

FirstEnergy Asset Management Initiative: CRC project

As is the case with most energy companies today, FirstEnergy Corp of Akron, Ohio looks at operational efficiency as the key to financial performance improvements and shareholder profit. After a series of mergers, FirstEnergy had grown to become the fifth largest electric system in the U.S., with 4.5 million customers and a service territory extending through Ohio, Pennsylvania and New Jersey. Workforce and IT integration had been accomplished, but with seven operating companies now combined, there were significant differences in information and processes across the FirstEnergy service territory. In 2006, management, pleased with the economies of scale gained from the mergers, intensified its focus on efficiency and reliability within the Energy Delivery business of FirstEnergy as the next source of performance improvement. They believed that SAIDI numbers could be improved if the company adopted a new approach to Asset Management, and they were interested in lowering capital expenditures as well.

For a complex multi-state company such as FirstEnergy, there were numerous facets of the business to investigate in the search for performance improvement. Could worker process and procedures be improved to add efficiency? Could information systems provide better information to streamline operations? Could outages be minimized, or restoration be improved? Would a hard look at maintaining aging assets and resulting impact on reliability yield ways to improve performance metrics while decreasing capital costs?

To satisfy many of these questions and areas of concern, FirstEnergy had already made some good decisions and investments, particularly in the IT space. A few highlights of these corporate-wide investments include:

- SAP had been implemented on a corporate-wide basis with many ERP benefits.
- PowerOn, from GE, now provides a modern corporate-wide Outage Management solution for FirstEnergy.
- An exceedingly robust Oracle-based GIS from Autodesk became the corporate repository for spatial asset and network data.
- In addition, NaviGate, an asset map-oriented, web-based data distribution application provided by Gatekeeper Systems was implemented enterprise-wide in 2005. It provides unlimited users with a seamless, real-time viewing and query environment for relevant operational corporate information. The NaviGate tool is also a platform for key operational functions such as electric trace and analysis of distribution loading.

Collectively, these solutions, along with numerous others, have contributed significantly to improving and consolidating corporate information and making it available whenever and wherever business decisions are made.

An investigation of costs associated with capital expenditures, maintenance and operations within the Energy Delivery business of FirstEnergy suggested that improvements would be possible. Maintenance, for example, had always been driven primarily by time-based models and reaction to interruptions and failures when they occurred. They recognized that a modern Asset Management strategy would need to look beyond basic factors like asset age, thermal overloads and voltage criteria. Management felt the traditional time/reaction based approach was inherently inefficient, as time is only one of many factors contributing to equipment wear

and ultimate failure. Other factors such as maintenance history, repairs, the use of non-standard construction practices, and precise measures of wear and weathering were not being considered. FirstEnergy's management understood that if the company could adopt a needs-based model for asset management by considering all relevant factors impacting asset performance and overall health, a more efficient and rigorous fact-based process could be formulated. Asset Management based on calculated and predicted need became a key goal.

Improvements in Asset Management processes would be based on *Root-Cause* determination and analysis. There would need to be two major components. *Asset Strategies* would emerge once FirstEnergy could determine a) Asset Performance, b) Root-Cause factors, and c) investment planning options. However, critical to any resulting strategies would be the initial steps of *Data Management*, including a) asset data acquisition, b) storage and retrieval, c) data quality and data integrity, and d) analysis.

After studying their options and available corporate information, it became clear to FirstEnergy management that an accurate asset inventory and condition survey would be the best way to provide a foundation for implementing a universal asset management program. This data, once collected, could provide a current and dynamically updated information base. It would provide an understanding of the current condition of all assets associated with distribution that would be necessary in the determination of when to replace vs. repair assets. Such an inventory would include all distribution assets, from substations to transformers and down to customers, regardless of asset type.

In order to move forward quickly, a team lead by Anthony Hurley, director of Asset Management, concluded that a new process of Circuit Reliability Assessment would be implemented. A significant field force of Circuit Assessors would be needed to collect all of the necessary data. An aggressive goal was set: FirstEnergy would accurately inspect all distribution assets and build an accurate asset database foundation—in only three years. To accomplish this, Circuit Reliability Coordinators (assessors) would need appropriate tools in order to complete inspections quickly and return meaningful data, store it for historical purposes and deliver it appropriately to back office analysis solutions.

Panasonic Toughbooks (Model 19 Tablets with GPS) were selected as the field hardware. In early January '08, after considering numerous mobile software options, the Asset Management Team selected NaviGate, from Gatekeeper Systems, Pasadena, CA as their most desirable solution for organizing and managing circuit assessments.

The decision to move forward using NaviGate was based on numerous factors. First, NaviGate had already been a valuable solution at the desktop across FirstEnergy and thousands of employees already were familiar with its intuitive, web-based, map-based user interface. The Oracle-based open architecture of NaviGate was desirable, and because there was urgency in moving forward with Capital Asset Management, risk assessment and need-based maintenance, they wanted a solution that could quickly be in place to start building an accurate asset database. Additionally, the Asset Management Team recognized the value of implementing a field environment with a wide set of flexible features. The chosen application would extend the same NaviGate application that was available at the desktop, thus reducing the number of additional applications for both IT and end-users.



By March, there were nearly 65 Circuit Reliability Coordinators (CRC) conducting assessments of above-ground assets throughout the FirstEnergy service territory. While inspections are transactional tasks similar to work orders or Underground Locate tickets, FirstEnergy had no Work Management system to specifically produce inspection candidate lists that would contain many assets aggregated into individual inspection "tickets." The NaviGate database and application emerged as an ideal mechanism to create and store assessment lists prior to and after assignment. Because circuit inspections are typically sequential in nature, the NaviGate inspection module could organize inspections based on spatial aspects derived from the GIS and network connectivity data contained within the application. In this way, supervisors can identify a circuit to be inspected, and NaviGate will extract asset candidates automatically and display a map showing the assets requiring inspections on a route the inspector would follow. Inspections are stored and can be assigned to inspectors electronically. The process is similar to the way a clipboard of assigned work would be collected and given to a field worker in a paper-based manual process.

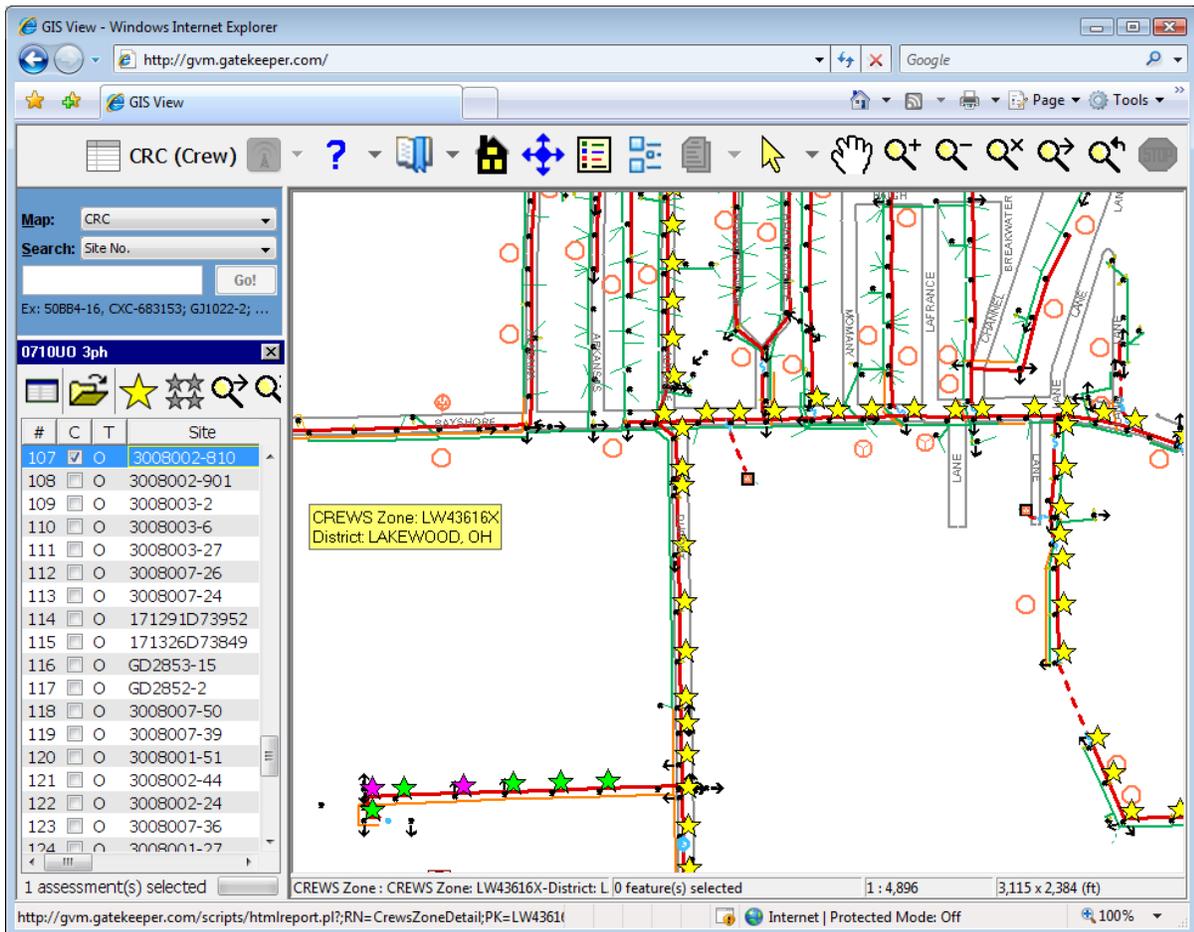


Fig 1. Sequential selection of assessment candidates by NaviGate to create assessment lists.

Once assigned, inspections are sent automatically to the mobile data terminal (MDT) of the

appropriate Circuit Reliability Coordinator. The electronic transfer of assessments to MDT's works via whatever available transfer mechanism exists including nearly continuous cell modem options, or periodic connections using docking, home Internet connections (or even Wi-Fi at Starbucks). Incremental updates to the asset map/GIS data on the MDT works similarly and can be automatic with whatever frequency is most appropriate or practical. NaviGate will manage updates individually, based on when the last one occurred.

Assessments are completed with forms designed specifically for the assets to be evaluated. Forms have pull-down options and defaults that insure that the data collected will be consistent and contain all aspects of factual information necessary. Individual assets are organized in order from substation downstream towards customers. During field assessments, time stamps and the GPS location of the assessor are recorded automatically. In addition, digital cameras are soon to be available to capture images that will be linked to assessment forms and the appropriate assets on the maps.

Assessment Results

Site No: 3008002-811

Circuit: UNION OIL/0710UO

Reference

- ✓ Pole
- ✓ Neutral Isolator
- ✓ Pole Tag
- ✓ Crossarm/Bracket (Pri)
- ✓ Crossarm Brace (Pri)
- ✓ Crossarm/Bracket (Sec)
- ✓ Crossarm Brace (Sec)
- ✓ Foreign Attachment
- ✓ Joint Use Issues
- ✓ Guy
- ✓ Static Wire
- ✓ Vegetation
- ✓ Primary
- ✓ Insulator
- ✓ Secondary/Neutral

Completion

Status: Completed as Planned
 Unable to Access
 Missing In Field

Access Issues: [Pull-down menu]

Mapping Issues: Mapping is correct
 See Markup

Comments: [Text area]

OK Cancel

Fig 2. Pick lists and pull-downs on electronic assessment forms

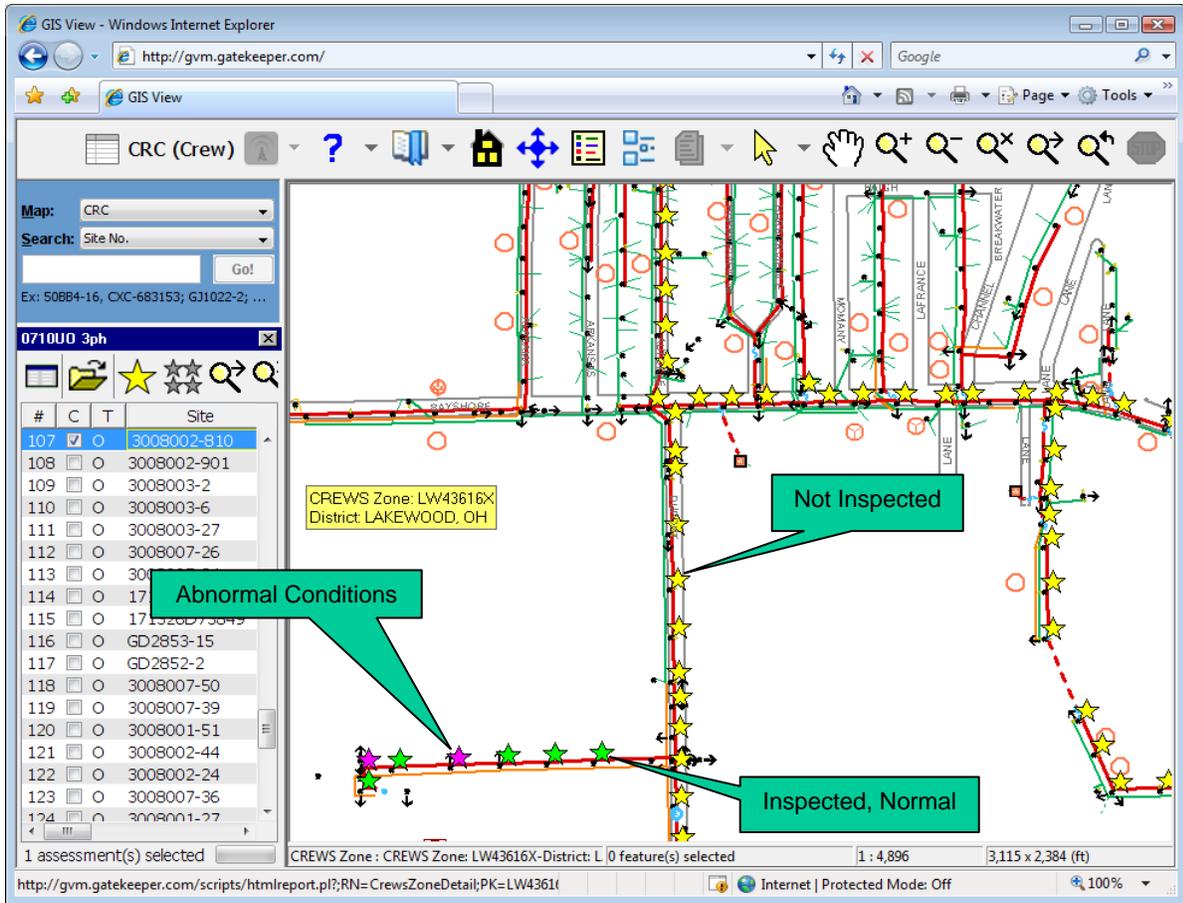


Fig 3. Thematic display of assets based on condition and inspection status.

Once completed, inspections are uploaded automatically, again using any available connection. Collected data is sent to the NaviGate Spatial Data Warehouse and also sent to appropriate back office analysis, work management and ERP applications. As soon as data is uploaded, all NaviGate users have access to assessment results, and image data depicting specific poles or devices.

When assessments reveal asset conditions requiring immediate follow-up, a work order creation process can be initiated. In the future, NaviGate will send corrective or follow-up work requests electronically to SAP where they become a priority work order where they are inserted into the maintenance workflow.

Once assessment data is collected and failure/outage details are compiled, complex evaluation begins. Factors like root cause, risk determination, criticality vs. likelihood, historical performance/maintenance and geographic/environmental conditions all must be considered. The E-CAT model (Energy Delivery Capital Allocation Tool) is the statistical tool developed by FirstEnergy to determine predictive aspects of reliability and to help prioritize capital investments. It requires input data and a variety of weighting factors. There are multiple applications that will provide the input necessary to get meaningful results from the E-CAT

model.

FirstEnergy noted that an additional benefit of the NaviGate architecture is its ability to link with any number or combination of back-office applications. Thus, as the iterative process for refining the E-CAT model progresses, and potentially different applications and products are introduced, NaviGate can simply be redirected to newer data sources and/or target applications. This sort of flexibility will help the new asset management process improve accuracy without the need to change the user environment of thousands of field or desktop NaviGate users.

The plan formulated by FirstEnergy to transform its asset management processes from time- and reaction-based to a predictive model is a multi-year project. It will require manipulation of information from a reliable asset registry with consistent condition data. The process of collecting and maintaining this information will be continuous. NaviGate provides the means to inexpensively collect consistent data critical to anticipated process changes. Other tools will apply the statistical analysis. Importantly, the consistent look and feel for CRC inspectors that is common with users at the desktop will be complemented by the flexibility NaviGate offers to support inevitable changes in other aspects of optimizing capital expenditures.

FirstEnergy's investments in NaviGate and a team of inspectors has provided a firm foundation for a accelerated progress toward an optimized asset management program. Now that asset data is flowing from the field, the program's impact on SAIDI and reliability results should begin to become evident.