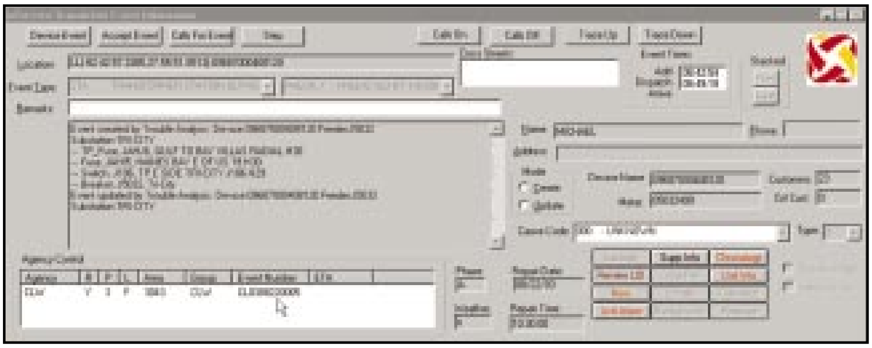
Fleet Tracking Enables Efficient Crew Dispatch

Progress Energy Florida integrates OMS, AVL to create mobile outage management system.

By Claude Pitts, Progress Energy Florida

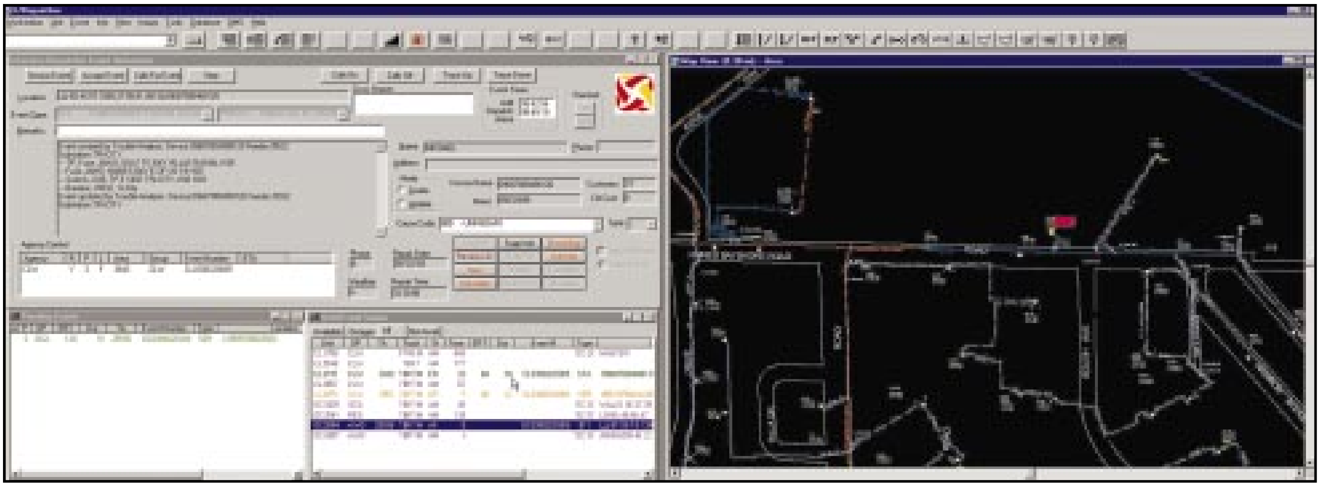
Earlier this year, a violent spring storm spawned a tornado that tore down seven spans of an electric feeder near Disney World (Orlando, Florida, U.S.), knocking out power to approximately 2000 Progress Energy Florida customers in Winter Garden. Within minutes, however, a dispatcher at the utility's distribution control center (DCC) in St. Petersburg had restored power remotely to more than 1800 customers by tapping into the integrated capabilities of automated outage management, mobile work force management, automatic vehicle location (AVL), and GIS-based facility-mapping technologies.



Call Taker: Real-time status information about outages is returned to the dispatcher/operator, who then relays that information to field crews and customers. Detailed information includes the predicted failed device, estimated repair time and event history notes.

As the storm moved across central Florida, distribution dispatcher Steve Magenheimer at the DCC monitored its impact in near-real-time on a map display screen showing the electric distribution system, crew locations and transportation network. Incoming trouble calls from customers triggered the outage management system (OMS) to trace the problems to damaged equipment, which appeared as outage icons onscreen. The OMS gave running totals of customers affected by each outage.

Magenhemier handled 30 outages in a two-hour period by consulting the map display to prioritize the problems by numbers of customers involved and to identify available trouble trucks. By viewing the relative locations of outages and crews onscreen, he then worked through the outages in descending order, assigning each to the closest



IDISP_All: With InService's detailed map display, dispatchers see real-time views as crews respond to regular and trouble-related work assignments. In this dual-screen presentation, the right view displays crew and work locations geographically in relation to the street and facility network. The tabular screen at left monitors crew and job status.

available truck. Crews in the trouble trucks received their work orders electronically inside their vehicles on mobile computers displaying the same outage location and distribution network information seen by dispatch.

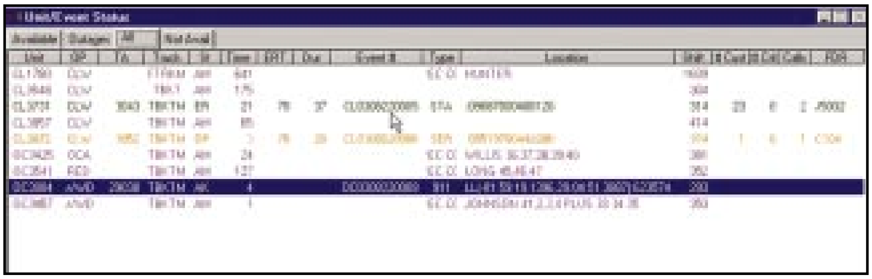
Each time a crew finished its task and electronically closed out the work order, the icon representing that vehicle location on the dispatch screen changed color, notifying DCC of the completed repair and the crew's availability. As the troublemen were able to handle another job, Magenheimer sent them the next closest outage assignment. This process cleared trouble tickets in half the time it took prior to automation.

The tornado-damaged feeder, however, was not as simple to repair because of the destruction of so many strands. Repairs would take time, and DCC wanted to get as many customers back online as quickly as possible. Conferring with the troubleman in the field via voice radio, Magenheimer devised a plan to isolate the downed wire and restore power on either side of the damage. OMS calculated that only 200 residences would remain in the dark for the duration of repairs if the isolation worked.

By viewing the distribution network map onscreen, the dispatcher pinpointed the downed line and remotely opened a 600-A switch in the field. This isolated the damage from the substation, enabling the feeder to be energized from the substation, which put many homes back online. By viewing the OMS screen, Magenheimer was able to watch the troubleman maneuver his truck through the maze of broken trees and fallen wires to the precise spot where the feeder line was still intact at the other end of the damage.

With the truck parked under the stand, Magenheimer viewed the truck's location onscreen and overlayed the feeder distribution map. By correlating the two locations, the dispatcher was able to determine where the jumpers could be opened safely to provide power to customers on that end of the feeder. Power remained shut off to the downed portion of the feeder, enabling the troubleman to conduct the necessary repairs.

Of the 2000 customers initially impacted by the outage, nearly 1900 had their lights back on within 35 minutes after the tornado passed through the area. Within just two hours, Progress Energy Florida crews had fixed or were working on every outage caused by the storm.



Unit_Event: This screenshot shows all crews, their assigned job and color coding that depicts job status, such as dispatched, enroute and arrived.

Achieving 100% Digital Conversion

Serving 1.5 million electric customers in 30 counties spread over 20,000 sq miles (51,800 sq km) of Florida, Progress Energy Florida counts itself among the handful of utilities that have converted to an entirely digital environment for the monitoring and mapping of its infrastructure and dispatching of its field crews. Progress Energy Florida credits this 100% digital conversion for its ability to respond quickly to outage events.

Then known as Florida Power Corp., the utility made the transition to the digital environment in phases beginning in 1997. It implemented FRAMME, a rule-based facilities management GIS developed by Intergraph Mapping and Geospatial Solutions (Huntsville, Alabama, U.S.), specifically for automated mapping of utility infrastructure. FRAMME is a GIS platform that enables utilities to create smart maps and graphics representing the complete distribution network.

Drawing upon an underlying database of feature attributes and connectivity rules, this geofacilities manage-

Replacing damaged poles and conductor along a busy right of way.

ment software accurately maintains the precise relationships among feeders, fuses, transformers, poles and other electric distribution devices. The geospatial software also represents the location of each infrastructure element in its true geographic position relative to a mapping coordinate system, which can then be used as a base layer to overlay other spatial information data sets.

At Progress Energy Florida, the digital workflow begins in engineering where construction and maintenance plans are drawn in the GIS. The built-in rule base ensures that designs are prepared properly with the connectivity of components automatically verified by the system. Work orders can be generated from the system, complete with detailed construction drawings for the crews to follow.

Adding OMS

The GIS' ability to correlate geographic locations with equipment components is critical to outage management. During the implementation of FRAMME, the utility also purchased Intergraph's InService OMS product and linked it to both the GIS and the customer information system. InService also can receive network status inputs directly from remote monitoring systems, such as SCADA, which is currently used to determine breaker status.

When a storm strikes and customers call the utility to report lost power, Caller ID identifies them by name and accesses their location address from the customer information system. This data is fed directly to the OMS which relates caller locations to the feeder, transformer, branch line or fuse serving those individuals. This helps pinpoint the potential cause of the outage. The results are displayed on the dispatch screen both as text and graphics.

On the map display screen, icons indicate the locations of outages and the equipment that may be causing them. This map screen is capable of projecting several layers of information, including the detailed distribution network diagram and the local road network. This graphical distribution information allows the dispatcher to further narrow down the possible source of failure. By viewing the outage data within the context of the transportation system, the dispatcher can determine which trouble crew is closest to the scene.

Going Mobile with OMS

Dispatchers relied on voice radio to direct trouble trucks to their next assignment until 2000, when Progress Energy Florida extended its digital environment to the field. The utility once again turned to Intergraph to implement its InService Mobile Workforce Management package, which provides an electronic gateway between dispatch and trouble crews. Integrated with automatic vehicle location technology, Progress Energy calls this solution a Mobile Outage Management System (MOMS).

MOMS consists of laptop comput-

Damaged light poles and trees.

Stringing new conductor.

Restoration in a busy intersection.

ers mounted in each of the utility's 150 trouble trucks. Using a wireless telecommunications protocol called CDPD, the InService Mobile software communicates with the DCC to receive work orders assigned by the dispatcher and to access distribution network maps from the GIS for field crew reference. The trouble men view the same outage information as the dispatcher, allowing them to see the big picture. In addition, access to network connectivity graphics gives field crews all the information needed to perform their tasks with minimal time-consuming voice communications.

AVL is the other MOMS component. Each in-vehicle laptop is linked to a CDPD modem and a GPS receiver. The GPS determines vehicle speed, heading and location to within 5 m (16.4 ft). The CDPD modem, which also handles reception and transmission of InService Mobile text and graphics data, sends the navigational data to the DCC for display on the map screen. As a result, dispatchers always know each trouble truck's location and status, making trouble ticket assignments more efficient.

The utility's experience with the AVL

Despite some early concerns by dispatchers and field crews that MOMS was a means of keeping better tabs on their whereabouts and activities, the entire utility is now firmly in favor of the new system.

has been so positive that plans are underway to equip the entire fleet of 500 vehicles with GPS.

Building Better Communications

Because of the increased efficiency of dispatchers using the OMS, Progress Energy Florida consolidated three dispatch centers into the central DCC in St. Petersburg. This centralization put a strain on the utility's three separate radio networks used for voice communication with field crews. In 2002, the utility began a multimillion-dollar program to install a 900-MHz Motorola radio network that includes construction of 56 transceiver towers.

Investment in the new radio network provides several opportunities to the utility in addition to upgrading its voice communications. For example, Progress Energy Florida is preparing a pilot project to test the network's suitability as a replacement for CDPD communication with the MOMS units. Although reliable in urban areas, CDPD provides poor coverage in many rural parts of the utility's service territory, making radio a more favorable option. The radio network also offers coverage overlap, ensuring that communication is not lost even if a tower goes down in a storm.

Another advantage of the Motorola system is its bandwidth. Aside from carrying voice and data between the DCC and trouble crews, the radio network still has capacity to handle more data. The utility is considering using it to relay SCADA data back to the DCC from substations in the service territory. The SCADA measurements could be fed directly into the OMS as another vital source of information to quickly and accurately identify the causes of outages in the Progress Energy Florida service territory.

No Big Brother, Just Better Service

Despite some early concerns by dispatchers and field crews that MOMS was a means of keeping better tabs on their whereabouts and activities, the entire utility is now firmly in favor of the new system. As was demonstrated in the recent Disney World storm and in Tropical Storm Gabrielle three years prior, OMS and the other automated systems have allowed the utility to respond to outages and restore power to customers more quickly, which is everyone's goal at Progress Energy Florida. ◗

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