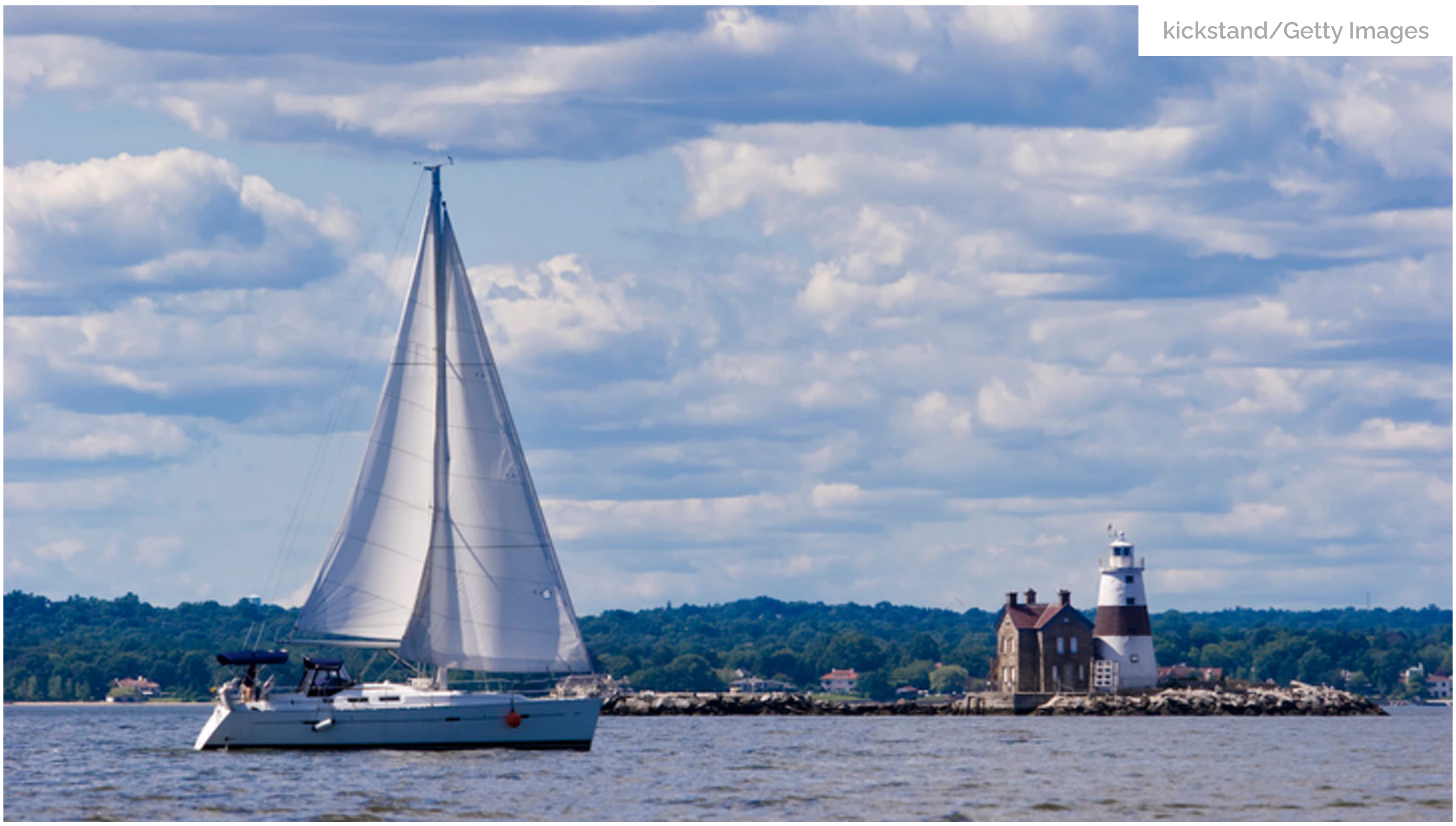

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NYPA to Test Use of Artificial Intelligence in Upgrading Transmission Cable

Joint project with startup to help advance power system reliability and resilience research.

JUL 14, 2021

The New York Power Authority (NYPA) is launching a demonstration project with a Sweden-based technology company to explore the use of artificial intelligence (AI) as part of a long-term upgrade strategy for the Y-49 Long Island Sound Cable. The cable transports power from Westchester to Long Island.

The Electric Power Research Institute's (EPRI's) Incubatenergy Labs program announced the selection of Eneryield of Gothenburg, Sweden, as one of 20 startup companies that will conduct accelerated demonstrations of their technologies with utilities and the EPRI as part of Incubatenergy Labs' 2021 Cohort.

"Collaborating on the rapid assessment and deployment of innovations across power generation, delivery, and end use is essential to achieving deep decarbonization by 2035," said the EPRI's Incubatenergy Lead Erik Steeb. "Incubatenergy Labs brings startups like Eneryield and utilities together to crowdsource the demonstration of these innovations and accelerate the commercialization of promising technologies."

The NYPA will collaborate with Eneryield, which provides machine learning algorithms for intelligent energy analytics and control of electricity flow, to demonstrate the use of new technology to identify possible solutions to detect faults and help strengthen and upgrade the Long Island Sound Cable. The cable is currently being evaluated for long-term repairs.

"This is an opportunity to take new technologies that have shown promise in development and put them to the test with real-time data and an active power system," said Alan Ettlinger, senior director of research, technology development, and innovation for the NYPA, which owns and operates the Long Island span. "The use of AI in infrastructure inspections can help

Eneryield was chosen by the NYPA from more than 250 international startups by a panel of global utility and EPRI subject matter experts. The startups will spend 16 weeks working with electric power utilities around the nation and the EPRI on demonstration technology projects intended to accelerate decarbonization, electrification, grid modernization, and other electric power industry innovation imperatives. Results will be presented during the interactive Incubatenergy Labs Demo Days, Oct. 19 to 20.

The NYPA's project will focus on its Y-49 transmission cable, a 23-mile, 693-MW line that runs from Long Island to Westchester. Historical data will be used from various sources and AI/machine learning techniques will be applied to identify small anomalies, deviations, and patterns to predict larger imminent disturbances or faults. The project aims to determine whether the techniques can help predict developing problems or incipient failure of buried/underwater cables and improve on unique correlations and data characteristics that can be measured in more conventional analysis techniques.

The cable has had faults that have contributed to intermittent outages over the past year. The NYPA is working with its local partners, the Long Island Power Authority, and its service provider PSEG Long Island to implement a long-term strategy for its reliability and resilience going forward. Solutions include replacing segments of the span and potentially expanding the line's capacity to prepare for an influx of green energy sources. The learnings from this demonstration project will help inform the next steps for the line's upgrade.

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Quantum Computing for the Future Grid

We need a robust computational foundation that can convert all this collected big data into actionable information.

Martha Davis

JUL 19, 2021

The electric power grid is undergoing unprecedented change. This change is due to decarbonization efforts, increased reliance on renewable and variable generation resources, the integration of distributed energy resources, and transportation electrification. In turn, these changes have required electric utilities to expand their monitoring and measurement efforts through metering infrastructure and distribution automation initiatives. All these efforts have resulted in the collection of mountains of data from the electric grid. While this significant increase in data collection enables better monitoring of the grid and enhanced decision making, we still need a robust computational foundation that can convert all this collected big data into actionable information.

Quantum Computing Applications in Power Grids

As mathematical challenges increase and data becomes core to modern utility decision-making, our industry needs to make progress and draw from emerging analytics and computing technologies. Quantum computing is a ground-breaking information processing technology that can support efforts to address power system challenges and enable the grid of the future. Given the promising applications to the power grid, this is an area of research that has really caught my attention lately. While quantum computing applications to the power grid have remained mostly unexamined, forward-looking utilities are exploring the next step can be leveraged to provide higher service levels.

Building the future grid will require an overall view of the quantum computing technology applications in power systems, such as the dynamic interaction of the transmission and distribution systems. According to a recent IEEE article by Rozhin Eskandarpour and a team of researchers from the University of Denver Electrical and Computing Engineering Department, current computational technologies might not be able to adequately address the needs of the future grid.

"The most notable change is observed in the role of the distribution grid and customers in system design and management. Transmission and distribution systems were frequently operated as distinct systems but are becoming more of an integrated system. The underlying hypothesis was that at the substation, the transmission system would supply a prescribed voltage, and the distribution system will supply the energy to individual customers. However, as various types of distributed energy resources, including generation, storage, electric vehicles, and demand response, are integrated into the distribution network, there may be distinct interactions between the transmission and distribution systems. Distributed generation's transient and small-signal stability problems are one instance that changes the energy system's dynamic nature. Therefore, developing more comprehensive models that include the dynamic relationships between transmission and distribution systems, and relevant computational tools that can solve such models will be essential in the future. Furthermore, better scheduling models are needed to design viable deployment and use of distributed energy resources."

Eskandarpour et al. describe other potential quantum computing applications for the power grid, including optimization, planning, and logistics; forecasting; weather prediction; wind turbine design; cybersecurity; grid security; and grid stability.

University-Industry Consortium

Given that I am both professionally embedded in covering the newest innovations within the power sector and nearing the end of a Ph.D. program at the University of Denver, it is not particularly surprising that a new university-industry research consortium has caught my building the future grid.

The University of Denver, in collaboration with various utilities, has established a consortium related to envisioning the **q**uantum **u**pgraded **e**lectric **s**ystem of **t**omorrow. “QUEST” is the clever acronym that has been adopted for this university-industry consortium. The consortium aims to enhance university-industry collaborations to solve emerging challenges in building the future grid by utilizing quantum information and quantum computation. The consortium will develop new quantum models, methodologies, and algorithms to solve a range of grid problems faster and more accurately. Topics of interest include:

- Increased levels of customer participation
- Opportunities in distributed energy resource integration and utilization
- Power quality and reliability improvement
- Asset management and system efficiency
- Demand-side management
- Electric vehicle studies
- Smart distribution
- Cybersecurity

Industry members financially support the QUEST consortium, and membership is voluntary and open to any public or private organization active in the power and energy industry. For more information, contact Dr. Amin Khodaei at the University of Denver, School of Engineering and Computer Science.

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