PUTTING DATA TO WORK:
EPUD Launches Advanced Analytics Initiative

By Kyle Roadman

The nature of work is changing at Emerald People's Utility District. Although still a "poles and wires" utility at heart, Emerald is seeing every area of its business impacted by the virtually unlimited availability of data. This is true for the line and tree crews as much as the accountants and engineers. And to thrive in this environment, the utility knows it must find a way to leverage all this data with the limited resources it has available.

The vision

Back in 2015, Emerald's staff worked with its board of directors to create a strategic plan for the utility. This document included key goals of partnering with customers and becoming the "energy services provider of choice" within the changing industry. As the staff developed initiatives to accomplish these goals, one priority became clear: a need to invest in new technology and leverage the associated data to the benefit of Emerald's customers.

The utility laid out a technology roadmap, the first step of which involved upgrading to advanced metering infrastructure. Starting in late 2017, this project is now nearly complete. Other upgrades on the roadmap include a new geographic information system, meter data management system, and outage management system.

Although these upgrades offer exciting opportunities, Emerald's staff also recognized that new systems by themselves do not create value. Rather, the key lies in turning the vast amounts of data created into useful information for the utility's staff and customers. On this point, the utility saw a real gap in the marketplace.

Many off-the-shelf analytics software packages promise to translate an organization's data into dashboards and charts that may or may not be useful in a given situation. Very few products, however, are tailored to the specific

> **"Data is the new oil. It's valuable, but if unrefined it cannot really be used."**
> – *Clive Humby, UK mathematician and data scientist*

needs of a utility and flexible enough to address real-world issues. Thus, rather than pay for a standard analytics package, Emerald's staff decided to take a new approach: looking at analytics as a dynamic service as opposed to a static software product.

Partnerships

In order to chart this new analytics course, the utility needed to call upon outside resources. As luck would have it, around the time Emerald was developing its technology roadmap, one of its existing partners was also looking to enter the "advanced analytics" space. The Energy Authority is a public-power-owned, nonprofit corporation that assists public power utilities with power supply and associated services. As a longtime customer of TEA, Emerald was excited to find another organization eager to disrupt the existing model of data analytics.

Employing a team of data scientists and analytics professionals, TEA offered Emerald the chance to be their first West Coast client to use a new "advanced analytics" service. While intriguing, there were several issues to be worked out. Not least among these was the time required of Emerald's staff, which was already heavily taxed by the ongoing technology upgrade projects. As a result,

TEA offered a "light touch" service that would offload most of the setup and ongoing work to their staff.

The next issue involved determining pricing and potential funding mechanisms. Although Emerald viewed this service as having great potential, it was in many ways still unproven and the utility was hesitant to put up a lot of money on the front end. As a result, Emerald staff decided to apply for grant funding through the American Public Power Association's Demonstration of Energy & Efficiency Development program. Through the grant process, Emerald and TEA hoped to prove that even small- and medium-sized utilities can leverage advanced analytics to solve practical issues.

By mid-2018, Emerald learned it had been approved for DEED grant funding and began working with TEA to scope out the project.

Changing needs

The initial scope of work was based on projects that TEA had been testing with clients in other regions of the country. These included using AMI data to develop a distribution system connectivity model, perform analysis on meter anomalies, and identify potential transformer loading issues. As these ideas were being considered, external factors pushed the project in an entirely new direction.

Emerald has been experiencing significant load growth over the past three years, and this accelerated in 2017-2018. As a result, the utility has placed a major focus on energy efficiency in order to avoid costly and risky supply side resource investments.

The problem with traditional energy efficiency marketing is that it tends to be extremely inefficient. Utilities blanket their entire customer population with incentive offers, most of which go unnoticed. In addition, there's no guarantee that customers who choose to take part in a program are the best fit.

This challenge caused Emerald's staff to ask whether advanced analytics could be used to better identify "high potential" customers for energy efficiency marketing. TEA was up for the challenge, and the two sides worked collaboratively to begin the study.

Initial results

The process began by organizing data on Emerald households by building type, year built, square footage, number of bedrooms/bathrooms, and latitude/longitude. TEA's data scientists then turned to a statistical approach known as Ward's method of hierarchical clustering to determine common groupings as well as outlier accounts within each grouping. This process identified approximately 500 Emerald customers that used significantly more energy than those with like houses.

With these accounts in hand, Emerald set to work developing new messaging to target these customers for energy efficiency marketing. The result was a campaign based largely on usage comparisons between customers and their neighbors. This "peer pressure" approach was unlike anything tried at the utility before and was made possible by the new advanced analytics service. A series of mailers was sent to customers in late 2019 and the utility will be monitoring results to determine effectiveness.

During this process, other energy efficiency topics were identified as good candidates for advanced analytics studies. Notably, post-install inspections are a time-consuming activity for Emerald's staff after customers undertake a heat pump or water heater upgrade. Emerald asked TEA whether it would be possible to determine from AMI data that a customer had, in fact, completed the installation. The potential savings in staff time would be enormous and Emerald thus made this a top priority.

To tackle this issue, TEA's staff turned to an approach known as change point detection. This involves studying usage data over an extended time period and looking for statistically significant changes. Although complicated by seasonal weather differences, this approach has shown promise and Emerald's staff has been following up with customers directly to confirm findings. The hope is to eventually use this tool as a "first pass" filter through which to run completed projects, and have staff focus their time on exceptions and outlier results.

Future plans

At this point, Emerald has only scratched the surface of what advanced analytics has to offer. The DEED grant funding ends this month, at which point the utility will perform a full assessment and decide on a future course. For now, several points are clear:

- Advanced analytics as a service has numerous advantages over "off-the-shelf" software. Having direct access to data scientists that know the utility business has been very helpful in developing custom solutions to real-world problems. In addition, less software setup and integration time means employees can stay focused on their most important work.

- The more historical data, the better. Having recently installed AMI, Emerald now has only about a year of historical data. This has limited the scope of certain analytical studies, such as those that rely on change point detection. As the utility acquires more data over time, the accuracy of these studies is expected to increase.

- Data quality is an ongoing challenge. As one example, Emerald's AMI system provides hourly voltage data but only in whole numbers. Many of the analytical studies the utility hopes to perform will require greater decimal precision, and the utility is working with our vendor to develop this.

Moving forward, Emerald sees potential for leveraging advanced analytics on several fronts. The utility is currently undergoing a physical system survey by visiting each point on its distribution system and taking inventory of equipment. The hope is to eventually compare this to a data-derived connectivity model to validate and extend the survey's findings. In addition, Emerald would like to build on the recent energy efficiency work by analyzing actual customer savings from completing an upgrade project.

Whatever the future holds, it seems clear that data will play a major role within the utility industry. Those that can make sense of it and use it effectively are most likely to thrive. By charting its own course in the area of advanced analytics, Emerald PUD hopes to find itself in this category for many years to come. NWPPA

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