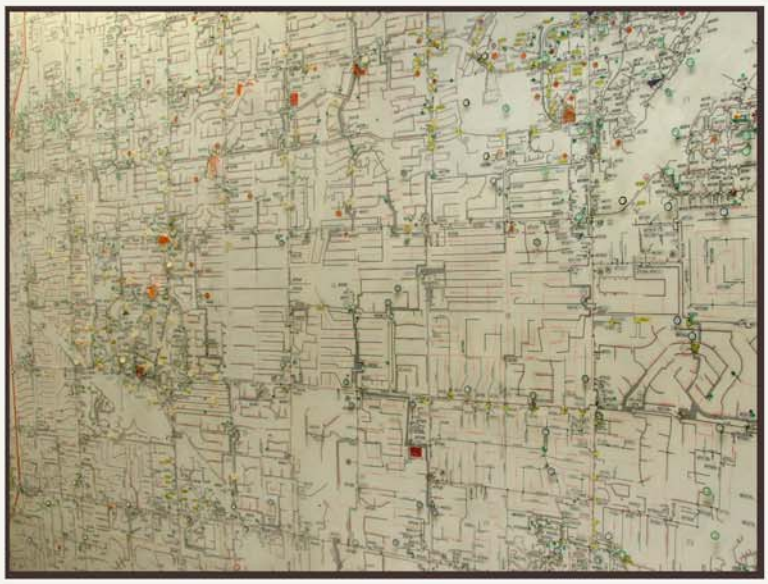
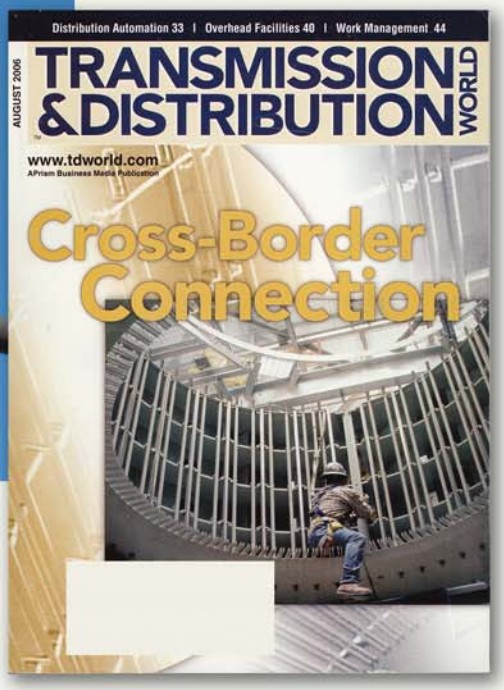
APS Moves Away From Old-Fashioned Wall Maps



Launches companywide phase ID program using the Origo Corporation PhaseID System



Article reprinted from Transmission & Distribution World
August 2006 Issue

APS Moves Away From Old-Fashioned Wall Maps

APS launches companywide phase ID program to build comprehensive mapping program for distribution system across entire system.

by Rufus Coleman, *Arizona Public Service*

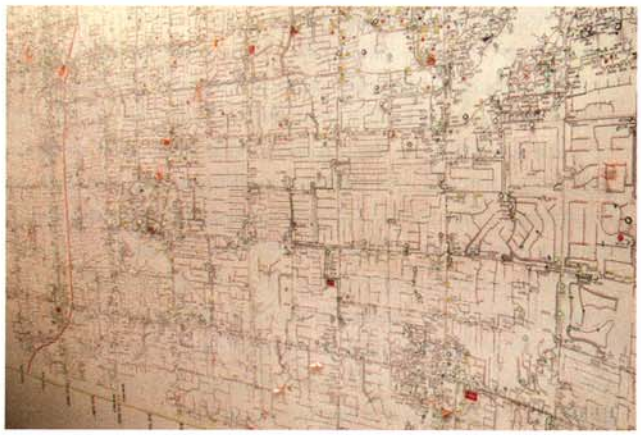
The workload for Arizona Public Service (APS; Phoenix, Arizona) field technicians doing phase identification has escalated in conjunction with an initiative called the Distribution Operations Management System (DOMS). APS is designing this new software system to replace wall maps, track outages in real time, and manage electrical loads, construction and repair crews. A win-win situation for field operations and system managers, the phase ID project is well worth the extra effort.

Like many utilities, APS currently relies on paper wall maps with color-coded pins to understand the big picture of its distribution electrical grid.

Computer systems at APS are in place to manage and track information on outages, repairs and updates to this grid. However, the tools used to compile all of the needed information into an overview haven't changed in decades—a common theme for most utilities.

APS believes the future will be a real-time DOMS with large-scale monitors replacing wall maps. This high-tech wizardry, which is being developed under the leadership of Gerry Boyd, APS's DOMS operations section leader, will replace the current process of updating wall maps with constantly changing information, thus providing a state-of-the-art system that provides electrical distribution operators with the most up-to-date information in real time. To get to this next-generation vision for operations management, a team of APS employees is collaborating to create the DOMS.

The DOMS will display high-level maps of the entire system or zoom in closer to view a single piece of equipment or a fault on a circuit.



Traditional wall maps and manual notations with pins and colored lines will be replaced with interactive 12-section LCD screens and a keyboard.

Managing and Monitoring

And while even the most-effective system requires some level of manual intervention, DOMS will be able to automate a great many tasks for the company. DOMS will allow users

An APS electric troubleman dedicated to the remote phase ID project prepares to acquire phase information and GPS location of the measurement.

The systemwide phase ID program includes verifying the phase on distribution circuits at APS's underground switching cabinets.

to quickly assess and respond to the needs of the electrical grid with an efficiently improved response time. It also will include predictive engineering functions in conjunction with a geographic information system (GIS), which APS has been developing since 1991.

The field probe (attached to the end of a telescoping hotstick) gathers overhead phase data by touching the conductor.

The need for this advancement is simple: growth. APS is Arizona's largest electric utility, providing service in 11 of the state's 15 counties to more than a million homes and businesses. Arizona is the second-fastest-growing state in the country, creating a robust customer volume for the utility. The company adds more than 40,000 new customers every year.

And while APS's traditional methods of managing electrical loads and its response to outages work well, there is a need for new technology to address the continued rapid growth. The company's goal is to not only address the growth, but to remain ahead of it. The objective of the DOMS project is to improve outage communications and reliability reporting, and further reduce customer power-outage durations. Improved customer satisfaction and enhanced safety practices are just a couple of benefits that would follow.

When the company first began researching systems that could meet its needs, it looked at what was already being done. After visits with seven other utilities that were implementing similar projects, APS concluded that none of them used systems in the exact manner that APS would. According to team members, the technology to create what APS desired was out there, but it hadn't been put together to perform such a unique task.

Phase Data Gathering

Before DOMS can be initiated, some preparation must take place. APS is going through a process of field-phasing verification to ensure the information in the DOMS correlates to what is out in the field. In a service territory that adds, on average, 10 new distribution substations each year and more than 125 new customers each day, that's quite an undertaking.

Field technicians, known as "electric troublemen" at APS, are conducting a comprehensive phase ID collection program that will ultimately result in a streamlined DOMS. The actual phasing is being accomplished by using an Origo Phasing Probe. This instrument, which weighs less than 3 lb, is attached to hotsticks typically used for overhead and underground primary distribution work.

Innovative technology allows the phase attribute of any energized conductor to be determined and pinpointed using a global positioning system (GPS) timing signal to simultaneously measure phase at a reference location as well as a field location. The phase measurements being taken come in a series of nine alphanumeric codes obtained from the field-phasing probe. The codes are processed by a local computer, which is local area network connected to the phasing base station. The codes received are precise timing signals from the various satellite atomic clocks.

In metro Phoenix, APS has four electric troublemen working on phasing related to the DOMS project. Five electric troublemen are also dedicated to the phasing and reliability inspection of APS's underground switching cabinets. Currently 17% of the project is finished, with overall completion anticipated in 2010.

The electric troublemen are departmentally assigned within the DOMS organization. The troublemen use GIS computer software—capable of integrating, storing, editing, analyzing, sharing and displaying geographically referenced information—to create sectional maps for the DOMS project. The maps will be in quarter sections and contain operating one-lines and switching cabinet details for field verification of the distribution phasing and system-operating configuration. GIS software tools allow users to create interactive queries, analyze the spatial information, and edit and update data. Phasing verification, system configuration and additional annotation are being recorded on the GIS field map and subsequently processed for update by GIS mapping personnel. It is a huge task.

Displaying the Data

One of the issues of implementing a system to replace the wall maps is finding a suitable graphic display. Only recently has technology reached a point where multiple monitors can be configured to work in unison. LCD monitors are the only current viable option offering the needed resolution.

To better understand the project, it is helpful to understand what the display will look like once completed. Twelve LCD screens will be matrixed to form a display encompassing all that would be found on a wall map. Again, APS had found that the technology to simulate wall maps electronically existed but had not been used in this way. DOMS will allow operators to work in pods with these screens, a keyboard and access to DOMS, the energy management system (EMS) and other critical operating data for managing the utility's electrical grid.

The DOMS display enhancements will allow the user to see high-level system configurations, zoom in for a closer view of a single piece of equipment, and access multiple views simultaneously. The displays will provide the operator with the most accurate, up-to-date information needed to keep the lights on, which of course is the company's ultimate goal. It will help operations to more effectively make judgments that enable workers to reconfigure the distribution grid during outages while managing the peak.

In the long run, the overall effect of DOMS will be a mass integration of APS services and systems. This will consolidate the systems at five distribution operating centers covering about 35,000 sq miles in the Phoenix metro area and four state regions into one as needed, such as after-hour operations. It also means a merging of computer systems. From this merger, DOMS will have the potential for quickly providing planning analysis, power-flow analysis and suggested switching tools to maintain the electrical grid.

APS's customer information system (CIS) provides a link to specific customer information used in customer service functions. The EMS is used by APS Power Operations to control and monitor the transmission system and generating units. During an outage, DOMS can show—in conjunction with EMS and CIS—what protective devices have tripped and how many customers are out of service.

DOMS will be supported by a new upfront GIS job-mapping process. The tool will allow engineering to better review system design criteria. Having all of the information from the various systems in one, DOMS will be able to tell operators if and where expansions are needed. It also will be specific about components that may need to be upgraded.

Field Crews Benefits

The implementation of DOMS will improve many of the ways APS does business in the future. The DOMS computer stations will be used to provide simulator training to new operators or load-management specialists, enabling them to hit the ground running. It will affect the areas of construction, operations, maintenance, data quality and customer care. For APS crews in the field, DOMS will offer crew management and call-out tools to better monitor manpower requirements. The systems' fault locater ability will also reduce the time necessary for troubleshooting to isolate faults.

Ultimately, though, it is our customers who will enjoy the greatest benefit. More efficient management and quicker response to the needs of the system will result in higher reliability and lower outage durations. TDW

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