Powering the future: Duquesne Light Co.’s quest for grid modernization with continuous innovation

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I recently had the pleasure of speaking with Dr. Elizabeth Cook, director of advanced grid systems and grid modernization at Duquesne Light Co. (DLC). We talked about the history of DLC and the utility’s recent efforts around grid modernization. In this blog post, I’ll share DLC’s story of innovation, rooted in humble beginnings, and how in recent years the utility has reignited the spirit of continuous innovation.

Inspired by Dr. Cook's data-driven story?

Fill out this short form to start a conversation about your data science needs and how we can help.

It was an unusually cool afternoon when I spoke with Dr. Cook. She was calling in from the Energy Innovation Center, Pittsburgh’s premiere commercial facility pursuing energy and sustainable technology advancement. Our discussion centered around DLC’s pursuit of continuous innovation and the utility’s approach to grid modernization. The chosen location couldn’t have been more fitting, and it was clear from the start that the cool temperature had done little to dampen Dr. Cook’s fiery enthusiasm for the subject at hand.

The vision of grid modernization

The story began when Dr. Cook joined DLC’s journey of continuous innovation seven years ago, fueled by a vision nicely encapsulated in her own words: “The North Star is to have full situational awareness to the edge of the grid.”

This vision of grid-edge analytics sets the stage, not merely as an infrastructure upgrade but as a

paradigm shift in the way power is generated, distributed, and consumed. The concept of grid-edge analytics isn't new—it's been circulated in academia for years, and big firms like Siemens and Deloitte have hammered home the point in articles and white papers galore. In my conversation with Dr. Cook, a root-cause analysis can be driven by a few key characteristics advancing this issue for utilities.

Exponential growth in the number of assets. Utilities like DLC are managing north of 10 times the number of assets they were managing 20 years ago, according to the Energy Central blog post Digital Asset Performance Management—Taking Utility Asset Management to the Next Level.

More about Dr. Elizabeth Cook

As director of advanced grid systems and grid modernization for DLC, Dr. Cook manages and leads efforts within the transmission and distribution power grid's operations and planning groups. To transform DLC into a digital utility of the future, she works with internal and external partners to collaborate with local, state, and federal planning entities, as well as universities and industry, to drive advanced grid solutions and plan for the future power grid.

In addition to her responsibilities at DLC, Dr. Cook is a mother of six, a business owner, an adjunct professor, and a published author. She holds a doctorate in electrical and computer engineering from the University of Pittsburgh.

Increasing asset complexity. Assets under management are increasingly complex, ranging from distributed energy resources and new meter technology to more-advanced hardware and software.

Proliferation of sensing technology. The conjunction of this growth and technology advancement has led to an increase of data and sensing—literally billions of new records to be used in operational decision-making.

Together, this technological advancement opens the doors of possibility for new methods of asset management. And, according to Dr. Cook, you can't simply pick just one part because it's all part of the process of continuous innovation. She said:

> They're all dynamically different … but they're all serving one larger purpose of grid modernization. All the little mini projects are part of a large mosaic; each initiative of advancement is a piece of a much larger puzzle to be solved for grid modernization.

This journey is steeped in DLC's tradition, which dates back more than 100 years. DLC was then a subsidiary of the Philadelphia Co., one of the dozens of companies founded by inventor and early electric pioneer George Westinghouse. In its early stages, the Philadelphia Co. was the literal powerhouse of Pittsburgh's historic steel and railroad industries. The roots of DLC persist: the utility still serves within the two original county footprints. The railroad and steel industries have long since moved on, but DLC has endured, expanding to serve more than 600,000 commercial and residential customers.

In the decades that followed, DLC was one of the first utilities to receive bulk generation from nuclear

power. Dr. Cook was quick to point out that DLC was also one of the first utilities to deploy distribution supervisory control and data acquisition systems.

Simply put, DLC is rooted in innovation.

With the rapid progression of technology, data has become critical to advancing the grid in a way that enables utilities to best serve their customers.

Dr. Cook shared that it's essential to have advanced analytics and data infrastructure models in place to deliver a clean energy future for DLC's customers. The utility's leadership recognized the need to develop a robust connectivity model while updating infrastructure and managing the exponential growth of connected devices.

Over the last seven years, Dr. Cook has worked cross-functionally alongside a team of dedicated engineers to tie together the pieces of connectivity and the different layers of the utility's data set. The results of this effort? The company built a robust geographic information system database, tracking approximately 7,000,000 unique attributes across its system.

The ultimate goal is to track characteristics like utilization, current capacity, age, health, past maintenance, and inspection records. When this data model is fully implemented it will allow DLC to develop a strategy to deliver decision-making intelligence.

A partnership for continuous innovation

It was during the formative years of this data set that E Source Data Science began its collaboration with DLC and—insert small round of applause here—the partnership hasn't gone unnoticed. Among nearly 200 vendors, E Source was chosen by DLC for its Innovation Excellence award at the utilityy's annual DLC Supplier Summit in July (**figure 1**).

Figure 1: DLC awarded E Source its 2023 Innovation Excellence award

Dr. Cook presented the award to Jonah Keim, vice president of E Source Data Science.



I asked Dr. Cook about this relationship and what it meant for her. She said:

> It's about having the right people in the right chairs, with the right talent. When we first engaged E Source, we didn't have a connectivity model but rather all these disparate data sets. So, the goal of the first engagement was to stand up distribution circuit performance where we could feed it all our outage data.

The project came together nicely, converting a process that used to take weeks of manual labor into a nearly instantaneous reporting tool. Dr. Cook said the ability "to slice data and present insights to executive leadership allows us to provide real-time perspective when answering questions about the grid's performance."

This real-time decision-making also resonated with her when I asked what gets Dr. Cook excited about this work (besides having a PhD in powering engineering and carrying a genuine interest). She said it's the aha moments that real-time decision-making brings:

> Real-time data will drive conversation in 'aha-like' moments. For example, when you want to perform a specific task, having data showing your current performance can demonstrate the impact of implementing that task. All of this will drive conversation with the stakeholders you are engaging. You can start making more-rapid decisions and perform your work at scale. Data is the common glue holding this process together.

Decision-making support systems is an E Source Data Science specialty, and we're excited to advance continuous innovation in partnership with DLC.

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