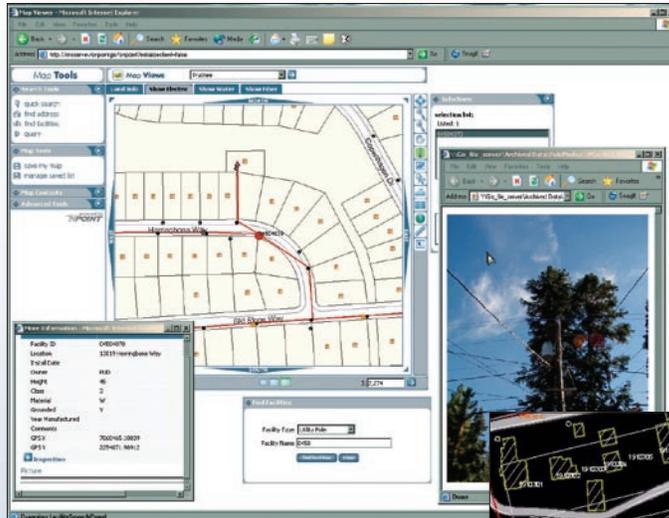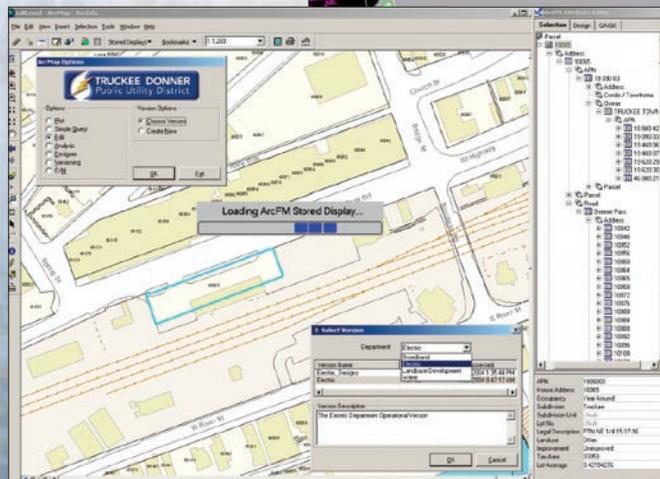# Truckee Donner Public Utility District Case Study

The Geographic Approach™—Transforming Knowledge into Results

Utility GIS Solutions for

- Company Dashboard
- Field Modeling and One Call/Locates
- Land and Asset Management
- Outage Prediction, Management, and Reporting
- Route Optimization and Meter Reading
- Utility Design Layout and Engineering

Truckee Donner Public Utility District Case Study

The Geographic Approach™—Transforming Knowledge into Results

The business of utilities is inherently spatial. A physical plant delivers a product to customers at a defined location. ESRI® geographic information system (GIS) software uses spatial location as the context for integrating a utility's information caches—data held by engineering, work management, accounting, and customer service departments.

Improved knowledge is transformed into better return on investment for infrastructure planning and maintenance, outage management, and customer service.

By integrating GIS into their information technology infrastructure, utilities can visualize the data through intelligent maps customized for each business activity. This geographic approach improves results for work processes, regulatory compliance, and customer service in

- Electric and gas distribution
- Water production, storage, and distribution
- Telecommunication and broadband services

You can get started with a GIS foundation for asset management, then grow it to incorporate business and operational activities and create a comprehensive, enterprise-wide business solution.

Truckee Donner Public Utility District (PUD) did just that—it started with a GIS for asset management and added new technologies and services for its electric and water businesses. Its current enterprise system, built on ESRI's GIS software, consists of a centralized master geodatabase that integrates work processes in electric and water services throughout the district.

Heavy winter snow obstructs utility infrastructure access in Truckee.

"ESRI GIS has allowed our PUD to see significant improvements throughout our organization by integrating it and making data available to the people who need it. We are now able to manage and respond to growth."

Stephen Hollabaugh, PE
Assistant General Manager
Truckee Donner PUD

The Truckee Donner Public Utility District is a nonprofit utility providing electric and water services in Truckee, California, in the Sierra Nevada Mountains. It distributes power and water to approximately 16,000 customers in a 65-square-mile area.

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Project History

The district's enterprise GIS improved its operation accuracy and efficiency and also provided a useful tool for everyday business needs. Implementation from the first ArcGIS® application took less than five years.

To stay within budget, the selected GIS software needed to be open, both in its ability to integrate different data formats and to accept multiple programming platforms. The software also needed to be usable off the shelf, yet be easily configured to fit the district's business needs. As a result, the district selected the suite of ESRI's ArcGIS and Telvent Miner & Miner's (TM&M) ArcFM™ Solution as the foundation.

Additional off-the-shelf applications added functionality and supported the setup and operation of an affordable but sophisticated GIS application in a short period of time. Further enhancements provided Web access and new field applications and completed a true enterprise GIS that integrates field activities with operations, outage, customer, and accounting information for the district's electric and water utility businesses.


A field crew removes a tree hazard from electric lines.

Sharing GIS Data—Community Relations

Because the district is a community-based cooperative, sharing and cooperating with other local service providers is a logical extension of its activities. Data sharing builds collaboration with other community entities and avoids costly data duplication. Data sharing has contributed to the success of projects such as

- Facility construction
- Fire responders' address and fire hydrant location
- Police radio coverage analysis
- School district zoning and boundaries
- Slope and runoff analysis

Timeline for Truckee Donner Enterprise GIS
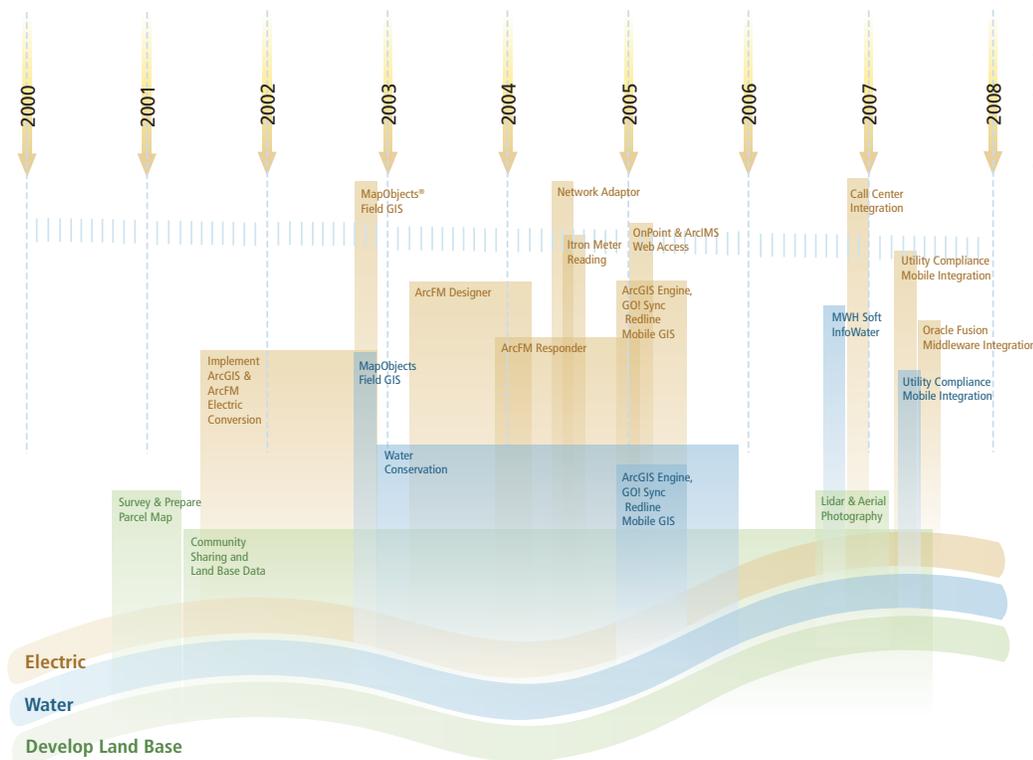
GIS Applications Drive Business Results

ESRI's GIS software delivers tangible, measurable business results. Enterprise GIS enables utilities to know their asset condition, deploy field crews, plan expansion, analyze community impact, and support customer service. With GIS, managers make better decisions, departments collaborate easily, and the interested public stays informed.
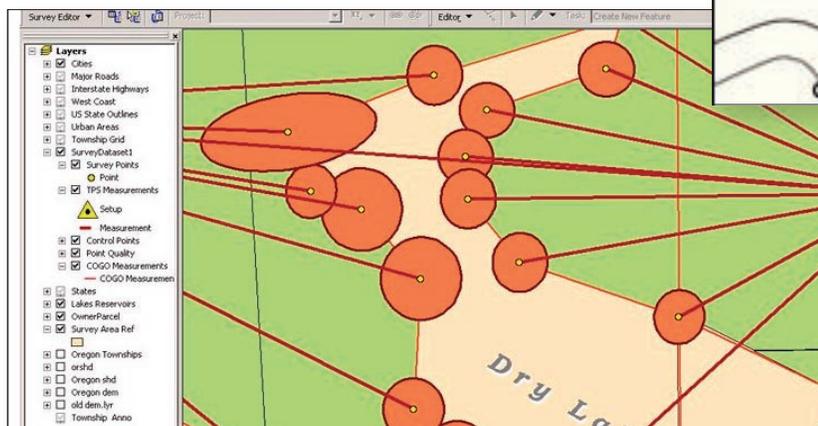
Truckee Donner Public Utility District implemented a variety of business applications using ESRI's GIS and benefits from the results.

Land and Asset Management

A first step in creating a GIS is building a basemap that accurately represents an area and includes important local features such as the location of the power grid. The district developed its own accurate parcel basemap in six months from available and acquired map data. It added local electric and water assets using survey methods, highly accurate Global Positioning System (GPS) devices, and ArcGIS Survey Analyst to ensure a minimum two-foot accuracy covering 65 square miles. Lidar images provided digital elevation data for creating accurate contour lines. Mapped electrical features include 6,000 poles and associated attachments, flow direction, connectivity, and phase configuration. Asset information is represented in geographic or schematic formats and can be exported to CAD format or linked to other reference materials such as photographs or manufacturer information.

"One of the critical roles of the GIS design set is that it gives the design engineer the ability to use a cartographic map to describe design ideas and communicate them to others."

Ian Fitzgerald
GIS Coordinator
Truckee Donner Public Utility District

Well-developed base data gives two-foot accuracy for relative positioning of facility features.

ArcGIS Survey Analyst software manages error ellipses of actual locations based on survey measurements and order of accuracy.

Benefits: The high-accuracy basemap set the stage for future savings by enabling facility information collection with both absolute and relative accuracy. It enables the design of new electrical and water infrastructure with 98 percent cost estimation accuracy because of the ability to measure distances and make analyses such as structural integrity or transformer loading estimates. Accurate maps also provide a way to calculate efficient vehicle routing for crews responding to water or electric service calls and to locate facilities even when hidden by heavy snowfall, both of which save time.

When building the district's water utility GIS, the accurate digital elevation model eliminated the need for a traditional cadastral survey, saving time and money.

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Company Dashboard

The district uses Orion Technology's OnPoint™ software to power the district's intranet application and, along with ESRI's ArcIMS® technology, present the entire district's data sources in a one-stop shop for users across the organization. On the company dashboard (a viewer displayed on a computer monitor), employees can see a combination of spatial and nonspatial data from the district's four different data servers. This includes information about customers, finances, outages, work orders, meter routes and locations, video files, photographs, and lidar and aerial photography.

About 80 percent of district employees are regular dashboard users, which exposes them to the power of GIS without having to use GIS processes.

Benefits: Field, office, and dispatch personnel engage in real-time data sharing, saving time and providing updated, correct information for the job at hand. Additional cost savings are realized because no custom software development is required for powering the intranet application.
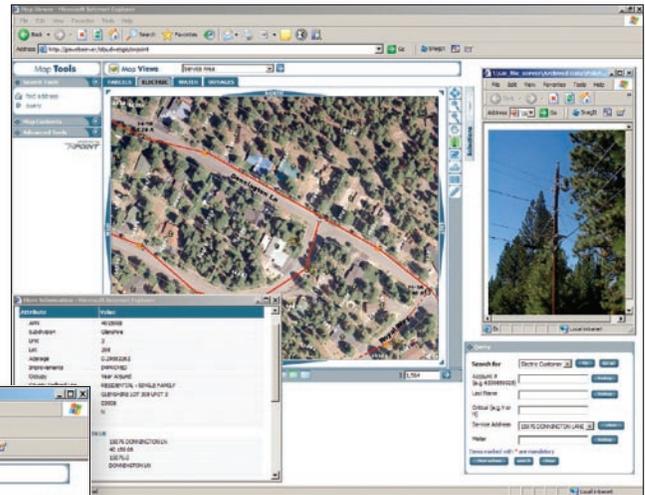
Photographs stored in a database or file base format can be linked to map layers and accessed through the Web environment.
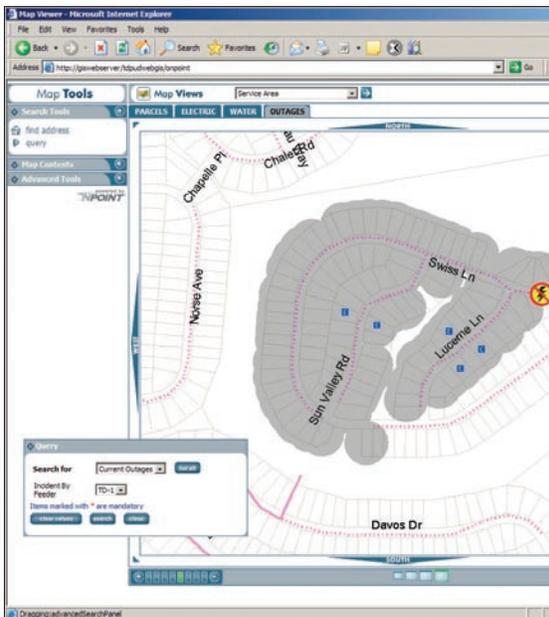
A map viewer gives nontechnical personnel access to parcel, electric, water, and outage maps.
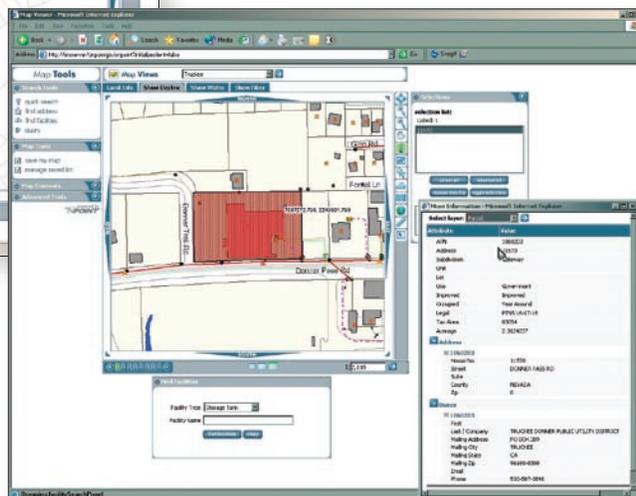
The Orion Technology, Inc., map interface makes the database available for queries and allows viewing of related spatial features.

Design and Engineering

By making facilities information available in a georeferenced database, GIS allows district engineers to run cost estimates, maintain map and data libraries, and model resources. Several of ESRI's many proven business partners provide personalized guidance and specialized application tools for design and engineering requirements.
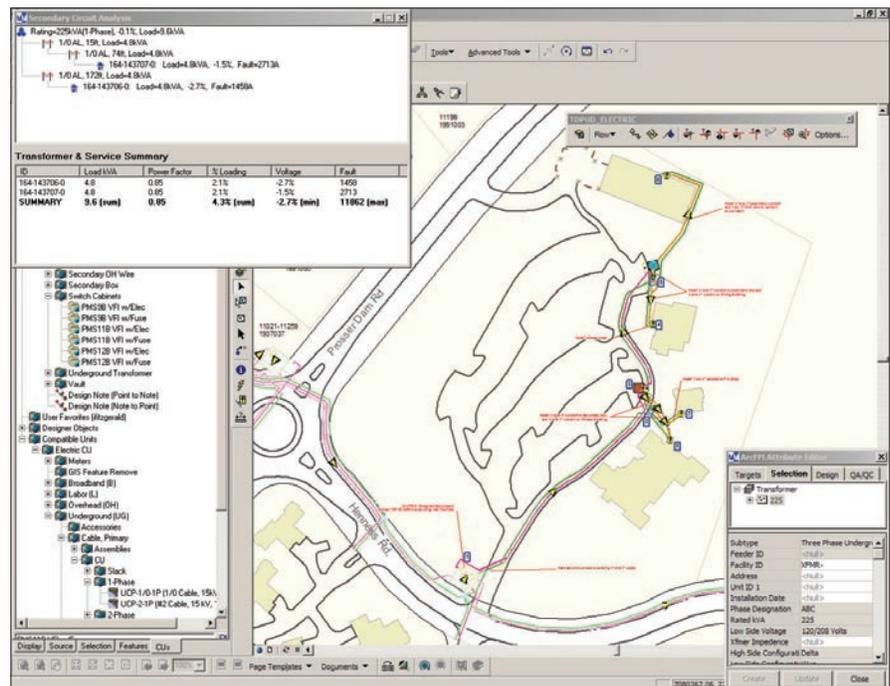
Project Design and Tracking

The district needed efficient and accurate ways to prepare construction work sketches, managed workflows, structural and network analyses, automated layouts, and job cost estimates. It needed to design and track power-distribution projects and also maintain distribution maps and data. Integrated GIS technology improved these activities by providing a single, up-to-date information repository and business tools for analyzing and sharing the data. The district chose TM&M's ArcFM Designer, built to work with ArcGIS, for electrical design.

Benefits: The ability to make instantaneous job cost estimates from design specifications saves an estimated $200,000 a year on electrical design projects. The use of Designer also reduces subdivision design time by two-thirds and transformer drops by one-quarter. Time for planning water utility maintenance outages now takes just one hour, down from more than a day. Communication between engineers and field personnel has improved because ArcGIS cartographic abilities and symbology improved maps and map sharing.

Cartographic Control

Custom extensions designed by POWER Engineers, Inc., improve ease of use for GIS design users by presenting an integrated look and feel for diverse applications and user screens customized according to the type of work performed. A POWER Engineers CAD integration tool enables exportation of GIS data to CAD format with dynamic labeling for better integration with outside developers.

ArcFM Designer provides tools for designing and tracking power-distribution projects.

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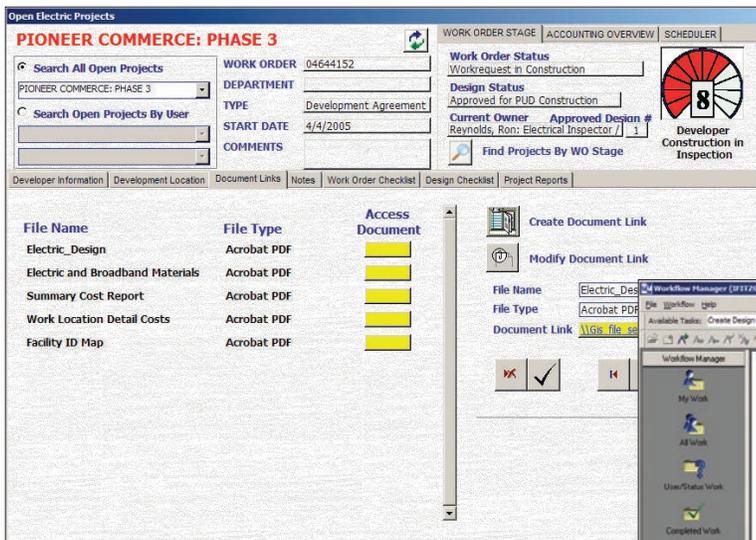
A projects extension gives easy access to integrated work order, scheduling, and accounting information on one page.
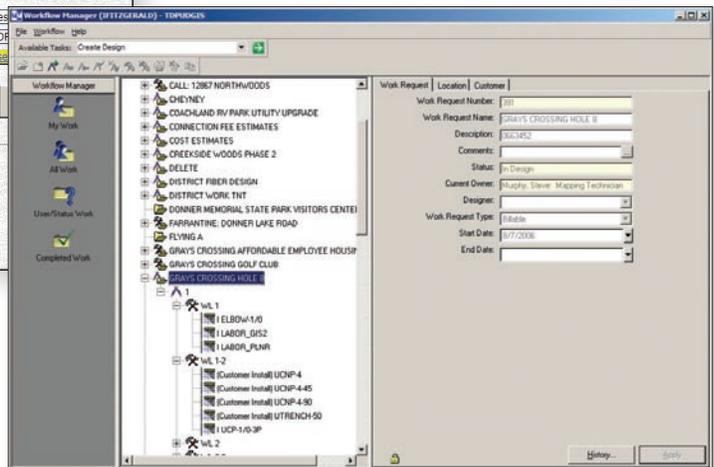

A workflow management extension centralizes control over work orders.

Electric and Water Modeling

The district chose two modeling software products. SynerGEE® allows them to make electrical switch and volt faulting analyses using GIS data. MWH Soft InfoWater® integration allows water modeling for any selected area and data importation of model elements into the geodatabase.

Benefits: Both technologies reduce time spent maintaining separate datasets and on previous time-consuming modeling approaches. The technologies provide more complete information, not previously available, for the engineer to model.

The district's MWH Soft InfoWater model improves facility maintenance planning, saves time, and increases accuracy during system design and when locating facilities. The model enables visualization of the aesthetic effect of new facility or water tank placements, which saves time and improves communication when presenting options for public approval.
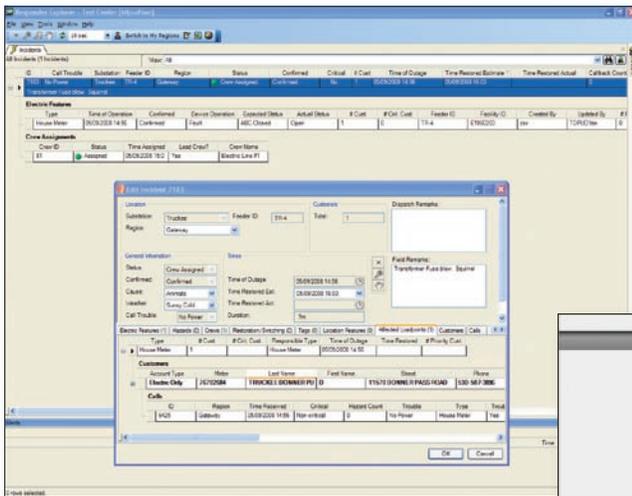
The ArcFM Responder outage management system displays trouble call information essential for dispatchers and provides data for performance reports.
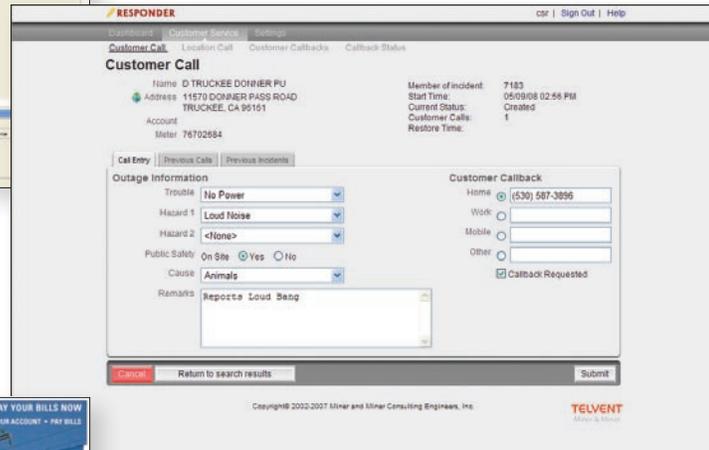
The outage management data-entry page uses the customer's address to establish location as related to the trouble call.
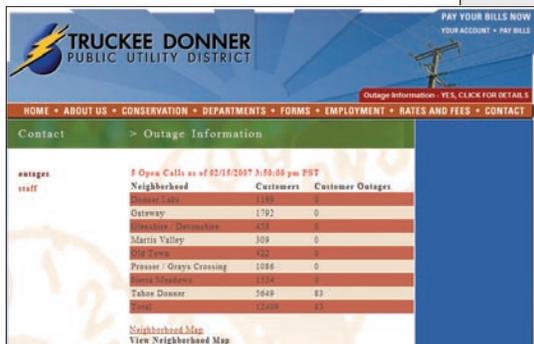
Customers can use the Internet to view outage summaries instead of phoning in for information.

Outage Management and Reporting

Utility outages require personnel to quickly locate an outage, correlate information, analyze the network, and dispatch a crew to the correct location. The district chose the TM&M ArcFM Solutions module, called Responder, to run its electricity outage management system (OMS). Personnel use it to consult a GIS-based view of the trouble area and affected network, analyze network connections, and dispatch and track crews in one operation. The ESRI ArcGIS Schematics extension generates online schematic diagrams of electric circuits used to determine switching scenarios during outages. Crews receive text messages identifying the most likely failed device and can return messages describing the situation and repair status. Responder helps personnel archive data and report on performance indexes. As a result, the district has an overall picture of the system's outage status and can share selected information with the public on a Web site. Call center representatives can view real-time outage maps and reports when fielding customer calls.

Benefits: Responder reduces the district's electric outage response time and improves ability to track outage statistics and reliability indexes. Customer communication is improved and current information posted on the Web reduces customer calls.

www.esri.com/electricgas

Field Use

Previously, district field personnel collected data with pen and paper. With GIS technology, personnel now use a stylus to enter data directly into handheld and mobile devices and transfer information electronically to a master database. ArcPad®, the ESRI GIS solution for mobile devices such as a Tablet PC, lets professionals take a current database to the field with the benefits of digital mapping, GIS, and accurate GPS integration. Personnel have tools that support business rules during the data collection process with easy-to-use features such as drop-down lists.

Field personnel also make handwritten diagrams and notes in the field using TC Technology's redlining technology, designed with ESRI's ArcGIS Engine, to add annotations (redlining) directly onto a map display. TC Technology's GO! Sync™ application transfers data quickly over a wireless Internet connection directly to the office's ArcGIS enterprise server. Notations are categorized as field observations in the data viewer until they are reviewed and officially accepted into the master geodatabase.

Field personnel can access the water or electric system models from the field and quickly analyze which valves should be closed or opened to permit repair work.

Benefits: Mobile solutions improve response time by 10 minutes per response. Mobile access to information saves time otherwise spent in the office. Mobile GIS solutions improve accuracy and resolution of customer problems, resulting in cost savings across the water and electric departments.
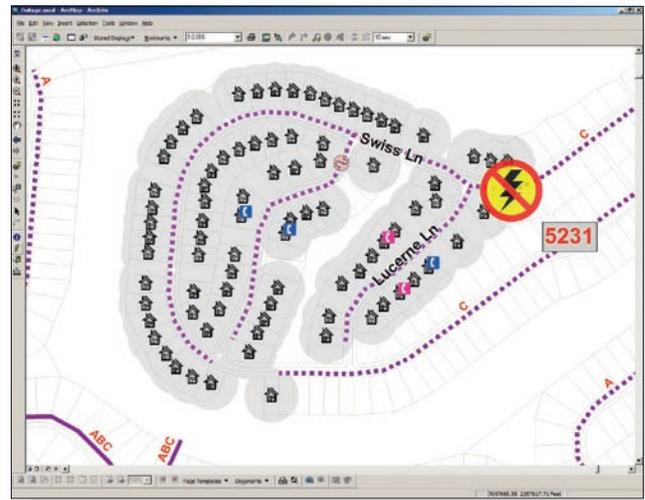
Combined call center trouble reports and utility network information help predict the extent of an outage.

The GO! Sync application enables data transfer and viewing in the field.

ArcPad mobile GIS software makes field data collection efficient and accurate.
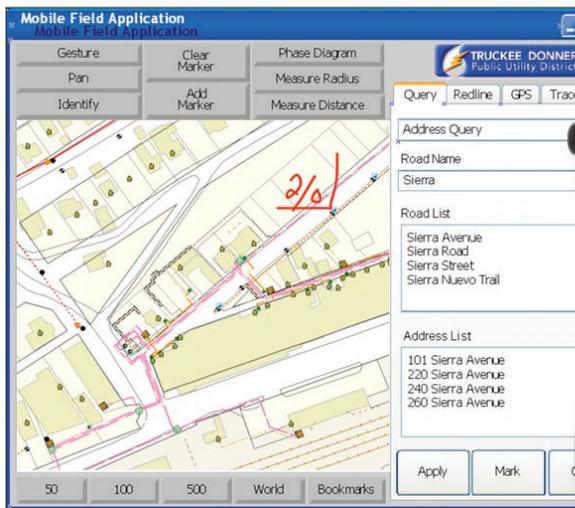
TC Technology's redlining technology, based on ArcGIS Engine, gives field personnel the ability to make handwritten diagrams and notations on a map display.

AMR/GIS Integration

One of the most time-consuming field activities is the traditional walk-and-read approach to meter reading. The district needed a way to quickly read meters and reduce the number of personnel and vehicles dedicated to this effort. Itron Inc. technology provides the district with radio-based data collection devices that allow automatic meter reading (AMR) of water and electric meters from a vehicle. Itron uses GIS technology to display a map with a visual confirmation of the read/unread status of each meter. Because they can see the meters' status, personnel can now skip driving down some streets because the meters were already read from an adjacent street.

Benefits: By optimizing meter reading and drive time, the district reduces electric meter-reading activities from multiple vehicles completing 11 routes in three days to one route completed by a single vehicle in just three hours, saving personnel time, fuel, and vehicle maintenance costs.

Map-based automatic meter-reading technology saves time and fuel.

Truckee Donner Public Utility District Technology Awards

- 2007 Geospatial Information and Technology Association Excellence Award for the Electric Industry

- 2005 National Rural Electric Cooperative Association's Most Innovative Technology Award

- 2004 ESRI Special Achievement in GIS Award

Web address
www.tdpud.org

www.esri.com/electricgas

Truckee Donner Enterprise GIS Architecture

Truckee Donner Enterprise GIS

- Number of Users: 50
- Number of Customers: 16,000
- Number of Full Editors: 4
- Number of Field Editors (Redline, GPS, Inspections): 8
- Number of In-House Viewers: 38

Software

- ArcGIS Desktop and ArcGIS Server
- ArcGIS Survey Analyst
- ArcGIS Schematics
- ArcPad
- ArcGIS Engine

Hardware

Client Machines
- Editors: Dell® PC on Windows® XP
  (2 GB CPU, 1 GB RAM)
- Viewers: Dell PC on Windows XP, Windows IE 7
  (500 MB CPU, 256 MB RAM)
- Field: HP tc4400 on Windows XP
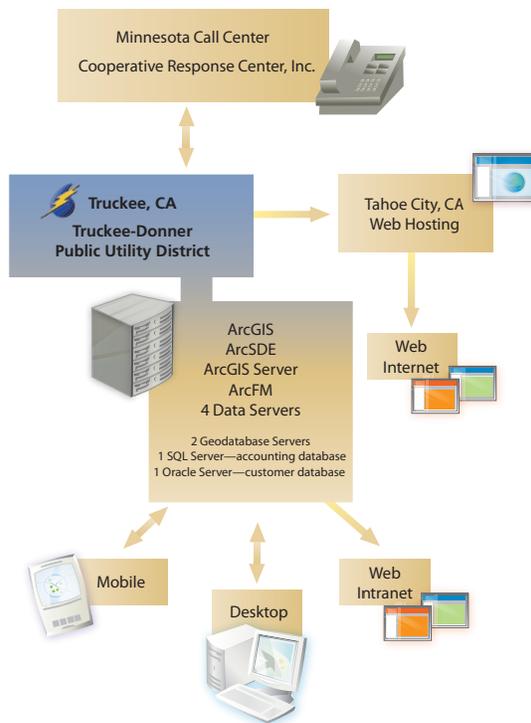 (2.16 GB Dual Core CPU, 2 GB RAM)

Network Access
- LAN 100 MB Switched Ethernet
- Wireless 56 MB Buffalo Airstation

Servers
- Data Servers: Dell 2 x 3.8 GB CPU, 8 GB RAM
  on Windows 2003 Server
- Web Server: Dell 1 x 3 GB CPU, 2 GB RAM
  on Windows 2003 Web Server

GIS Architecture

Minnesota Call Center
Cooperative Response Center, Inc.

Truckee, CA
Truckee-Donner
Public Utility District

Tahoe City, CA
Web Hosting

ArcGIS
ArcSDE
ArcGIS Server
ArcFM
4 Data Servers

2 Geodatabase Servers
1 SQL Server—accounting database
1 Oracle Server—customer database

Web
Internet

Mobile

Desktop

Web
Intranet

Partner Solutions

Advantica, Inc., provides ESRI-based utility software solutions including SynerGEE.

www.advantica.biz

Telvent Miner & Miner's ArcFM Solution is an enterprise solution for utilities.

www.miner.com

Orion Technology, Inc., offers off-the-shelf Web GIS products.

www.oriongis.com

POWER Engineers, Inc., develops custom GIS tools for file management and CAD integration.

www.powereng.com

TC Technology's Go! Sync field mapping software supports enterprise GIS data management.

www.tctechnology.com

Itron Inc. provides automated meter reading that leverages ArcGIS technology.

www.itron.com

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For more than 35 years, ESRI has been helping people make better decisions through management and analysis of geographic information. A full-service GIS company, ESRI offers a framework for implementing GIS technology and business logic in any organization from personal GIS on the desktop to enterprise-wide GIS servers (including the Web) and mobile devices. ESRI GIS solutions are flexible and can be customized to meet the needs of our users.

For More Information

1-800-GIS-XPRT (1-800-447-9778)
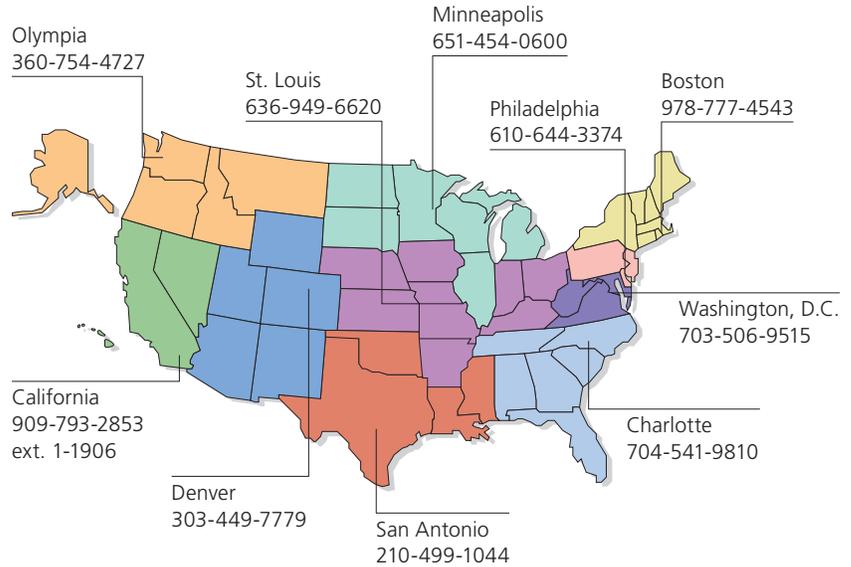
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