Transmission & Distribution World

Getting a Grip on Connectivity

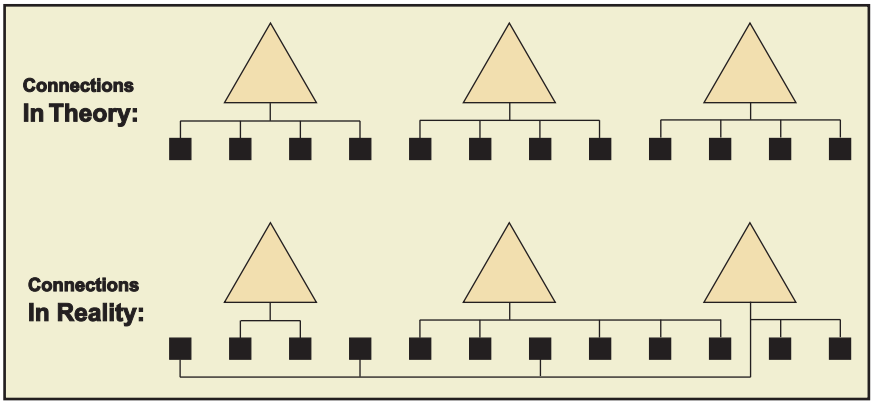
PSE&G uses automated mobile technology to enhance customer data in outage management and service restoration.

By Robert Czyzewski, PSE&G

In January 2001, Public Service Electric & Gas Co. (PSE&G, Newark, New Jersey, U.S.) completed the installation of a new outage management system (OMS) and geographic information system (GIS) in the north-central portion of New Jersey. PSE&G selected and implemented the systems with the highest expectations, but the company soon realized that something, somewhere wasn't right.

A mild winter storm raised some concern the first day the systems went live, but the utility attributed the problems that day to the high concentration of service-related damage and the steep learning curve the new OMS system imposed on end users. By the time the second and third storm hit in the next few weeks, however, PSE&G focused its attention on other potential causes.

PSE&G specifically selected the new OMS system (Cognicase·M3i, Montreal, Quebec, Canada) and the new GIS system (ESRI, Redlands, California, U.S., and Miner & Miner, Fort Collins, Colorado, U.S.) to help trouble crews respond quickly to day-to-day problems and major storm situations, while also providing the engineering applications necessary to support a network "connected" model. The systems seemed to be working well, but the OMS was not always predicting outages as quickly or as accurately as expected, and the numerous "orphan" and "misconnected" calls were causing confusion and extra work for system users. ("Orphan" refers to a customer account that cannot be linked to a valid street address or transformer and would never group to a larger outage. "Misconnected" refers to a customer account that was assigned to the wrong transformer, which could be on the wrong phase or the wrong circuit.)



"Geocoding" and "proximity" assign customer-to-transformer connections based on the nearest transformer of the right type and voltage (in theory); actual connections (in reality) may be quite different.

To get a clear picture of the extent of the problem, PSE&G conducted field surveys on a random sample of customer accounts.

Ultimately, PSE&G determined the problem was not with the OMS system itself but with the data used to analyze customer calls. Specifically, the customer-to-transformer connectivity appeared to be less accurate than anticipated. To get a clear picture of the extent of the problem, PSE&G conducted field surveys on a random sample of customer accounts.

The results showed 76% of customers were connected to the correct circuit, section and branch. This represented a significant improvement over the accuracy of the company's legacy system, which used a grid coordinate system to assign customers and circuit elements (mainline sections and branch lines) to the grid. The survey also indicated that only 31% of customers were actually connected to the correct transformer. In the old system, only 42% of customers were assigned to the correct circuit, section and branch, and customer connectivity to the transformer level did not exist.

It was clear that, while OMS and GIS had drastically improved the customer-to-circuit connectivity, additional work was needed to improve the customer-to-transformer information for the systems to provide the desired results.

Putting the Challenge into Focus

Lacking actual customer-to-transformer data for any of PSE&G's overhead construction areas, the company

Automating the Field-Collection Process

The FastGate Mobile approach PSE&G selected helped automate the data-collection (and eventually the data-maintenance) process. The strategy (see figure below) involved the following steps:

- Access source data from PSE&G's ArcGIS and Meter Data Repository (MDR) databases.
- Create work packages for GPS-fitted PocketPC handhelds equipped with FastGate Mobile software configured to collect data specific to PSE&G's requirements.
- Capture customer-to-transformer connections and targeted facility data in the field using integrated geospatial and customer data.
- Conduct QA/QC and data-validation processes on sample data using the handheld device to identify any potential data problems.
- Import updated and corrected data from FastGate Mobile to the FastGate processing environment for data validation, automated creation of connectivity, and detection and correction of data errors.
- Upload corrected data into GIS and OMS databases. Conduct final data checks and QA/QC on OMS data.

was faced with some tough decisions at the outset of the OMS/GIS project. It was important to get the new systems running quickly in order to satisfy regulatory requirements and to abide by the recommendations of the company's own internal studies.

So to meet the time constraints, the company decided to pursue an automated means of creating customer-to-transformer connectivity. PSE&G would use transformer-proximity techniques and geocoding to ensure reasonably accurate connectivity. In essence, customers are assigned to the nearest transformer that have the correct phase and voltage.

Although this approach provides a timely way to create connectivity, it understandably is not as accurate as the data a comprehensive field survey provides. The project team and the GIS vendor knew, however, that the approach would provide reasonable and functional results.

Some degree of error is to be expected in the geocoding process. Most geographic data sets, for example, assume that addresses are evenly spaced between street intersections; however, this is not always the case in the real world. Problems also arise as a result of obstacles and physical constraints that sometimes require construction crews to connect customers to transformers that are the closest choice. Finally, typographical errors or inconsistencies in the way addresses are entered in the Customer Information System (CIS) can cause customer accounts to be missed entirely by the geocoding process. For example, people can distinguish between "1st Street" and "First Street," but computers require a standard of consistency.

A Second Pass at Connectivity

While the geocode and proximity approach came with compromises, both systems were successfully implemented within very tight time constraints. The company knew, however, that a labor-intensive field survey ultimately would be required to allow the OMS system to perform to its full capabilities. A second pass at customer connectivity was planned to immediately follow the system rollout as the single best way to resolve the issue. PSE&G published a project scope document that outlined the basic requirements of a field audit. The four key objectives included:

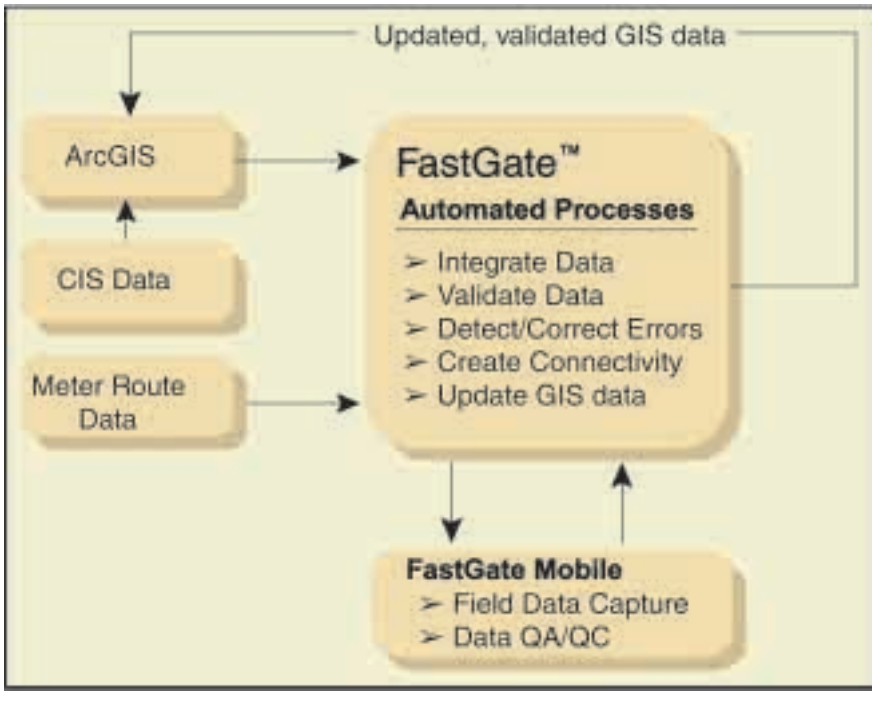
- Improve the customer-to-transformer connectivity to an accuracy level of 96% or better.
- Focus on areas with the most outages and the largest number of customer errors.
- Institute a maintenance process to ensure the ongoing accuracy of the data.
- Reconcile transformer and pole data per the customer survey.

Meeting these objectives would significantly improve the accuracy and responsiveness of the company's OMS system, while also reducing the manual workload of the system's end users.

It was generally acknowledged that PSE&G's network (circuit) connectivity down to the transformer level was good. As such, the main focus of the field survey was to correct the link from the transformer to the customer. Errors in facility information would only be captured and reported on an exception basis as the field survey team found discrepancies.

Selecting a Solution

Accuracy was key to the overall success of the cleanup effort. To be sure that the successful vendor could deliver the customer connectivity with at least 96% accuracy, the project scope included a small 5000-customer pilot area. At the conclusion of the pilot, several of the participating companies



The FastGate Mobile approach allowed fast, automated data collection and data maintenance.

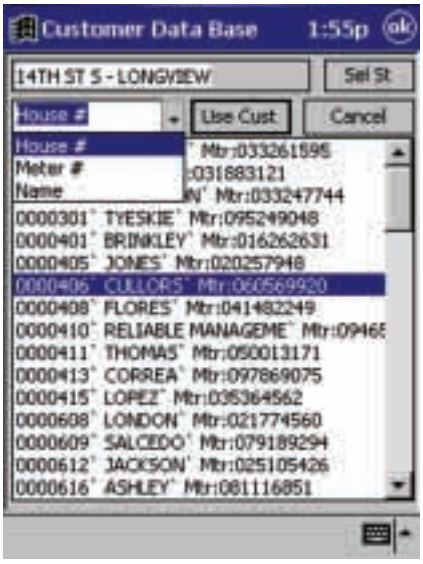
were able to demonstrate the accuracy of their approach, but only one could provide a turnkey solution at the desired price point in the time frame needed.

The solution from Osmose Utilities Services (Buffalo, New York, U.S.) included the use of the company's FastGate data-integration software to access and combine GIS and meter-reading data. The data is then downloaded to PocketPC devices fitted with GPS receivers. Osmose field crews would utilize the FastGate Mobile application and the geospatial data from ArcGIS in combination with PSE&G's meter-sequence route information to complete the field survey. The FastGate Mobile software provided detailed map data and customer information to field crews so that customer-to-transformer connections (as well as other targeted facilities data) could be added, deleted, and/or verified on the spot. The approach streamlined the data-collection process and eliminated the need for hardcopy. Only a small subset of the field survey data required manual data entry, owing mostly to versioning requirements of the GIS system.

PSE&G intends to use the FastGate Mobile software to automate the *quality assurance/quality control* (QA/QC) and data maintenance process. The same features that made FastGate useful for the data-collection phase of the project—automated download, embedded data validation, and the near elimination of manual data entry—also are expected to provide PSE&G with significant cost savings in the acceptance and ongoing maintenance of the data.

The ability to use handheld field devices was an important consideration. Laptop computers are expensive and difficult to manage in an environment where "walking" surveys may be required. By comparison, the small PocketPC devices are compact and relatively inexpensive, but still provide adequate functionality to support field-based data collection.

For PSE&G's purposes, the FastGate Mobile approach offered a flexible, economical and feasible solution. It was configurable, allowing for simple changes in process and data collection requirements. It also was easy to learn and easy to use. Finally, it ran on an inexpensive off-the-shelf Compaq iPAQ PocketPC device rather than a more expensive and cumbersome laptop computer.



CIS information is integrated with geospatial landbase and facility data from the GIS.

An 18-Month Initiative

In January 2002, Osmose completed the first phase of the project, involving 45,000 customers from PSE&G's southern division area. The purpose of this phase was to prove the proper operation of the software and work the kinks out of the various data exchanges before moving on to the large-scale effort.

The full-scale survey work began March 2002 and focused on those areas within PSE&G's territory with the largest number of circuit outages and the worst customer connectivity. Field survey work will continue until the project is completed in mid-2003, and will include all of PSE&G's 1.5 million overhead customers.

Lessons Learned

One of the key lessons of PSE&G's OMS/GIS project is that the importance of data quality can never be overestimated. While the use of sophisticated customer connectivity algorithms vastly improved the data quality over the legacy system, further cleanup was needed for both systems to deliver their full potential.

It is also important to think long term when it comes to investing in major systems and the data that supports them. In the case of OMS and GIS systems, connectivity data typically will change slowly but continuously over time. Therefore, there needs to be a commitment to the ongoing maintenance and management of the data, even after a bulk cleanup effort is complete. Companies making substantial investment in such systems must also be willing to make the necessary investments in training and tools to ensure the data stays accurate over time.

It is especially important to structure a data maintenance program so that it fits well in the company's larger business processes and systems. This can be a significant challenge, especially in the midst of a new technology deployment that relies on data that was not necessarily maintained in the past. Introducing new technologies and new data-collection requirements at the same time requires patience, continuous monitoring, and follow-up.

The solution PSE&G selected works well, because it provides an appropriate solution to a potentially time-demanding and large resource-consuming problem. It also works because of the company's growing awareness that accurate data is as important as sophisticated software. Technical solutions may be elegant and important, but without a commitment to accurate data, the value of most major technology investments can not be fully realized.

Bob Czyzewski holds a BS degree from the U.S. Merchant Marine Academy and an MBA degree from Temple University. As project lead in the business systems group, he is responsible for the conceptualization, justification, design and deployment of major computer applications. Previously, Czyzewski served as co-project manager for the company's first Automated Work Management System (AWMS) and project lead for the OMS component of the system.

Osmose Utilities Services, Inc.
980 Ellicott Street
Buffalo, NY 14209
800-877-7653
www.osmose.com