Southern California Edison
Risk Assessment and Mitigation Phase Proceeding
I.18-11-006
Safety and Enforcement Division Briefing

Dan Bout, PhD.
Dave Ashuckian, PE
Martin Kurtovich PE
Wendy Al-Mukdad, PE

May 29, 2019
Los Angeles, California
Workshop Agenda

8:30 – 8:45 am Introduction and Background,  
Dan Bout, Program Manager, Cyber Security Branch

8:45 – 10:00 am California’s Utility Safety Framework  
Dave Ashuckian PE, Manager, Utility Risk Assessment  
Martin Kurtovich PE, Senior Utilities Engineer

10:00 – 10:15 am BREAK

10:15 am – 10:45 am Assessment of SCE RAMP Report and Addendum  
Martin Kurtovich PE

11:00 – 11:45 am Analysis of SCE Risk Modeling for Wildfire Safety and Contact with Energized Equipment  
Wendy Al-Mukdad PE, Senior Utilities Engineer

11:45 am – 12:30 pm Public Comments
Risk Management 101
Part II: Risk Management in Southern California

SCE Stats
- 50,000 square miles
- 4.9 million customers
- 76 billion kWh/year of electric service
- Over 400 cities & communities with a collective population of over 13 million (larger in population than 45 states)
- 1,440,000 wood poles
- 50,000 cond-miles of UG primary conductor
- 106,000 cond-miles of OH primary conductor
- 4600 distribution circuits
- 715,000 distribution transformers
A Short History of California Utility Safety

• 2014 – 2019
  - Adoption of CPUC Safety Policy
  - Development of New Risk Evaluation Framework
    o Development of Safety Assessment Modeling Protocols (SMAP)
    o Initiation of Risk Assessment and Mitigation Phase (RAMP) Process

Utility Risk Assessment and Mitigation Phase Report – utility should show how it will use expertise and budget to improve its public safety record

• 2019 forward
  ➢ SB 901 Utility Safety Framework
  ➢ Governor’s Executive Order on Wildfire Policy
  ➢ CPUC Climate Adaptation Proceeding
A Short History of California Utility Safety

Safety Mandates

2014-2018
CPUC Safety Policy

CPUC Safety Guiding Principles include:

1. The CPUC is accountable for safety
2. The CPUC must continually assess and reduce the safety risk
3. The CPUC must hold utilities accountable on safety
4. Set Safety Expectations for Utilities
5. Oversee and Ensure Expectations are Met
6. Promote Safety Culture
7. Continuous Improvement Process
Establishes a Management Framework with –

Specific Objectives:
- Minimize risk
- Highest level of safety, reliability, and resiliency

Specific Requirements:

• Safety Performance Metrics
• Risk Assessments
• Safety Mitigation Strategies and Programs
• Restoration and Recovery Plans
• Independent Evaluations
• Community Outreach and Partnering

**SB 901 Utility Safety Framework**

Objective: Each electrical corporation shall construct, maintain and operate its electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire posed by those electrical lines and equipment. with the highest level of safety, reliability and resiliency (Note does not distinguish between distribution and transmission, addresses all lines)

Components:

- Identification of roles and responsibilities
- Program objectives, short and long-term
- Safety Performance Metrics
- Identify, describes and prioritizes all risks and associated drivers for all equipment and facilities, particular risks and drives associated with topographic and climatological risk factors.
- Methodology for identifying enterprise wide safety risk and wildfire-related risk
- Reassessment of high fire threat areas, Identification of any geographic area in utility’s service territory than is currently identified in fire threat map, where Commission should expand the high fire threat district
- Description of safety mitigation strategies and programs, should include dynamic climate change risks
- De-energization protocols
- Veg Management Plans
- Inspection Plans
- Includes disaster and emergency preparedness plans
- Restoration and Recovery Plans
- Community outreach and public awareness program
- Plan for how utility will monitor and audit implementation, inspections and identify plan deficiencies
- Penalties for failure to implement
- Independent evaluation of safety culture every five years
- Independent evaluation of implementation of mitigations and inspections
Building A New Risk Evaluation Paradigm

S-MAP (on going)

Safety Model Assessment Proceeding
Development of utility risk-based decision making model (A.15-05-002 et al) then ongoing reporting, verification, and evaluation

RAMP (3 year cycle)

IOUs use approved risk analytics including adopted modeling protocols to –
1) Identify and determine prioritize risks,
2) estimate risk impacts
3) propose mitigation programs, plans and budgets

GRC proceeding (3 year cycle)

IOUs seek funding. Intervenors use information from RAMP to review IOU proposals. CPUC determines final revenues.

Each S-MAP, RAMP, and GRC proceeding generally have different assigned judges. There is no Decision made in the RAMP proceeding. Any staff recommendations are informally rolled into the GRC proceeding.
Building A New Risk Evaluation Paradigm

Figure 1: S-MAP - RAMP - RSAR - Safety Performance Metrics Cycle

- IOUs use approved S-MAP model to determine and prioritize risks, propose mitigations and estimate their expected costs.
- Intervenors use information from RAMP to review IOU proposals. CPUC determines final revenues.
- S-MAP

- Proceeding to review utilities' risk-based decision-making model (A.15-05-002).

- GRC proceeding

- Safety Performance Metrics Report
  - SED Staff Review
  - Party Comment
  - ED Staff Review

- Risk Spending Accountability Report

- Interveners and Staff review IOU reports and consider in subsequent GRCs

- IOUs base Safety Metrics report and RSAR on approved RAMP
S-MAP Settlement Agreement (SA) Established Risk Modeling and Assessment Protocols for California

- Establishes uniform risk modeling requirements across utilities
- Requires mathematically correct and logically sound methodologies
- Requires transparency and sufficient data for third parties to assess utility judgments
- SCE incorporated many features of this Agreement as drafted in May. Includes Multi Attribute Risk Score (MARS) risk modeling.
Required Protocol for RAMP
First 10 Steps

The utility should show how it will use its expertise and budget to improve its safety record. To do so, each utility should:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>Identify its top risks</td>
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<td>2.</td>
<td>Describe the controls or mitigations currently in place</td>
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<td>3.</td>
<td>Present its plan for improving the mitigation of each risk</td>
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<td>4.</td>
<td>Present two alternative mitigation plans that it considered</td>
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<td>5.</td>
<td>Present an early stage “risk mitigated to cost ratio” or related optimization</td>
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<td>6.</td>
<td>Identify lessons learned in the current round to apply in future rounds</td>
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<td>7.</td>
<td>Move toward probabilistic calculations to the maximum extent possible</td>
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<td>8.</td>
<td>For those business areas with less data, improve the collection of data and provide a timeframe for improvement</td>
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<td>9.</td>
<td>Describe the company’s safety culture, executive engagement, and compensation policies</td>
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<td>10.</td>
<td>Respond to immediate or short-term crises outside of the RAMP and GRC process</td>
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</table>
"A New Risk Evaluation Paradigm"

- GRC Proceedings
- CPUC Safety Policy implementation
- Post Settlement Agreement
- Risk Assessment Mitigation Phase (RAMP)
- Safety Model Assessment Proceeding (S-MAP)
- Climate Adaptation Proceeding
- SCE RAMP & CPUC Review
- SB 901/EO N-05-019 implementation
Risk Matrix

Bowtie Risk Model, Risk Matrix, Risk Modeling

Risk Model, Monte Carlo, Probabilistic Estimates of Consequences

Risk Modeling


Bowtie Analysis
- Parsing of Risk
- Drivers/Threats
- Event
- Consequence/Impact
  1. Injuries
  2. Fatalities
  3. Utility Damages
  4. Reliability
Identification of Risks to Utility Assets and Operations
SCE’s Top Safety Risk

FERC – Federal Energy Regulatory Commission,
DWR – California Department of Water Resources
Identification of Risks to Utility Assets and Operations - SCE’s Top Safety Risks and Associated Multi Attribute Risk Score (MARS)

Results: Baseline MARS for the 9 Risks (Mean)¹

# of fatalities > # of injuries

[1] Modelled results reflect the annual average mean results over the 2018-2023 time period
[2] Note: Climate Change data inputs modelled for 99th percentile events, and as such, the results are not directly comparable
Identification of Risks to Utility Assets and Operations
SCE’s Top Safety Risk

Results: Baseline MARS for the 9 Risks (Tail-Average)¹

[Diagram showing MARS values for different risks]

The tail-average measures the average of the worst 10% of results from the risk simulation—it attempts to represent a reasonable extreme event.

# of fatalities > # of injuries

[1] Modelled results reflect the annual average tail-average results over the 2018-2023 time period
Ranking SCE Safety Risks Ranking


Notes:
- Tier 3, Challenges to Protection Layers; includes near miss incidents
- Tier 4, Operating Discipline & Management System Performance Indicators; includes proactive evaluations and continuous improvement efforts, such as operational discipline surveys [8], management reviews [7], process safety management system audits [9], and field observations (e.g., behavior-based observations).
Recommended Risk Ranking Tiers


Tier 1
Catastrophic or Cascading Failure Risks

Tier 2
Operational Risks

Tier 3
Federally Regulated Risks

Tier 4
Climate Resilience

Notes:
- Tier 3, Challenges to Protection Layers; includes near miss incidents
- Tier 4, Operating Discipline & Management System Performance Indicators; includes proactive evaluations and continuous improvement efforts, such as operational discipline surveys [8], management reviews [7], process safety management system audits [9], and field observations (e.g., behavior-based observations).
Recommended Risk Rankings

Tier 1 Risks

- Transmission Wildfire Risk

- Flooding/Mudslides

Tier 2 Risks

- Seismic Risks to Generation, Distribution, Transmission Assets

Tier 3 Risks

- Nuclear Decommissioning, Storage and Transportation
Assessment of Proposed Mitigation Plans for Selected Priority Risks

Review of Two Mitigation Plans

• Contact with Energized Equipment
• Wildfire Safety
Assessment of Proposed Mitigation Plans for Selected Priority Risks

(Public) Contact with Energized Equipment
### SCE Risk Analytics – Number of Injuries by Year

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<th>cause/year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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## SCE Risk Analytics – Number of Fatalities by Year

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<td>2</td>
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<td>12</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>37</td>
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</table>
Risk Drivers – Contact with Energized Equipment  2014-2018

Major Causes of Injuries
• Maintenance workers
• Digging accidents – contact with underground equipment
• Vandalism of utility assets

Major Causes of Fatalities
• Aircraft accidents

SCE Proposed Mitigation – Contact with Energized Equipment
Proposed Capital Budget, Risk Score Reduction and Risk Spend Efficiency
2018 - 2023

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Implementation Period</th>
<th>Cost Estimates (SM)</th>
<th>Expected Value (MARS)</th>
<th>Tail Average (MARS)</th>
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<tr>
<td></td>
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<td>Start Year</td>
<td>End Year</td>
<td>Capital</td>
<td>O&amp;M</td>
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<td>C2</td>
<td>Public Outreach</td>
<td>2018</td>
<td>2023</td>
<td>x</td>
<td>$3</td>
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<td>M4</td>
<td>Infrared Inspection</td>
<td>2018</td>
<td>2023</td>
<td>$3</td>
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<td>Wildfire Covered Conductor Program</td>
<td>2018</td>
<td>2023</td>
<td>$1,161</td>
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<td>TOTAL</td>
<td></td>
<td>2018</td>
<td>2023</td>
<td>$1,910</td>
<td>$36</td>
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</table>
Questions:
1. Why invest almost $750 million on mitigations when safety performance has improved over last five years? *SCE RAMP Report did not explain reason for improved metrics*

2. Why are certain risk drivers, e.g. physical security and underground excavation ignored in proposed plan?

3. Why is the wildfire covered conductor program included under this risk? *BTW, it has highest cost, lowest RSE, and seems to have marginal benefit, gets only 10% risk reduction.*
Comments on SCE RAMP Report
Contact with Energized Equipment Mitigation Program

• RAMP Report does not provide sufficient justification to support funding proposed mitigation plan.

• Proposed mitigation plan has no strategy or rationale for heavy investment in covered conductors. Does not address risk drivers.

• Risk modeling results does not agree with historical data.
Assessment of Proposed Mitigation Plans for Selected Priority Risks

Wildfire Safety
Wildfire Mitigation Requirements

Pursuant to Public Utilities Code Section 8386, R.18-10-007 requires the electric utilities to file annual wildfire mitigation plans that include:

- **A description of performance metrics** to evaluate the mitigation plan’s and individual measure performance.

- **A description of how risk analytics and metrics were utilized** to evaluate past performance and utility planning. The plans must include a discussion of how, “the application of previously identified metrics to previous plan performances” has informed each plans.

Public Utilities Code Section 8386(b)(4) (5); See also Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018),” October 25, 2018, in R.18 10-007.
<table>
<thead>
<tr>
<th>Activity/Program</th>
<th>Capital Cost 2019 ($M)</th>
<th>O&amp;M Cost 2019 ($M)</th>
<th>RSE</th>
<th>MRR</th>
<th>RSE</th>
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<td>AT-2 GSRP Wildfire Mitigation Program Study</td>
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<td>IN-1 Distribution Enhanced Overhead Inspections and Remediation in HFRA</td>
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<td>144.9</td>
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<td>25</td>
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<td>IN-3 Ouality Oversight/Quality Control of EOI</td>
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<tr>
<td>IN-5 Infrared inspection, corona scanning and high definition imagery of energized overhead distribution facilities and equipment</td>
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<td>IN-6 AP - Shim &amp; top of overhead distribution facilities and management</td>
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<td>OP-2 Wildfire Infrastructure Protection Team Additional Staffing</td>
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<td>Enhanced Situational Awareness</td>
<td>2018</td>
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<td>SA-5 Develop Asset Reliability and Risk Analytics Capability</td>
<td>0.5</td>
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<td>SH-1 Covered Conductor</td>
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<td>2018</td>
<td>2023</td>
<td>$1,161</td>
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<td>SH-2 Evaluation of Undergrounding in HFRA</td>
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<td>SH-3 Composite Poles and Crossarms</td>
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<td>SH-7 Circuit Breaker Fast Curve Breaker</td>
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<td>VM-2 Expanded Pole Brushing</td>
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<td>M2 Remote-Controlled Automatic Reclosers and I</td>
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<td>2019</td>
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<td>VM-4 DRI quarterly inspections and removals</td>
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<td>VM-5 LIDAR Inspections of Transmission facilities and equipment</td>
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<td>WMP Color Legend</td>
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**TOTALS**

- **44 mitigations**
- **10 mitigations**
### Wildfire Mitigation Plan (2019) vs. RAMP Wildfire Mitigations (2018-2023)

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>WMP Color Legend</th>
<th>no. of tasks</th>
<th>Capital ($M)</th>
<th>O&amp;M ($M)</th>
<th>no. of tasks</th>
<th>Capital ($M)</th>
<th>O&amp;M ($M)</th>
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<tr>
<td>Design &amp; Construction (D&amp;C)</td>
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<td>$0.0</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>44</strong></td>
<td><strong>$812.5</strong></td>
<td><strong>$347.3</strong></td>
<td><strong>10</strong></td>
<td><strong>$1,608.0</strong></td>
<td><strong>$446.0</strong></td>
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- **WMP CapEx ≠ RAMP Proposed CapEx**
- **WMP > $800 M; = $4.0 B over five years?**
- **RAMP > $1.6 B over five years**

- **WMP O&M Ex < RAMP Proposed?**
- **WMP > $1.5 B over five years?**
- **RAMP > $450 M over five years**

- **64% of WMP CapEx is inspection and maintenance**
- **94% of RAMP Proposed is design and construction**

- **No proposed spending for response and recovery**
## Comparison of WMPs

<table>
<thead>
<tr>
<th>Type of Mitigation</th>
<th>SDG&amp;E</th>
<th></th>
<th></th>
<th>PG&amp;E</th>
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<th>SCE</th>
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<tbody>
<tr>
<td></td>
<td>no. of tasks</td>
<td>% of Total Budget</td>
<td>no. of tasks</td>
<td>% of Total Budget</td>
<td>no. of tasks</td>
<td>% of Total Budget</td>
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<tr>
<td>Design &amp; Construction (D&amp;C)</td>
<td>13</td>
<td>23</td>
<td>9</td>
<td>21</td>
<td>15</td>
<td>34</td>
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<td>Inspection and Maintenance (I&amp;M)</td>
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<td>11</td>
<td>26</td>
<td>22</td>
<td>50</td>
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<td>Operational Practices (OP)</td>
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<td>12</td>
<td>12</td>
<td>28</td>
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<td>5</td>
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<td>Situational/Conditional Awareness (SCA)</td>
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<td>12</td>
<td>8</td>
<td>19</td>
<td>5</td>
<td>11</td>
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<tr>
<td>Response and Recovery (R&amp;R)</td>
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<td>14</td>
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<td>7</td>
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<td>Total # of Mitigation Measures</td>
<td>57</td>
<td>43</td>
<td>44</td>
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</table>
In Closing . . .

• **SCE RAMP Report advances California’s utility risk evaluation framework** by demonstrating value of risk modeling protocols, risk scoring to evaluate risks, and proposed mitigation plans and budgets across a utility’s operations.

• **With this framework, Safety and Enforcement Division ranked utility risks** to reflect public safety needs in Southern California.

• **RAMP evaluation provides valuable input that will inform SCE’s upcoming general rate case filing.** Evaluation improves likelihood that filing is compliant with recent changes to the California Public Utilities Code.
Upcoming CPUC Hearings related to SCE

06/24/19  
9:30 a.m. to  
4:00 p.m.  
ALJ Houck  
Comr Picker

A.18-03-009 (EH) - Joint Application of Southern California Edison Company (U338E) and San Diego Gas & Electric Company (U902E) for the 2018 Nuclear Decommissioning Cost Triennial Proceeding.  
Commission Courtroom, State Office Building, 505 Van Ness Avenue, San Francisco, CA (and June 25th)

07/01/19  
10:00 a.m.  
ALJ Haga  
Comr Picker

A.18-09-002 (EH) – Application of Southern California Edison Company (U338E) for Approval of Its Grid Safety and Resiliency Program.  
Commission Courtroom, State Office Building, 505 Van Ness Avenue, San Francisco, CA (until July 3rd and July 8th – 10th)