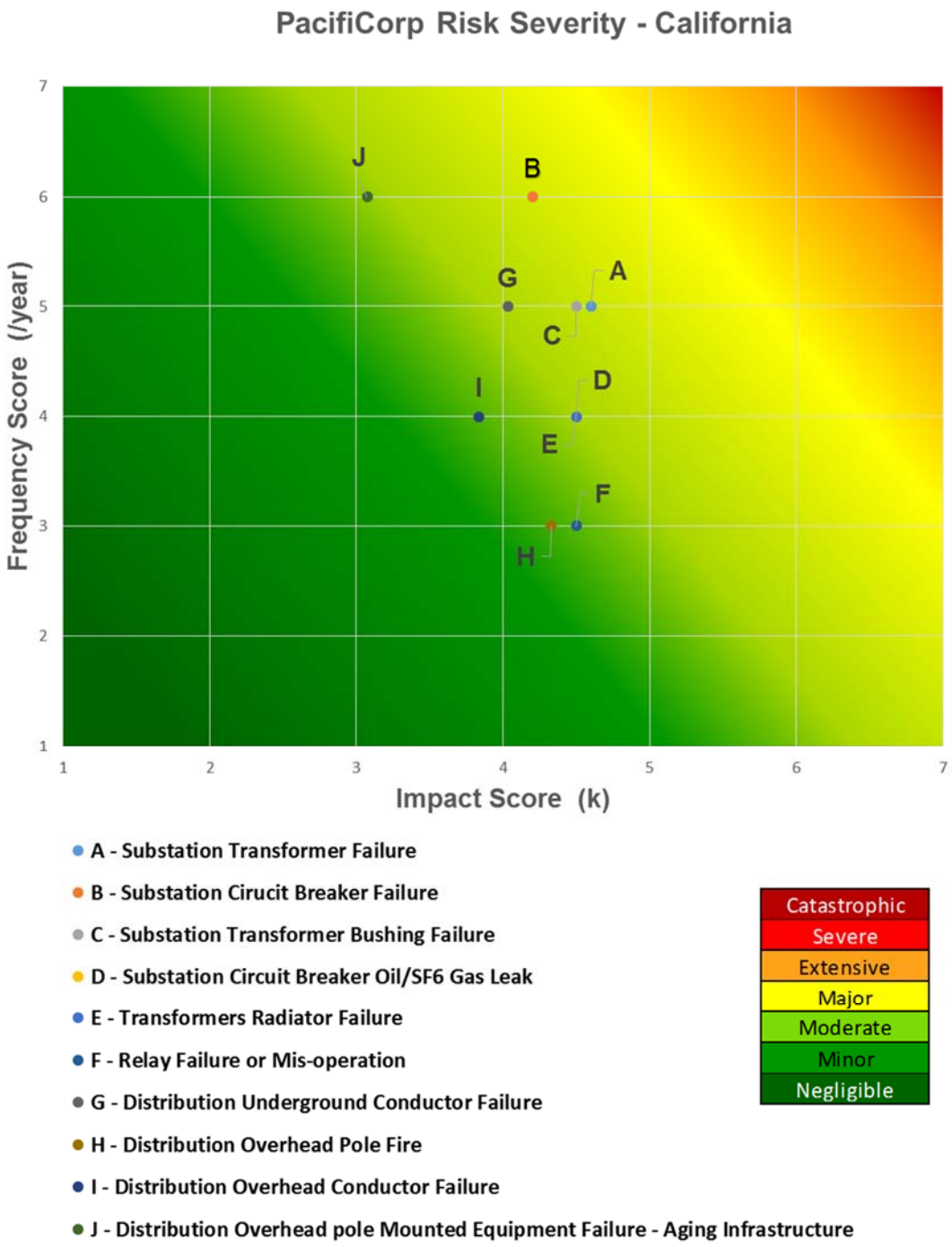
1. Substation Transformer Failure
2. Substation Circuit Breaker Failure
3. Substation Transformer Bushing Failure

4. Substation Circuit Breaker Oil/SF6 Gas Leak
5. Transformer Radiator Failure
6. Relay Failure or Mis-operation
7. Distribution Underground Conductor Failure
8. Distribution Overhead Pole Failure
9. Distribution Overhead Conductor Failure
10. Distribution Overhead Pole Mounted Equipment Failure – Aging Infrastructure

The Risk Event scoring sheets for these Risk Events are attached as Exhibit PAC/1002.

In addition to the scoring sheets in Exhibit PAC/1002, PacifiCorp developed a 7x7 heat map to portray the frequency and impact scores of the 10 top Risk Events, as shown in Figure 6 below. Each Risk Event is identified by the risk plot key (Risk Plot Key) "letter" that represents the intersecting point on the heat map. The top Risk Event is identified as Risk Plot Key "A" and proceeds in descending order to the tenth top risk that is identified as Risk Plot Key "J". The y-axis on the heat map represents the frequency score, while the x-axis represents the weighted impact score. The upper right hand corner of the heat map represents the highest risks and the lower left hand corner represents the lowest risks.

Figure 6: Heat Map for PacifiCorp's Top 10 Risk Events



Q. What controls does PacifiCorp currently have in place to mitigate the impacts of its top scoring Risk Event?

A. The primary controls in place to mitigate the impact of a substation transformer failure that could result in all its oil being released are the inspection and maintenance programs that include preventative maintenance monitoring of transformer conditions, the Spill Prevention, Control and Countermeasure (SPCC) program that assess adequacy of SPCC plans and installs and maintains preventative systems and devices, and purchase of pre-capitalized spare transformers.

Q. Are additional mitigation measures going to be implemented to further mitigate the risk of substation transformer failures and their associated impacts?

A. No, the controls in place are considered to be sufficient at this time.

Q. What additional mitigation measures were considered should the current control measures prove to be insufficient?

A. The additional mitigation measures that were considered are as follows:

- Develop emergency generator deployment contract with service suppliers;
- Increase the number of mobile substations to minimize outage times; and
- Add redundant transformers at substations.

Q. What are some of the areas PacifiCorp identified through its risk-based investment decision making process requiring further improvement?

A. By implementing the new risk-based investment decision making process required by D. 14-12-025, PacifiCorp has identified the need to make improvements related to this process that will enable it to more effectively and efficiently identify top risks, monitor RCMs, detect changing conditions that would trigger re-evaluation of risks,

and measure the cost effectiveness of its RCMs to control or reduce the impact of top risks.

Q. Is PacifiCorp proposing additional revenue requirements in its GRC based on the outcome of its risk-based investment decision making process?

A. No. Based on the outcome of its risk-based investment decision making process, completed in 2017, PacifiCorp is not proposing additional revenue requirements in its GRC. Current controls in place include, but are not limited to, program funding to perform transmission and distribution inspections and maintenance, pole test and treat, vegetation management, asset replacements, planned capital construction, and targeted reliability improvements. The top risks will be monitored and additional mitigation measures will be implemented should conditions change.

VI. ADDITIONAL RISK MITIGATION ACTIVITIES

Q. Other than as an outcome of the risk-based investment decision making process described in this testimony, is PacifiCorp undertaking any programs designed to increase safety and minimize risks within its system?

A. Yes. First, PacifiCorp continues its legacy programs that increase safety and minimize risks within its system. For example, PacifiCorp has well-established inspection, maintenance, and vegetation management programs, which in addition to particular operational practices, serve to maximize safety. Many of these programs are required by general orders or are otherwise dictated by accepted good practice.

Second, in addition to these legacy programs, PacifiCorp has implemented new operational practices as part of its California Drought Mitigation Plan, in effect since 2014. The details of this program are discussed below.

Third, PacifiCorp intends to implement new mitigation plans, the costs of which are included in this application, for its California Fire Prevention Program addressing implementation of regulation changes and Reliability-Based Vegetation Management/Reduced Risk Programs.

Q. Please describe PacifiCorp's California Drought Mitigation Plan.

A. PacifiCorp's California Drought Mitigation Plan was implemented in response to direction received from the California Public Utilities Commission's (Commission) then-Acting Director of the Safety Enforcement Division (SED), in a letter dated February 18, 2014, to take all practicable measures necessary to reduce the risk of fires. The Commission was responding to Governor Edmund G. Brown Jr.'s proclaimed State of Emergency on January 17, 2014, directing state officials to take all necessary actions to prepare for conditions that could result from the drought. PacifiCorp developed and implemented a drought mitigation plan in accordance with SED's instructions, and provided quarterly reports on progress. On April 7, 2017, after record-setting precipitation levels, Governor Brown ended the drought declaration on the portion of California in which PacifiCorp operates. As a result, PacifiCorp provided a final quarterly update on its drought-related fire hazard mitigation measures on May 1, 2017.

PacifiCorp's drought-related fire hazard mitigation actions included incremental safety patrols on transmission lines not scheduled in the annual inspection plan, re-inspected existing targeted conditions based upon Geographic Information System (GIS) overlay of drought-ridden areas and existing Facility Point Inspection (FPI) conditions and accelerated repairs if necessary, performed additional

(off cycle) inspections of distribution facilities in high hazard areas, accelerated vegetation management for distribution and transmission circuits in potentially elevated areas of concern, evaluated the possibility of temporary or permanent relay upgrades for fault detection purposes, and outfitted field resources in areas of elevated fire threat with additional means for fire protection.

Q. Please describe PacifiCorp's new California Fire Prevention Program addressing implementation of regulation changes.

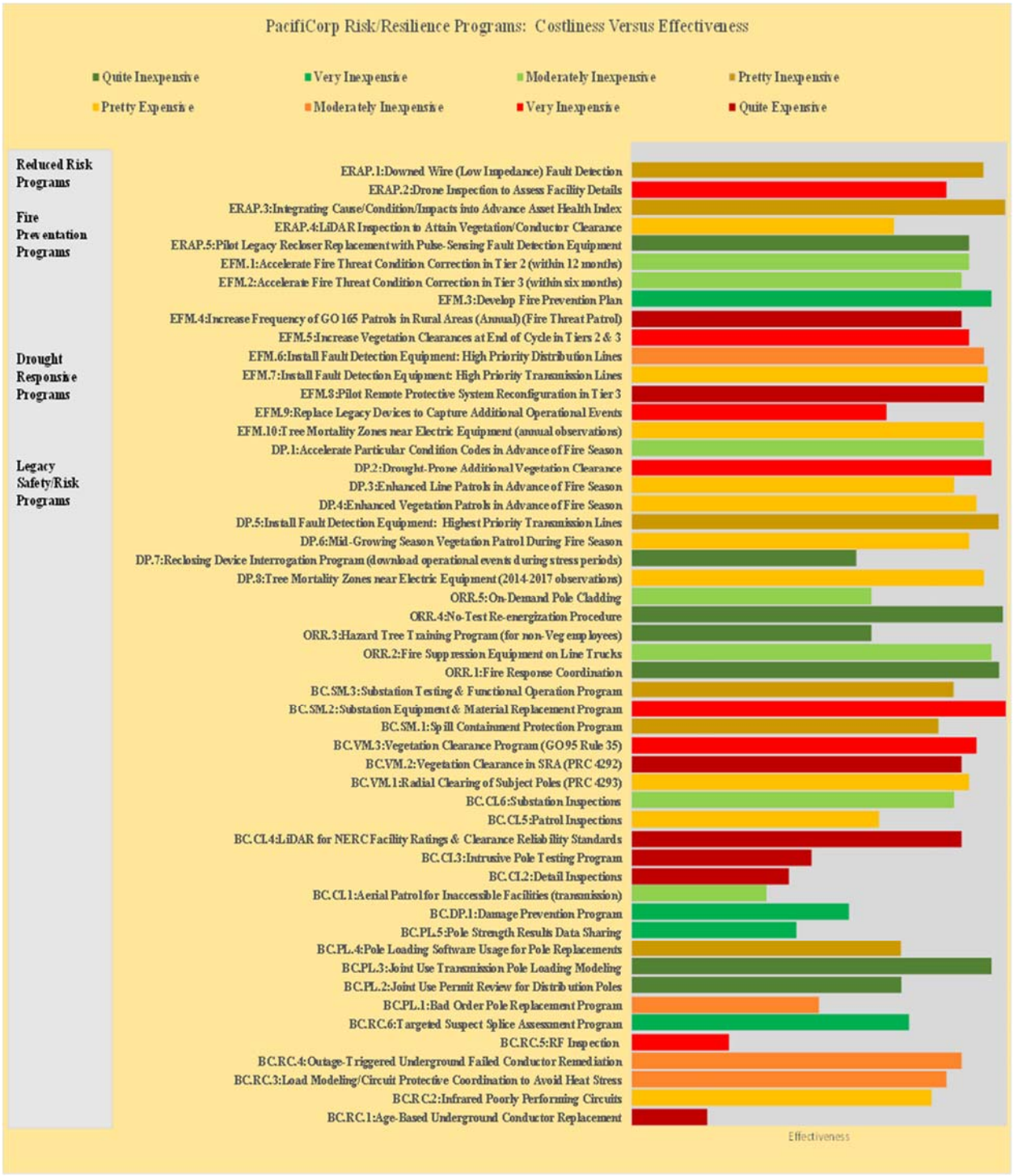
A. PacifiCorp's new California Fire Prevention Program is being implemented to comply with the modified rules adopted by the Commission in response to D.17-12-024, focused on enhancing fire safety of overhead equipment. Among other things, the Fire Prevention Program includes PacifiCorp's strategies and programs to reduce the risk of fire from its electrical lines and equipment. It specifically addresses steps required to gain compliance with newly adopted rules which are intended to mitigate the risk of wildland fires. Some of these rule changes include increasing vegetation clearance requirements at the end of vegetation cycles within Fire Threat Districts, more frequent patrol of overhead equipment in rural California, more rapid correction of inspection conditions that may be considered to be fire threats and the development of a fire safety plan.

Q. Can you provide a graphic summary depicting the costs versus benefits of the legacy and new safety/risk mitigation programs?

A. Yes. The four categories of risk mitigation programs described above are depicted in Figure 7 below. The effectiveness of the program in enhancing safety and minimizing risk is measured by the length of the bar, while the costliness of the

program is identified by the color of the bar. Programs which are high cost and offer limited safety/risk benefit require additional review, while those which are low cost and high safety/risk benefit advance rapidly.

Figure 7: Four Categories of Risk Mitigation Programs



Q. Are there other ways to show the risk mitigation value versus the costs of these programs?

A. Yes. Shown below in Figure 8 is a scatter chart wherein the graphic provides another perspective enabling identification of programs and the order of costs versus safety/risk effectiveness provided. Each program is shown as a dot, and based on the placement illustrate effectiveness versus cost. Those dots which fall toward the right side of the chart that are also toward the x axis yield little benefit for their cost, while those which are distant from the x axis offer substantial benefit and warrant the program cost.

Figure 8: Scatter Chart Depicting Risk Mitigation Value Versus Cost of Programs

Q. Does this conclude your direct testimony?

A. Yes.