Predictive Outage and Asset Management Decision-making Tool Assisting Distribution Operators

Scope of Work

Version 2

Work performed by TEES under the Smart Grid Center sponsorship

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Funding for Phase I (2020):
CNP: $40k; The Co-Ops (United, Bluebonnet, Farmer's, Grayson-Collin, Mid-South): $40k
Total: $80k
Project duration: *2 Years*
Period of performance for Phase I: January 1, 2020-Dec 31, 2020

Feb 24, 2020

1. Introduction

1.1. Project Objectives

The environmental impacts (weather, vegetation…) are the cause of majority of electric power network outages. With the recent development of various platforms that collect different environmental measurements, and advancements in capabilities of prediction algorithms and their ability to handle large heterogeneous data sets, it is now possible to predict future outages on a very granular spatial and temporal scale and with better accuracy. The objective of this project is to evaluate the capabilities of data mining algorithms to predict probabilities of outages in distribution, and provide the visualization of results convenient for use in decision-making for distribution operators.

1.2. Goals

- Develop the predictive framework for distribution outages based on the historical outage and environmental data. The model will predict probabilities of distribution outages at every feeder for up to 48 hours into the future with 3 hour resolution.
- Develop a visualization strategy for easy access to the prediction algorithm result for the operators.

2. Scope of Work

2.1. Tasks

1. Gather all necessary data:
    a. Data received form CNP and Co-Ops (load flow and network model data)
    b. Vegetation data (free-access database)
    c. Weather data (free-access database)
        i. Weather forecast
        ii. Weather measurements
    d. Lightning data (free from Vaisala under special research agreement)
    e. Soil data (free-access database)
2. Set up the geospatial database
3. Develop the Predictive model for Distribution operation
4. Develop visualization of the use of decision-making tool
5. Prepare report and demonstration

2.2. Expected Outcomes

The following outcomes are expected:

- Predictive Decision-making tool for distribution operators (Reporting capabilities)
- Visualization of the prediction results and demonstration

CenterPoint Energy Team is responsible for the following inputs (data):

- Distribution one line geographical maps (lines, poles)

- Distribution historical outage data
- Distribution historical maintenance data
- Electrical network data and measurements

3. Timeline

Task #/Moth	1	2	3	4	5	6	7	8	9	10	11	12
1. Gather all the necessary data												
2. Set up the geospatial database												
3. Develop the Predictive model for Distribution operation												
4. Develop visualization of the use of decision-making tool												
5. Prepare report and demonstration												

4. Implementation Options

The research team has spent time in several discussions with vendors of various packages and came up with variety of implementation options:

- Custom code in ArcGIS, and use of Esri GIS platform for result presentation
- Use of ABB ADMS platform
- Use of IBM PAIRS platform
- Use of SAS platform

After initial evaluation of the options, we recommended going with the first option (Esri) until the results are demonstrated and the use of the predictive decision-making tool is better defined, and then we can evaluate different implementation options in detail in Year II of the project and compare benefits. This recommendation has been accepted by CNP and Co-Ops, and will be pursued in the first year.

5. Project Organization

TEES Team includes following researchers:

Texas A&M Faculty: Dr. Mladen Kezunovic

Texas A&M Research Stuff: Dr. Tatjana Dokic

Texas A&M Students: Rashid Beambitov

CNP Team includes the following oversight manager: Kevin Ding

Co-Ops Team includes following oversight manager: Jared Wennermark