5 Year BS/MS Project
May 2021

# FPL Pole Inspection Database


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## Abstract


The purpose of this project was to develop a complete database and decision support system to assist the Florida Power and Light Company in streamlining their power distribution pole inspection and maintenance process. A system was devised that combines a SQL Server database, a Visual Basic processing script for Microsoft Excel, and a data visualization suite in Microsoft PowerBI.


## Introduction

The Florida Power and Light Company (FPL) is the largest power distributor in Florida. They maintain over 1.4 million poles as a part of their grid and must regularly check the condition of these poles to ensure there are no weaknesses or failures. Previously, there was no central database containing the current state of every pole in the grid.

Our job was to consolidate the historical reports and streamline the overall process to facilitate the analysis of a comprehensive history of the entire pole inspection program.

### Data Volume

The poles are inspected over an approximately 8-year cycle. Each year, about 150,000 poles are inspected by a third-party contractor. Each of those yearly inspection reports were saved into their own distinct Excel Workbook.

| | InspectionYear | Total Inspections |
|---|---|---|
| 1 | 2007 | 148168 |
| 2 | 2008 | 148601 |
| 3 | 2009 | 144586 |
| 4 | 2010 | 145875 |
| 5 | 2011 | 143069 |
| 6 | 2012 | 147449 |
| 7 | 2013 | 142519 |
| 8 | 2014 | 151424 |
| 9 | 2015 | 159676 |
| 10 | 2016 | 145012 |
| 11 | 2017 | 150056 |
| 12 | 2018 | 160596 |
| 13 | 2019 | 153729 |
| 14 | 2020 | 152243 |
| 15 | 2021 | 51155 |

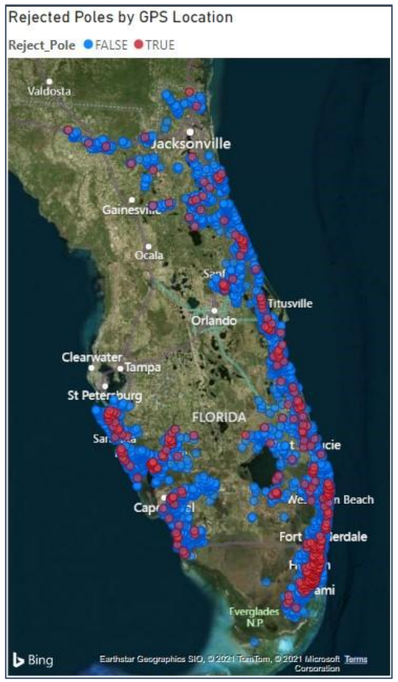
While Microsoft Excel is extremely handy for day-to-day data storage and calculations, it quickly hits its processing limit and is highly inefficient for large quantities of data. It was clear that another data environment was going to be necessary.

## Methods | Design | Analysis

We began by deciding upon the environments we were going to use for the project. Microsoft Excel does not have the capacity to store and conduct calculations on the entire historical set of over 2,000,000 lines of data. We thus elected to use Microsoft SQL Server, a Relational Database Management System. We also decided to use Microsoft PowerBI for our visualization and reporting platform, as FPL already had secured licensing within the company and it offered the best compatibility with SQL Server. Finally, we created a VBA script to auto-format the Excel inspection reports and prepare them for importing into the database.

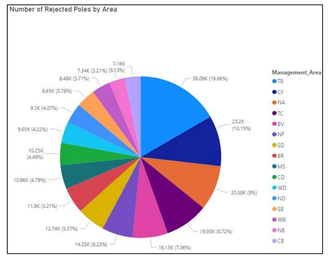
We first conducted a kickoff meeting with the FPL Smart Grid and Innovation team. We asked them what their priorities and best-case wishlist items were, and then used their responses to set our project roadmap.

We then conducted weekly meetings where we demonstrated our progress and used their feedback to create the best possible platform without compromising their existing workflow. We sought to vastly expand their analytical capabilities while saving them both time and effort.




## Results

We were able to create a full database in Microsoft SQL for the entire inspection history of all of the ~1.4 million wooden poles that FPL owns and made it easy to upload new pole inspection data into the database as it becomes available to them. We also created different views in Power BI to showcase the data collected about the poles during inspection so the FPL team can quickly do varying types of data analysis. The image on the right shows one type of view that the FPL team can look at to quickly see all of the poles that have been rejected during their inspection process over the past 15 years of data collection.




## Conclusion

We fulfilled every one of our project objectives without compromising any of our priorities. Our database comfortably houses over 2.14 million lines of data with room for nearly infinite expansion, and the processing time each week was reduced from several hours to mere minutes. The PowerBI analytics suite offers greater insights into the overall robustness of the power grid than FPL has ever had access to before.

With the ability to conduct any variety of analysis they choose, we are excited to see what kind of improvements FPL can make in the operations of their inspection program. We expect that our database will be instrumental in the coming years as 5G data transferring enables the deployment of large-scale network monitoring through pole-by-pole IoT devices.

## Acknowledgments


Many thanks to Dr. Buitrago for overseeing our project, Dr. Miville for giving us the freedom to submit our materials whenever we wanted, and the team at FPL for all of their input and advice.


## References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