

Background

Arizona Public Service (APS), Arizona's largest and longest-serving electric utility, serves more than 857,000 customers in 11 of the state's 15 counties. While other Western utilities were raising customer prices, APS (the largest subsidiary of Pinnacle West Capital Corporation) lowered retail rates seven times since 1993. During that time, they've reduced electric prices by 13 percent, saving customers more than \$800 million—the largest cumulative rate decrease among all investor-owned electric companies in the nation.

In the last two years, peak load demand has grown 15.2 percent. In the next five years, load growth is projected to increase nearly 30 percent. In 2001, APS experienced 3.7 percent customer growth—approximately three times the national average. Retail electricity sales increased 3.8 percent to 23.4 million megawatt-hours. This growing customer base also has increased the energy demand.

As a company, APS strives to remain flexible in the face of changing markets, yet it is unwavering in its commitments to increasing customer satisfaction and shareholder value.

The Issues

- Tracking thousands of miles of territory, practically countless miles of electric line, numbers of utility poles and substations
- Servicing one of the fastest growing areas in the US
- Big challenges for the sixth largest utility in the US

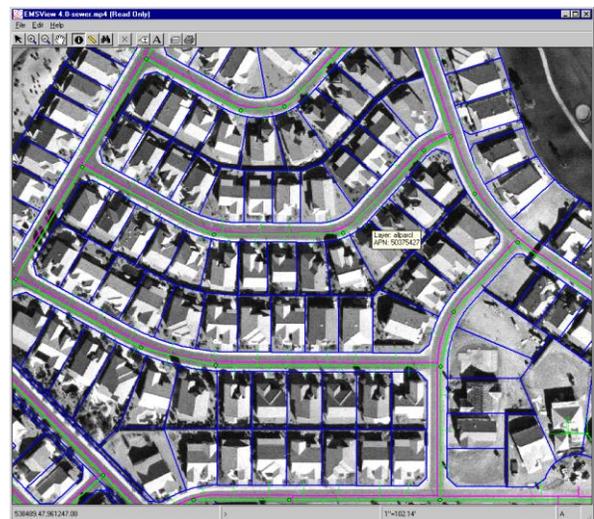
An important component of managing these challenges is a powerful GIS (Geographic Information Systems) system. For APS, GIS means having a geospatial database that includes all the facilities under its control, including transformers by type and size, as well as the locations of lines and utilities from the substations to the customers. When a customer calls with no power, the system makes it easy to locate the problem.

The Scope

APS covers 42,000 square miles of service territory, including half of metropolitan Phoenix's 960 square miles. With a service area that large, finding facilities can be a real challenge. Some facilities are over a hundred years old. Records get lost, people retire, and information disappears. Before GIS, APS would use maps to manually locate facilities. They would maintain ground view maps and underground maps, but they were not integrated. Also, accessibility was limited; field units relied on microfiche mailed out once a month.

Specifically, APS was looking for better ways to deal with the following issues:

- Tracking of outage problems as quickly as possible
- Providing access to current and complete field data for its field and office staff



- Providing methods for checking and updating data from multiple locations
- Quickly and accurately inventorying equipment by location and relative location

The Goals

APS saw that finding solutions to these challenges would improve service to its clients, make field crews more efficient and effective, and streamline communications and decision making due to consistent information. APS knew that the right solution had to be cost effective from the start, yet also be flexible enough for future growth. To this end, APS selected SchlumbergerSema in January of 2001 to convert their hard copy maps into ESRI GIS Format. This project is expected to be complete by the third quarter of 2003.[PJV: IS THIS DATE ACCURATE? IF NOT, WHAT IS THE REVISED DATE?]

Delivery of this data, which began in early 2002, exposed an issue of concern: How best to deploy this data into the field vehicles where it is needed most?

The Opportunities

Chuck Stevens of the APS IT Group had considered several solutions before asking for a presentation of EMSFieldMap by Engineering Mapping Solutions (EMS). Chuck liked what he saw with the EMSFM software and implemented it at several of the 12 APS districts. Results were so favorable that the EMS FieldMap software rollout has been continued statewide.

In addition to dealing with tracking and inventory monitoring issues, the EMSFM solution required little training and is fully compatible with existing ESRI software solutions already in place at APS.

“We saw this as a fantastic opportunity to field test EMSFieldMap in a broad territory of coverage,” says EMS Vice President Phil Ponce. “This is by far our largest single deployment of the EMSFM tool to date.”

The Challenges

The first—and biggest—challenge EMS faced was to come up with an efficient storage strategy for the 8-10 gigabytes of data currently housed in their ARCFM Geodatabase. Because its target storage is ESRI Shape format, EMS needed to have a conversion strategy from the Geodatabase that would allow “hands-off” export of the data on a regular basis. Working with APS programmers, they used ArcObjects to convert the themes to the proper Shape Files, as well as extraction of the Annotation features into an EMS Annotation database (Microsoft Access format), where it is optimized for quick display in EMSFM.

The next challenge was to implement a true type font library to ensure that the MapObjects display had the proper “look and feel” of the plotted GIS map. This involved customization of the databases and display code of MapObjects LT to handle the scale, display, and rotation of the custom symbols.

Lastly, EMS had to make sure the tool was customized to the user’s unique needs. APS has several issues that required a many-to-one resolution, such as many addresses to one parcel, and many transformer busses to one transformer. EMS made it possible for APS users to see these externally related databases when selecting the associated GIS graphic.

The Results

Many APS field trucks now sport the small rooftop antennae that indicate the use of powerful EMS FieldMap software inside. Updates to the database are sent out weekly on CD, instead of monthly on microfiche. Ground view and underground view maps are integrated into one view. The system has become an enterprise facilities database.

Here are a few actual stories that illustrate how the EMS FieldMap software is saving thousands of hours—and headaches!



These small antennae indicate that the powerful GIS and EMS FieldMap solutions are working inside. *Photo by Bobby Collum*

Off-Road Adventure

With EMS FieldMap, field teams have the data on their laptops. While searching for a power substation in the still rural town of Buckeye, an APS field crew found themselves at the end of a dirt road. Their traditional map showed the transformer to lie ahead of them—somewhere. With the EMSFieldMap software and the integrated GPS unit, the crew was able to search “off-road” to quickly pinpoint the brush-covered substation, saving hours and possibly days of searching the Arizona desert landscape.

Instant Inventory

On short notice, managers of a Pinal County area were called on to provide a listing of equipment, lines, poles, and substations in a specific 20-square-mile area. What could have been a nearly impossible task was easily accomplished in less than an hour using EMSFieldMap’s custom queries. The EMSFM software allows users to place an irregular polygon around existing GIS features, then export the selected data to an Access database which has pre-built reports that summarize the information.

Customer Satisfaction

An APS management area was threatened by a competitor during a contract renewal period. The client was concerned that APS wasn’t up to date with its inventory of the client’s assets. A short time spent with EMSFieldMap and the data from the client’s territory produced a report that more than satisfied the client, securing the account for APS.

Transforming Transformers

Over the years, APS found itself with the challenge of having transformers with duplicate names. Although each transformer should have a unique identifier, about 5 percent had the same name although they were in different locations. This created a problem; when grouping trouble tickets, crews could be sent to the wrong transformer. Now that all the operating numbers are in one database, it’s very easy to differentiate among them. The system has the ability to display the duplicates and easily identify the one causing the trouble.

Designing Efficiency

EMS FieldMap is also used by the designers in the office. They can see what substation they are bringing in power from, which phase is loaded, and which phase has available power. If a phase has, for example, 500 customers on it, the designers know to choose one of the other open phases.

APS continues to expand its application of EMS FieldMap software and find new applications for it.

About EMS

Founded in 1995, Engineering Mapping Solutions, Inc. (EMS) is a professional services corporation with expertise in digital mapping. EMS leverages the latest technology to provide its clients with cutting-edge solutions for GIS consulting, digital engineering solutions, mapping applications, and utility modeling. The company's founders, Martin Shaeffer, P.E. (President) and Phil Ponce, P.E. (Vice President), have over 30 years of combined expertise in engineering design, GIS, CAD, and database design, as well as an unparalleled passion for leveraging the power of technology for engineering solutions.

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