EPIC 1.08 – Distribution System Safety and Reliability through New Data Analytics Techniques

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STAR = System Tool for Asset Risk

The STAR proof of concept demonstrates a more effective way to calculate and visualize Asset Risk Scores for electric assets and systems.

Asset and System Risk Scores can be used to improve Public Safety and Quality of Service, and better inform Risk Management, Planning, and Operational practices.
### Addressing Business Needs

#### Need

- Data analysis and automated integration to improve data cleanliness and reduce time spent on manual data collection
- Establish/ refine risk algorithms across all asset classes utilizing probability and severity of occurrence
- Refreshed and most current state of assets
- Risk scores at individual asset and system level provide additional risk perspective and understanding

#### STAR Resolution

- Develop an enterprise application that calculates and graphically displays risk scores to facilitate decision making using a consistent approach (considering probability and severity of occurrence) for both assets and systems
- Support the development of proactive and efficient asset management strategies
- Support integrated planning activities and rate case filings to develop investment plans based on prioritized risks
- Provide regulatory transparency on how PG&E considers risk in the development of business strategy and spending decisions
**How the Tool Works**

**Data Integration**
- Disparate data sources are integrated

**Analytics**
- System runs asset risk algorithms
- Risk calculation results are displayed through user interface

**Visualization**
- Users can track trends, identify high-risk areas, and make risk-informed decisions

**Risk-Informed Decisions**

**Primary Users**
- Asset strategists
- Risk analysts
- Investment planning
- Risk-Informed Budget Allocation team (RIBA)

**Secondary Users**
- System operators

**Disparate data sources are integrated**

**System runs asset risk algorithms**

**Risk calculation results are displayed through user interface**

**Users can track trends, identify high-risk areas, and make risk-informed decisions**

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**Secondary Users**
- System operators
Proof-of-Concept Scope

Functionality

- Develop algorithms to calculate asset and system risk scores
- Geospatially display risk information
- Trace risks to assets from any point in system

Geographic Scale

- Assets located in the California Central Valley Area

Data Sources

- Asset Attribute Data
- Geospatial Information
- Operational Data
- Other (e.g. excel spreadsheets)

Assets Assessed

- Distribution wood poles: 590,000
- Distribution overhead conductors: 425,000
- Distribution breakers: 2,000
- Distribution substation transformers: 300
Total Risk Score

\[ RS_{Total} = RS_{Safety} + RS_{Environmental} + RS_{Reliability} \]

- Safety Risk Score
  - Impact Score – Safety (Algorithm)
  - Frequency Score – Safety (Algorithm)
- Environmental Risk Score
  - Impact Score – Environmental (Algorithm)
  - Frequency Score – Environmental (Algorithm)
- Reliability Risk Score
  - Impact Score – Reliability (Algorithm)
  - Frequency Score – Reliability (Algorithm)
STAR Proof of Concept was evaluated during Sprint Demos and Testing using three criteria:
Software Quality, Implementation Ability, and Product Usability.
<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Software Quality</th>
<th>Implementation Ability</th>
<th>Product Usability</th>
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<tbody>
<tr>
<td><strong>Software Quality</strong></td>
<td>Visual risk scores on the map and in tables</td>
<td>Requirements and User Stories established online that allowed progress, feedback, and bugs to be tracked</td>
<td>Navigation too complex (excessive “mouse clicks”)</td>
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<td>Asset information available to the user</td>
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<td>Thorough and useful product documentation for “out-of-the-box” functionality</td>
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<td>Application integration with R programming language enables asset strategists</td>
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<td>Ability to integrate several source datasets</td>
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<td>User performance issues related to table querying/sorting and application errors</td>
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<td>Lack of a system integrator resulted in some difficulty integrating disparate systems</td>
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<td>Creating electric system connectivity within the vendor application resulted in project delays</td>
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**Proof-of-Concept Benefits**

PG&E believes the POC demonstrated capabilities which evidence the business value of a production system.

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<tr>
<th>Market Landscape</th>
<th>Algorithm Development</th>
<th>Geospatial Risk Algorithms</th>
<th>System Data and Capabilities</th>
<th>Asset Strategy</th>
<th>Implementation Strategy</th>
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<tr>
<td>• Provided insight into vendor capabilities in the areas of data integration, analysis, and visualization</td>
<td>• Opened our eyes to how a production version of the application could provide a framework to further develop algorithms</td>
<td>• Learned how to incorporate advanced geospatial (population, wind, fire maps) information into risk calculations</td>
<td>• Generated awareness of the importance of data quality and relationships between disparate data systems</td>
<td>• Demonstrated the need for having a strong foothold in risk analysis methodologies and how they should be applied to asset and system risk scores</td>
<td>• Provided basis for developing an implementation strategy for a production system</td>
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<td>• Set the stage for continued engagement with the analytics, visualization, and situational intelligence market</td>
<td>• Identified the need to create failure models</td>
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<td>• Led to a better understanding of data systems and an informed data approach to establishing a production system</td>
<td>• Exposed personnel to technology that leverages data to calculate risk scores and how to use that information when developing spending portfolios</td>
<td>• Identified the necessary resources required (internally and externally) to stand up and manage an asset risk tool</td>
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<td>• Identified the required analytics skillset</td>
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<td>• Considered how a production version of the application can provide a framework to further develop asset risk algorithms</td>
<td>• Allowed PG&amp;E to determine if a production system would provide business value and what kind of staged approach would lead to the best results</td>
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STAR Future - Expected Benefits

Quality of Service
- Improve public safety by identifying and addressing higher risk assets
- Reduce unplanned outages and customer interruptions
- Improve reliability measures by proactively managing assets

Planning
- Replacement of equipment at non-premium costs due to replacing before failure
- Turn unplanned replacements into planned replacements
- Avoid unneeded replacements as a result of better information
- Increase in productivity due to accelerated analysis/conclusions and increase in transparency and confidence of data
- Gain hours or reallocation of hours to do better analysis
- Improve ability to scope projects and bundle work
- Improve risk informed Capex spending, planning and processes
- Alignment with existing risk based processes
- Define "effective age" of assets which supports more accurate prediction of future performance of assets and asset classes

Operations
- Enhance O&M condition based maintenance using risk information

Other
- Improvement in rate case showings through enhanced risk informed decision making
- Increased efficiency in preparing rate cases and responding to data requests
- Increased efficiency in preparing data for internal/external requests/audits/initiatives (risk requests may increase)
- Improve communication with stakeholders regarding assets and risks - community, regulatory, public
- Improve enterprise collaboration, apply best practices and governance
Appendix – STAR Screen Shots
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