

EPRI Program 1 *PQ Tools and Analysis Research (PQView)* provides foundation for new fault location function at Consolidated Edison

Success Story



“Recent addition of advanced fault location capability has significantly increased the value of these systems, reducing the time required to locate feeder faults at Con Edison by more than one hour.”

-Paul Stergiou, Power Quality Manager

SUCCESS STORY One of the most important development areas for power quality (PQ) monitoring is the implementation of intelligent systems that can automatically evaluate disturbances and conditions to make conclusions about the cause of the problem or even predict problems before they occur. Fault location is one of the most important of these intelligent applications. Automatic fault location can reduce the time to repair faults and have a direct impact on overall system reliability. However, implementing an automated fault location function requires a robust power quality monitoring system with functionality that allows integration of new functions and capabilities.

THE CHALLENGE For more than 180 years, Consolidated Edison Company of New York (Con Edison) has been supplying the energy that powers New York. Today the regulated utility provides electric service not only to New York City (except for a small area of Queens), but also for most of Westchester County (total of almost 3.1 million electric customers). Con Edison also provides natural gas service in Manhattan, the Bronx, and parts of Queens and Westchester, in addition to owning and operating the world’s largest steam system. The company is a subsidiary of Consolidated Edison, Inc., one of the nation’s largest investor-owned energy companies, with approximately \$10 billion in annual revenues and \$25 billion in assets. The downtown network includes over 1200 underground feeder circuits that supply extensive underground networks. Faults on these feeder circuits can require long periods to locate with traditional methods (e.g. thumping). There is substantial opportunity to improve the efficiency in locating and repairing these faults using system monitoring data.

THE SOLUTION For many years, Con Edison has been active in the area of PQ monitoring, using technology and techniques developed by EPRI through Program 1 *Power Quality Analysis Tools and Testing*. The company had also been working aggressively to develop computational techniques for locating faults within their electric power distribution system. Initial application of power quality monitors was throughout the secondary network system. However, more recent additions to the PQ monitoring have included monitors at the primary distribution substations. These monitors record the disturbances for every fault condition, providing the basis for automated analysis of these events. The PQView software system is used to manage the entire power quality monitoring database at Con Edison and PQWeb used to provide access to the information

throughout the company. Beginning in late 2004, power quality (PQ) and distribution engineering (DE) experts at Con Edison began a project to see if their investment in PQ monitoring could be made to return dividends in another area—that of more quickly and accurately locating the geographical location of distribution system faults immediately after a fault occurred.

The project focused on two key elements. The first involved adapting an impedance/reactance model of the Con Edison distribution system that would allow rapid calculation of fault locations. The second was to develop PQView to automatically calculate a Reactance-to-Fault (RTF) value for single phase faults and feed the RTF data directly from the PQ monitoring system into this model to allow for quick and accurate inference of fault locations. The goal was to enable use of the monitoring data along with the system electrical model to provide an estimate of fault location that could be accessed directly and quickly by operations personnel.

BENEFITS The initial results from this effort have been impressive. Although in its initial phase the project reduced fault locating time by more than one hour and was effective in locating faults within 3 manhole structures 50% of the time in June and July and 60% of the time in August. Fault locating consumes precious time, manpower and prolongs the feeder outage; any reduction in fault locating time is therefore extremely beneficial, especially during the summer months when feeder restoration is key for system reliability.

Although pleased with the improvements yielded thus far from this effort, Con Edison plans still further enhancements to their fault location system, including improving PQView to calculate multiple reactance values for the duration of any fault (including 2-phase and 3-phase), and using algorithms to optimize and select the reactance value to estimate a location. Through this effort, Con Edison hopes to further and dramatically reduce the time required to locate and repair faults, thereby producing cost savings for the company and improved electric supply reliability for its end use customers.

PQView is a registered trademark of Electrotek Concepts, Inc., and is part of the EPRI Power Quality Diagnostic System.

CONTACT INFORMATION For more information, contact the EPRI Customer Assistance Center (EPRI CAC) at 800.313.3774 (askepri@epri.com).

© 2005 Electric Power Research Institute (EPRI), Inc. All rights reserved.
Electric Power Research Institute and EPRI are registered service marks of
the Electric Power Research Institute, Inc.

 Printed on recycled paper in the United States of America

1013001