Distribution Reliability Model

Optimizing budget for consistent and efficient electrical power delivery

Background

Background

Improving Reliability

PUD wanted to ensure spending will result in sustainable improvements to infrastructure.

Data-Driven Spending

Effects of budget were estimated by stakeholders without any real mathematical support.

System Modelling

Complex inputs and interactions make resource allocation difficult.

Data and Relationships

Historic Outages and Restoration

Weibull Asset Failure Curves

Transmission Asset Registry and Installations

Vegetation Spending and Outage Reduction Regression

Animal Populations and Infrastructure Installations

Independent Weather Controls

Architecture

Simulations in AnyLogic

Single Runs

Get single possible result from user-provided inputs.

Monte Carlo

Specific experiment to get realistic upper and lower bounds for reliability changes based on inputs.

Optimization

Find realistic resource allocation scenarios to achieve desired reliability metric.

AnyLogic Cloud API

AnyLogic Cloud

User requests experiment from AnyLogic. Simulations run in cloud and are fetched via API.

Backend

Experiment control handled via backend. Once run, data is stored for easy and custom comparisons.

Frontend

Users can easily create and compare experiments. Custom frontend allows for new features and fine-tuned control.

Web Application

Granular Input Control

Custom frontend allows for more control of inputs. Advantageous for end user experience and smoother experiment creation.

Unique Outputs and Data Visualization

New outputs and data visualization are possible. Users can toggle between various input types. GIS incorporation in beta testing.

New Experiment Types

Custom stack allows for new experiments. Advanced regression, experiment combinations, and machine learning enabled.

End Product

New Experiment

- District Simulation +
- Hazard Spotlight +
- Parameter Variation +

Run Experiment

Cancel

Clear Inputs

Inputs

Parameter Variation Focus

Please select a hazard class to spotlight.

Chelan County PUD
DISTRIBUTION RELIABILITY TOOL

HOME | NEW EXPERIMENT | EXPERIMENT HISTORY & COMPARISON | HELP & DOCUMENTATION

New Experiment

- District Simulation +
- Hazard Spotlight +
- Parameter Variation +

Run Experiment

Cancel

Clear Inputs

Inputs

New District Simulation

SIMULATION CONTROLS	VALUE	DESCRIPTION
Experiment Name	New Simulation Experiment 26	Name of experiment to reference later when searching and comparing.
Total Proactive Budget Limit ($)	$10,000,000	Hard cap for the sum of proactive wildlife, cable, and vegetation management budgets.

labor considerations

District Simulation Experiment Setup

Purpose

The district simulation experiment allows users to quickly see what might occur with a certain set of inputs. It runs only once and contains many random outcomes, such as an underground cable randomly failing. This means that the results could greatly change from one simulation to another, with almost identical inputs.

While limited in use, it provides a very quick look at a possibility, and could allow a user to understand a "worst-case" or "best-case" scenario.

Experiment Inputs

This section details each group of inputs as well as a brief explanation of each.

Simulation Controls

- **Experiment Name:** For internal reference, a name of the experiment. This is used later in experiment history and viewing. Users can search for a past experiment by name.
- **Total Proactive Budget Limit ($):** A helper parameter that assists the user in not exceeding a budget.

District Changes

- **New Customers per Year:** Its only effect is to improve reliability metrics by increasing the denominator in SAIDI calculations. This number would be positive if the number of customers were to increase without infrastructure changing, perhaps via increased population density.
- **Chelan County Population Increase per Year (%):** This input is directly tied to squirrel and rodent populations, based on empirical evidence. The higher it is, the less effect new animal guards will have on reducing wildlife outages.

Labor Pool

Viewing Experiment Initial GIS Results

Timeframe: Annual | Seasonal

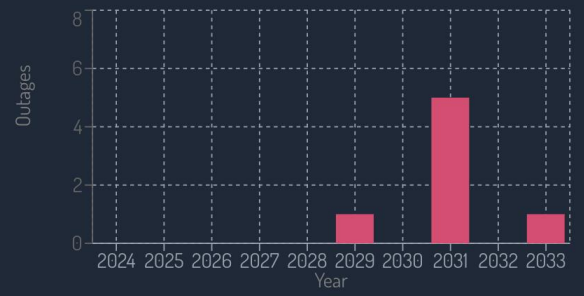
Output View: Standard | GIS

Reliability Metric: SAIDI

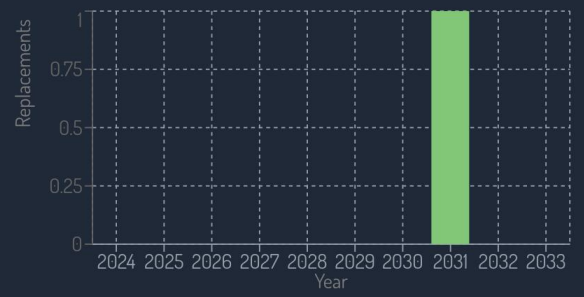
Summit Annual Results

Back to All

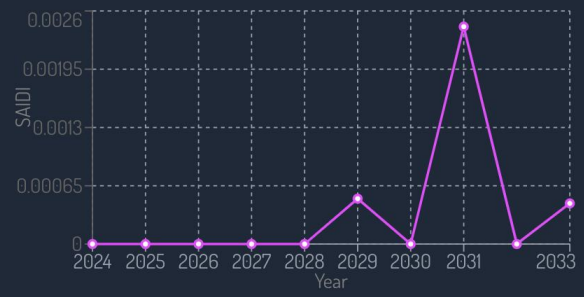
Summit Underground Cable Failures



Summit Underground Cable Replacements



Summit SAIDI



Results

Results and Outcomes

New Spending Insights Unlocked

New strategies for spending and bolstering infrastructure discovered during data discovery and modelling.

Budget Adoption

Model-supported recommended budget approved by board.

Reassurance and Sustainability

Stakeholders have confidence in infrastructure moving forward and can focus on improvements.

Conclusion

Q&A

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