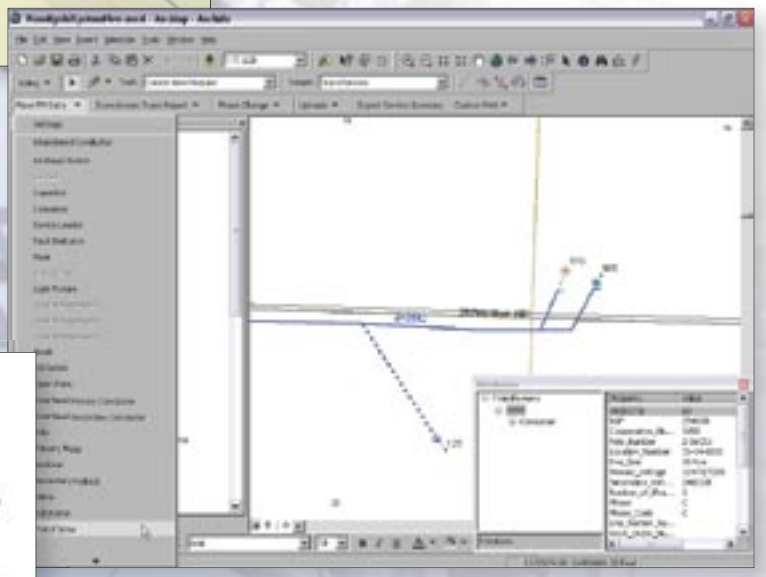
Municipalities and Cooperatives

ESRI GIS Technology Enabling Utilities



Asset Information
Internet Mapping
Multiservice Management
Outage Management
Regulatory Compliance
Staking
Workforce Productivity

ESRI

ESRI Technology

ESRI GIS Technology Enabling Utilities

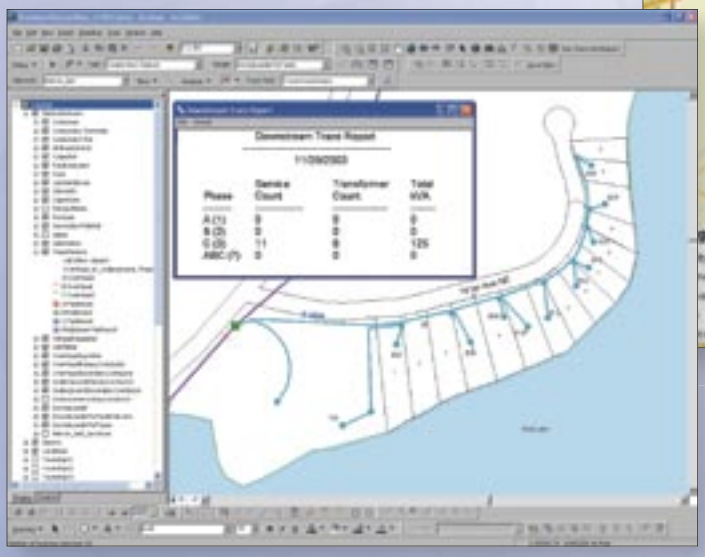
Municipal utility services and cooperatives are using new business strategies to better manage and improve utility services. Geographic information system (GIS) technology offers utility organizations a method of quickly accessing and producing maps, leveraging database information, and automating work processes. ESRI® GIS software is an open system conforming to information technology standards. Therefore, it can be adapted to a variety of constructs and respond to endless combinations of requirements and operations management tasks.

ESRI's software developers and business partners work together to help electric and gas utilities derive benefit and value from

- Improved service delivery and management efficiencies
- Efficient design and management of facilities
- Data sharing that supports decision making
- Collaborative efforts
- Decreased redundancy
- Visualization of data to create new information
- Support for daily work flows throughout the utility

Since 1969, ESRI has been helping people solve real-world geographic problems. A pioneer in geoprocessing tools, ESRI is wholly dedicated to GIS technology. Today more than 100,000 organizations around the world use ESRI software because it uses the leading ideas in technology for geographic information management.

Pole inventory map



A trace down from device map shows the primary lines to the connected consumers.

Getting Started

A Framework for Utility Management

ESRI has worked with the electric and gas community to support an effective and efficient framework for utility management. Together, this group has created data models that streamline system design for utilities, making GIS more accessible to cooperatives and municipalities with limited budgets. Data models are practical templates for implementing GIS projects. ESRI also works with national and international organizations, such as the National Rural Electric Cooperative Association (NRECA), to develop geospatial data standards and encourage interoperability between systems.

NRECA promotes the data and interface standard MultiSpeak™, which is the development component for the common data model for software regularly used by municipal and cooperative electric distribution facilities. Through a partnership with Origin GeoSystems, a part of Power Delivery Associates (PDA), ESRI offers the ArcGIS® energy model MultiSpeak. Utilities that use the MultiSpeak data and interface standard are able to foster the development of software that can be integrated without the need for custom interfaces. It is available at Origin GeoSystems' Web site www.origingeosystems.com.

MultiSpeak®2 compliant

ArcGIS Data Models for the Utility Industry

- Electric Distribution
- Electric Transmission
- Gas Distribution
- Energy Utilities MultiSpeak
- Land Parcels
- Pipeline
- Telecommunications
- Water Utilities

Case Study—City of Mesa, Arizona

The city of Mesa Electric Division in Arizona migrated from its old GIS to ESRI's ArcGIS and Miner & Miners' ArcFM™ MultiSpeak solution. The city of Mesa Electric Division also provides water, wastewater, and gas utility services to the greater Mesa area. The city's decision to migrate was based on the need to better support the city's various business requirements. Staff members believe that ArcGIS and ArcFM MultiSpeak technology gives them the flexibility to integrate future systems, and the associated data model provided the level of detail needed for their business operations. With the updated system in place, the city can better manage, integrate, and maintain its data.

The implementation of the new GIS project required data migration. This included data cleanup efforts to improve the accuracy and consistency of the system data. The tools in ArcEditor™ and ArcFM enable the city to quickly identify and correct data issues such as disconnected sections, loops, and double-feeds. For example, ArcFM Feeder Manager uses ArcFM auto updaters to update the feeder identification and other feeder-related information for all features.

The GIS Work Flow Advantage

ESRI's GIS is database oriented and, thus, handles data in a single, seamless database, called a geodatabase, rather than a cache of tiles. The geodatabase can be accessed by multiple users in the office, in the field, or via the Internet using ESRI's ArcGIS Desktop, ArcGIS Server, and mobile products. Utilities are taking advantage of the new streamlined work flow capabilities available through ESRI's GIS software.

Case Study—Fort Pierce Utilities Authority, Florida

The Fort Pierce Utilities Authority (FPUA) recently migrated some of its electric CAD operations into GIS and currently maintains a dual CAD and GIS system. FPUA employs approximately 250 people who serve more than 24,000 electric, 15,000 water, 12,000 wastewater, and 4,700 natural gas customers in Fort Pierce and portions of St. Lucie County, Florida. FPUA wanted a system that worked with an intelligent technology database. Because the utility had a limited initiating budget, engineers chose to do the CAD data conversion in-house. They also believed that by doing their own conversion, they would gain very strong understanding of how GIS works.

ESRI demonstrated how FPUA users could convert their data; put it into a geodatabase; and apply GIS functionality such as editing, map book production, and symbology. FPUA was able to complete the migration in-house and have the advantage of locating its CAD files in a seamless database. Engineers also implemented ArcSDE®. FPUA's employees built an intelligent database that is object oriented.

ESRI's GIS software has features that enable integration of CAD data despite the differences in data models. ArcGIS, for example, can display CAD data in DGN, DWF, and DWG files directly and in the same map can display the data as GIS layers. ArcGIS symbolizes CAD data as defined in the CAD file. Thus, the user can still see CAD data in the native CAD format. Furthermore, by using certain GIS tools, the data can be adjusted to fit the land base map better.

ArcGIS creates data integrity, which makes data integration a feasible option for other FPUA departments. ArcSDE offers users better productivity. Because of fast access to maps, as well as the data behind the maps, ArcSDE also improves data quality control.

With the GIS in place, FPUA is working to bring the natural gas and fiber-optic telecommunication service databases into the GIS as well as to integrate them with the water service and wastewater collection GIS. This will complete the desired goal of an enterprise system. GIS can do complete systemwide tracing, create service area summaries and reports, and offer more automated mapping.

CAD data is placed into a seamless database so that the existing tiled CAD data can be made to perform seamlessly inside the GIS.

Case Study—City of Leesburg, Florida

The city of Leesburg, Florida, uses GIS in many of its departments to keep costs low and service quality high. The city's municipal services are launching GIS applications, currently in pilot stages, which are tailored to each service's needs.

Leesburg's different municipal services were on multiple software platforms, and the maps were in a variety of formats. For its new GIS, Leesburg chose to use ESRI products because of the software company's solid reputation. It then added Miner & Miner's ArcFM to its ArcGIS platform for providing facilities management solutions.

A needs assessment indicated that GIS should have a wider user base than originally imagined. It was initially thought that the city's eight-member GIS division would be the principal users. After the needs assessment, it became clear that other departments wanted to use GIS, so the city decided to make GIS available for engineers in the electric and gas departments to use it for network design.

Miner & Miner partnered with ESRI on developing a data model for the city. It is tailored to specifications of all seven utilities. For example, domain changes were made to show the type of materials that workers use. Also, preferences in terminology were modified to specific department language usage.

The utility group has relied heavily on this function in its CAD environment, so it wanted a strong tracing function. Therefore, designing a tracing application was given priority. Staff is designing the application in-house using Miner & Miner's Designer software. Designer provides an integrated environment for preparing construction work sketches, work flow management, structural and network analyses, automated layouts, and job cost estimates. It provides an automated means to update the baseline corporate GIS database based on changes to the electrical, gas, and water distribution facilities shown on a work sketch. This helps engineers create different versions for planning, extending lines, and so forth.

The city of Leesburg contracted out the facility's inventory with Southeastern Reprographics, Inc. (SRI), who recorded facility data using GPS. This helps staff members see results right away because they can lay data over aerial photography and see how well it matches. This has been useful for making adjustments.

Network gas lines layered on aerial photograph

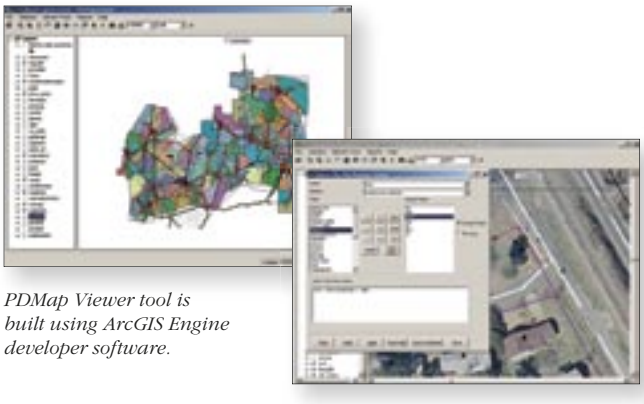
Case Study—Gibson Electric Membership Corporation

Gibson Electric Membership Corporation (EMC) in Trenton, Tennessee, made the move from paper to digital maintenance of its asset management data. By migrating from another GIS to ESRI software, the co-op now has a system with flexibility, interoperability, and rich functionality. Gibson EMC also wanted a flexible map viewing solution that could be used by customer service representatives, engineering, dispatch, field personnel, and staking technicians and offer functionality specific to their job functions. Embedded GIS applications that support daily work routines were the answer.

Gibson EMC uses the Patterson & Dewar Engineers (P&D) PDMap-GIS software program for the update and maintenance of Gibson EMC's AM/FM/GIS data. Using ESRI's ArcGIS Engine software, P&D was able to deliver PDView, a viewing software solution specifically designed to view its current geodatabase.

Now Gibson EMC is able to view spatial data in the office or in the field. A key advantage of using PDView for this solution is that now it is possible to perform functions previously unavailable in many viewers. The viewer solution gives users the ability to trace, find upline devices, perform complex spatial searches, link to other data systems, log outages, and print maps all from a central viewing product.

With ESRI's ArcGIS Engine, program developers such as P&D can use the programming objects associated with many ESRI core products. Gibson EMC plans on taking full advantage of this new technology by working with ESRI and P&D to implement an outage (PDOutage) and staking (PDStake) solution being built using the same ArcGIS Engine.



PDMap Viewer tool is built using ArcGIS Engine developer software.

Asset Management and Regulatory Compliance

Power companies are required to comply with environmental regulations, inspection directives, dig programs, tax laws, and many other agency mandates. Companies can leverage their databases with GIS technology to meet the demands of these mandates and provide regulatory agencies with compliance information.

Case Study—City of Painesville, Ohio

Municipally owned electric systems need to comply with government reporting guidelines. The Government Accounting Standards Board (GASB) has issued guideline 34 that requires detailed financial statements about the full cost of providing services. Utilities and public works agencies need to produce acceptable methodologies and practices for infrastructure maintenance to support the reporting and depreciation requirements of GASB 34. An infrastructure inventory for the past 20 years is also included in the requirement.

The city of Painesville, Ohio's utility services include water, electric, storm water, and sewer services. The city has set up a system for government regulation compliance by using GIS. The windfall of meeting the government requirement is that Painesville's GIS also supports asset management for electric operations, system maintenance, and capital improvement planning.

The city contracted with Metcalf & Eddy (M&E) to implement a GIS for utility management built on ArcGIS. The first GIS project was for sewer services. Its success led to applications for electric and water services. M&E set up the GIS database structure using ArcSDE. A utilities data collection service, TransMap Corporation, performed citywide infrastructure data inventory including manholes, utility poles, roadway systems, traffic signals and signage, fire hydrants, and so forth.

A pole inventory included poles both inside and outside city limits. Pole information was gathered on handheld computer devices with ArcPad® and GPS. The pole inventory list includes pole tag information, pole type, attachment types, number of primary and secondary wires, and line voltage.

To meet the GASB cost-out requirement, Painesville uses a publicly available materials cost index history. This cost is input to the GIS model along with other tables containing infrastructure information. Tables are related to each other using common identification features. GIS connects the tables to a basemap to produce infrastructure map data layers.

Beyond regulatory compliance, GIS provides other benefits. With the pole inventory data, the city can manage and audit joint pole use, thereby increasing revenues. The infrastructure inventory can be used to create an accurate GIS circuit map. GIS is also proving useful for Painesville's capital improvement planning. For example, it can be used to estimate a projected road replacement cost.

In Phase 2, the city will complete inventories of the sanitary sewer system, the storm sewer system, and the municipal water system. In Phase 3, the city plans to implement an automated work order system. The city is also considering GIS as a spatial analysis tool for public safety, land use and environmental planning, economic development, and capital planning for infrastructure maintenance. Because GIS supports many city functions, Painesville is developing management strategies for coordinating data flow between multiple agencies.

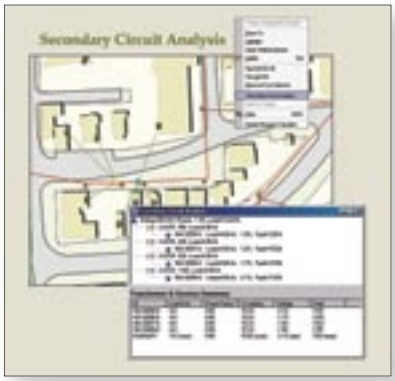
Pole inventory map

A citywide infrastructure map shows many city service departments with detailed asset information.

Multiservices

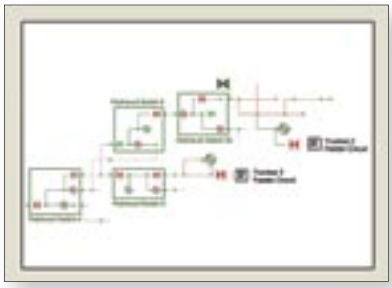
Case Study—Truckee Donner Public Utility District, California

Truckee Donner Public Utility District (PUD) provides electric and water service to the town of Truckee, located in the central Sierra Nevada Mountains in California. It provides electricity and water and is in the process of launching its telecommunication services. Truckee Donner's geodatabase model provides a central, versioned, spatial data repository. It also offers flexibility for integrating other platforms and has advanced modeling capabilities.



Secondary Circuit Analysis

Miner & Miner's (M&M) ArcFM Secondary Circuit Analysis tools help engineering staff members determine the optimal transformer size based on the number of customers and size of the businesses served by that transformer. It also helps staff members determine transformers that may be overburdened.



ArcGIS Schematics

The ESRI ArcGIS Schematics extension uses electrical network data to generate one-line schematic diagrams of electric circuits.

Feeder Manager

M&M's Feeder Manager directs every aspect of Truckee Donner's electric utility model. It determines flow direction and connectivity and enforces network business rules.

Pole Analysis

Truckee Donner maintains more than 6,000 distribution and secondary poles. Its electric model contains pole and attachment information on each pole, allowing engineering staff to conduct analysis to determine the structural integrity and guy placement for each pole. The utility also models the phase configuration on the cables attached to poles.

Advantica SynerGEE

Advantica SynerGEE provides an electric network analysis tool helpful in circuit analysis and switching scenarios. The GIS model allows data to be exported quickly and easily to the SynerGEE tool, negating the need to maintain duplicate data.

GIS in the Field

Combining GIS with mobile technologies, such as global positioning systems, synchronizing technologies, and automated vehicle location systems, provides utilities with mobile solutions that save time, focus resources, and capture accurate data. ESRI's ArcPad supports field data inventory and staking tasks. ArcReader™ provides a digital field map book that can be updated. ArcLogistics™ Route is an efficient fleet management tool. ESRI's mobile solutions bring office technology to the field for work processes such as work tickets, inventory management, and even cost application. GIS mobile solutions enable those working in the field to better service the utility's service territory.

Case Study—City of Burbank, California

The electric division of Burbank Water and Power (BWP) is improving the way geospatial information is deployed to and from field personnel by using cutting edge technology for its mobile GIS applications.

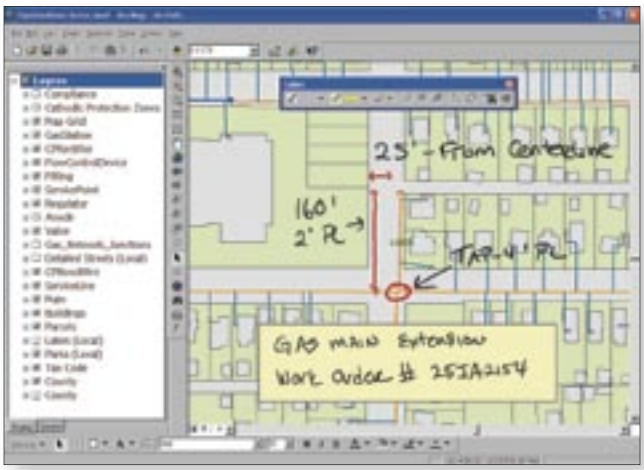
The municipality was already using ESRI's ArcGIS software and Miner & Miner's ArcFM for its enterprise GIS. But it was wrestling with the processes of decoding field notes, entering valid information into the geodatabase, and redistributing new paper maps. It found a solution. By taking the Microsoft® Windows XP Tablet PC edition operating system into the field and combining it with GIS and wireless geodatabase connectivity, Burbank Water and Power has placed the power of an enterprise GIS on a device that can be carried in one hand.

Using Tablet PCs equipped with ArcEditor, field-workers create redline notes directly on the map with a digital pen. With ArcEditor, digital ink can be stored inside the map document file (.mxd) or within the corporate geodatabase. Examples of GIS functionality include the ability to make notes about a specific geospatial location, highlight features on a map, sketch shapes that indicate GIS editing tasks are required, create thematic redline layers, and mark the site of a damaged asset or dangerous condition. By using Tadpole Technology gesturing tools, the user quickly and easily navigates and annotates a GIS map, without the use of an awkward keyboard.

Once uploaded to the company's database, the information can be viewed across the enterprise on both Tablet PCs and desktops. To accommodate shared data, Tadpole Technology's GO! Sync™ is used to move the electronic annotations directly into the geodatabase. GO! Sync provides secure data reception and transmission across the network, requiring minimal interaction with the mobile users. Burbank's solution takes advantage of 802.11 wireless network features built into the Tablet PC, ensuring that mobile work teams are provided with accurate, up-to-date geospatial information in the field.

Engineers receive a redline map layer from the file, make edits, and enter them into the geodatabase. The engineer erases the red layer and returns the clean digital map to the field-worker. This dramatically reduces paper printouts, improves data entry, and decreases data update turnaround time. Engineers no longer have to maintain the personal geodatabase on disconnected field units. Instead, GIS maintains it automatically.

Burbank Water and Power has a local area network (LAN) that works with the built-in 802.11 wireless feature of the Tablet PC. This makes it possible for field supervisors to access the enterprise geodatabase in the field. The 802.11 antennas that support wireless communication are strategically set within the 17 square miles of service area. A supervisor enters an antenna zone and performs direct data exchanges between the mobile computer and the company's GIS. The Tablet PC receives an update packet, and in turn, field edits are posted back to the enterprise geodatabase via GO! Sync. The 802.11 wireless antenna can easily serve 50 people at one site. This growth capability is important to the municipality because the city plans to extend the solution to its water and telecommunications services.



Microsoft Windows XP Tablet PC Edition and ArcMap application

Case Study—American Samoa Power Authority, South Pacific

The South Pacific islands are located in an area that is vulnerable to dramatic shifts in weather patterns including typhoons, cyclones, and droughts. In preparation for the inevitable typhoons that devastate its island community, American Samoa Power Authority (ASPA) implemented a GIS that supports day-to-day utility operations and will assist the power authority with future storm restoration efforts.

ASPA turned to ESRI for its GIS solution. It also called upon the United Services Group (USG), an ESRI business partner, for its automated staking application ADELINE™. USG helped ASPA convert its legacy system to ArcGIS.

ASPA's asset data was converted to operate in a geodatabase. As part of the conversion, USG also provided a wall-size printed map of the island of Tutuila showing all of ASPA's electric facilities. This was the first time the power authority had the ability to produce a wall map of the entire island that includes electric facility attributes. USG provided training to staff members on ArcGIS, ArcPad, ADELINE, and the use of GPS equipment.

Today ASPA is staking all new lines and services with the ADELINE automated staking software and using the data it collects to keep the ArcGIS system up-to-date. ASPA staff is currently using Microsoft Pocket PC-based GPS collectors and ArcPad to perform a system inventory of the entire island of Tutuila. This data will be used to ensure that ASPA maintains an accurate facility database of everything on its system. Having up-to-date, accurate information readily available helps staff members reduce outage time and manage restoration efforts.

Since very little map data existed, it has been difficult in storm situations to coordinate operations on multiple islands that are several miles apart. ASPA is working hard to collect data for the geodatabase. The utility company will continue its GPS inventory of facility data on other islands of American Samoa and the Marshall Islands.

Case Study—Laurens Electric Cooperative, South Carolina

Laurens Electric Cooperative (LEC) uses mobile GIS solutions to improve its field service crews' daily work processes. The cooperative's GIS is built using ESRI, Miner & Miner, and Telcordia Technologies-Geospatial Solutions Group GIS software. LEC's central seamless database is integrated with the customer information system (CIS)/financial software and outage management system (OMS).

LEC found significant benefits to using GIS in the office and decided to extend it into the field. Field crews had been using paper map books to locate assets in the field, and the cooperative had a difficult time keeping the data current and accurate. LEC sought a mobile solution that easily could be used by field-workers, improve data capture, and work seamlessly with the existing GIS. LEC decided on ESRI's ArcPad because of its functionality and low price point.

Telcordia Technologies customized ArcPad to create Field Viewer, a tool for data collection and redline staking. Crews simply plug their field laptops into the network and download updates of the entire service area from the GIS database. Downloading data from the main database takes an average of three minutes. Field-workers use Field Viewer for viewing, querying, and locating assets. Tools such as pan, zoom, and find make access to data at different scales easy. A crew member can zoom to a particular map site, and attribute data is instantly visible at the appropriate scale.

The worker can view substation and associated circuits in coded colors for rapid identification of circuit areas and phases. Field crews can quickly identify power source sites.

Intelligent geographic data that can be edited on the fly in the field saves the crew time in the office. LEC's GIS mobile solution eliminates printed map books, reduces production costs, lowers radio dispatch traffic, and provides its field personnel with the most current view of the facilities network possible.

Custom locate tools allow field personnel to quickly find locations and information associated with the map features.

The preset configuration allows field GIS users to visually analyze circuit phase configurations to support field activities such as troubleshooting customer outage calls.

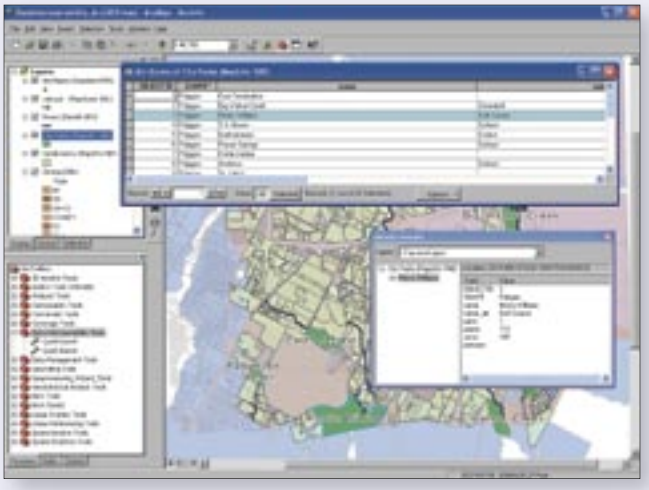
The Inspection Tracking extensions to ArcPad allow for the accurate entry of inspection data about various facility types.

Integration

GIS is considered enterprise when by design it is part of the overall information technology (IT) architecture of the company. This implies that GIS is integrated with the standard corporate systems such as outage management, customer information system, or back-office systems. Therefore, the utility's geospatial database can be leveraged by many users for a wide variety of everyday work tasks. Cooperatives and municipalities are discovering that they can extend the scope of their GIS applications to gain greater return on their GIS investment.

Data Interoperability Extension

The ArcGIS Data Interoperability extension eliminates barriers to data sharing by providing direct data access, complex data transformation, and import/export capabilities. The extension allows GIS professionals to easily integrate data from multiple sources, organizations, and formats.



Case Study—Lee County, Florida

Lee County Electric Cooperative, Inc. (LCEC), Florida, has a GIS database that is updated in near real time. The outage management system provides maps that show the outage sites, where the trucks are located, and what crews are assigned to various tasks. Using only a device number, a lineman can look at a map and go directly to the affected pole. No addresses are needed. For example, when a pole is hit by a car, the customer response person simply uses the pole's location or device number to access the feature in the geodatabase and see exactly what type of pole it is and what hardware is attached to it. The responder can then assess what needs to be done to isolate the problem and restore power.

LCEC works with UAI, Inc. to automate its meters and interface them with the GIS. The system helps workers locate and verify outages. When a customer calls about having no lights, representatives can see if the customer truly has a power outage or simply needs to reset the breaker. The system shows representatives an outage area and who in that area is or is not experiencing an outage. This enables the cooperative to restore power to large areas more quickly and also affirms that the power is indeed restored. Thus, representatives do not need to call customers back to see if their power has been restored.

ArcGIS integrates with the customer information system.

Case Study—Meeker Cooperative, Minnesota

Meeker Cooperative extends the use of GIS to include facilities management, outage response, staking, field service, vehicle location, and marketing. New applications are always on the Meeker Cooperative GIS workbench. The co-op recently upgraded to ArcGIS 9. Currently, it is working on a GPS project that captures pole inventory data and ties this information to pole testing. It combines cabinet underground inspection data, the regulator database, and customer data. Customer data, such as addresses, phone numbers, and so forth, are useful data for the automated meter reading (AMR) system. Demand information is relayed to field personnel, so they know if transformers are overloaded or underloaded. GIS uses regulator information to show panel types, regulator types, and reclosure information. The co-op's Turtle AMR provides a blink count that indicates the number of times a member has a blink in power. This is tied back to GIS so trends can be mapped. Problematic line segments that have more than two to five blinks in a given period of time are color highlighted (Figure 1).

The outage management system is tied to the Cooperative Response Center, or call center. Outage data is entered either through the automated voice system or by manual entry. Personnel click on the outage map and see which truck has been dispatched to that site (Figure 2).

Meeker is piloting an application that extends GIS to the new automated vehicle location (AVL) system. Dispatch is able to see dynamically on a GIS map where vehicles are located. A GPS unit and a small radio are mounted in a truck. A radio signal is transmitted at a standard 400 MHz frequency back to the office where it is captured with a monitoring program. It is simple and relatively inexpensive.

Field crews are using mobile GIS. All the co-op's trucks have computers that use ArcReader, so field-workers can pull up any set of information they need such as customer information. Transmission is through either a LAN or the in-house wireless network. This makes it possible to update the field-workers' geodatabase as frequently as desired.

The MiniMax staking tool, StakeOut, has become a routine tool for stakers. Staff exports shapefiles from the GIS database and moves them into Stakeout. Field-workers can actually stake using the co-op's background maps. This is helpful because staff members do not have to draw background maps, developments, roads, lakes, existing power lines, or existing consumers, which saves time.

The StakeOut application makes it possible to capture field data and facility changes as they happen from the site. Integrating GIS and GPS technology gives a high degree of positional accuracy to the data. GPS points are passed directly to the mapping system. This keeps the database up-to-date.

A memory card drive enables easy data sharing between portable and desktop systems. The field-worker inserts a GPS card into the laptop and the program interfaces with the StakeOut tool. Drivers can see exactly where they are on a GIS map. The tool instantly updates staking work with submeter accuracy. This makes it possible to stake and use GPS at the same time, providing instant database updates (Figure 3). StakeOut is used to stake 170 to 180 new services a year as well as service upgrades, road jobs, and regular facility upgrades.

GIS is being extended to include member services. For example, registration data for co-op members who attend Meeker's customer appreciation days or annual meetings is entered into the database. GIS plots the addresses of event attendees on a regional map. This shows where event participants are coming from and where the co-op needs to improve advertising efforts.

Figure 1

The blinks in power shown on these maps indicate problem trends in line segments.

Figure 2

Outage status and response is coded by color. No power and not dispatched are red. No power and dispatched are blue. Restored power from an outage is green. Personnel click on a blue section to see which truck has been dispatched to the site.

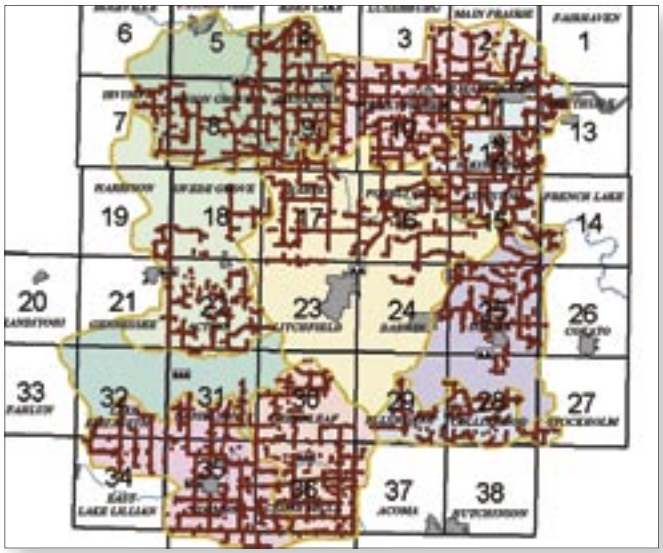


Figure 3

A bird's-eye view of Meeker's GPS project shows the amount of work completed.

GIS on the Web

GIS can serve spatial information across the Web to tell customers what they need to know about their utility service. A utility network can also transfer vast amounts of information to and from technicians in the field or from department to department. Furthermore, GIS offers multiple combinations of user interaction with GIS.

Case Study—Hart Electric Membership Corporation, Georgia

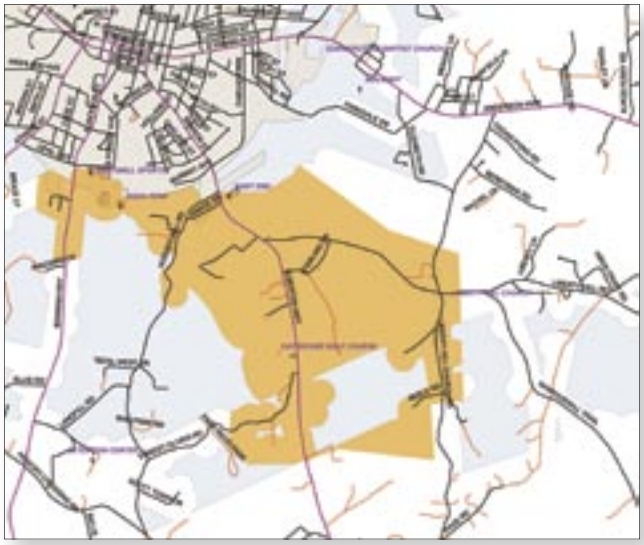
Hart Electric Membership Corporation (EMC) uses GIS to serve the community in many ways. Hart EMC provides electricity to five counties in Georgia, serving more than 32,000 members with approximately 4,500 miles of line. Its Web site (www.hartemc.com) offers information on outages, the weather, economic development, and much more. The ArcIMS® software-supported Web site is accessed by media that relay information about outages and storm damage to the public. In addition, the co-op is a map center for the region. Web site visitors can access general land base maps with layers for roads, railroads, lakes, rivers, and so forth. Fire information is posted for the volunteer fire department. The chamber of commerce uses the site for spatial pictures of the business community. The co-op's GIS-enabled Web site is a vital component of the region's information system. When outages occur, emergency services, public safety, and media people visit the Web site to see the status of outages and restoration of power.

The co-op's GIS operations are based on ESRI's ArcInfo®. The enterprisewide system is useful for facilities management and more. Internally, the co-op uses ArcReader and ArcGIS Publisher to distribute maps to its employees. Engineering, Customer Service, and Operations use GIS.

Hart EMC designed its own outage management system and integrated it with Origin GeoSystems' Origin GIS software, an enterprise GIS solution built on ArcGIS. It automatically creates a model of the Hart EMC electrical system and provides that data to the OMS for outage analysis and tracking.

By using GIS data, Hart EMC's OMS application enables customer service representatives to provide up-to-date outage information to individual customers calling the cooperative. ArcIMS automatically produces maps from GIS and serves them on the Web, enabling Hart EMC's customers and others to access map-based outage information from their browsers. The site visitor sees the magnitude of outages and receives statistics about the number of people out of power, how long outages last, and how many outage calls came into the co-op's call center. ArcIMS directly accesses the spatial database so it can generate maps in near real time (outage maps are updated once every minute). Because the site automatically manages the public's storm information requests, co-op employees have more time to respond to outages and get the lights back on.

Depending on the reader's needs, Web maps can be specific or general. Outage zones are represented as shaded areas. For example, if a substation is out, the map shades the entire service area of the substation. If the outage is circuit related, a shaded area of the circuit is shown. If the outage is on a line, a 400-foot buffer is drawn from the primary line. If customers reside in the shaded area, they are out of power. In rural areas, service providers' territories are mixed, so power may be off in other power providers' areas. Hart EMC's Web site posts a service provider's map that helps site visitors determine who they need to contact for customer service.



The community can access the public Web site to see outage management system's outage tracking on a map.

Centers of Excellence

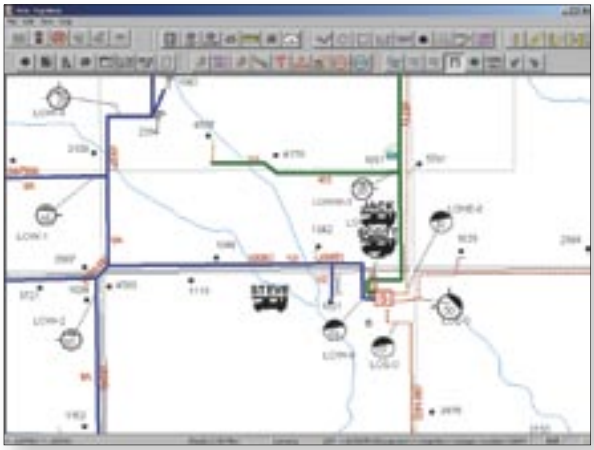
Many cooperatives participate in consortiums that offer technical advantages that a cooperative could not afford or engage in on its own. Similarly, municipal power and gas companies turn to the municipal government administrative initiatives for technological support and direction. These corporate efforts, seeking to perform as centers of excellent technology, work with ESRI's GIS to offer their constituents better management of spatial and related information within an enterprise GIS.

Case Study—National Information Solutions Cooperative

As a member–owner of National Information Solutions Cooperative (NISC), Verendrye Electric Cooperative (VEC) sought help for integration of its operations. VEC serves more than 10,000 meters in the six counties surrounding Minot, a 4,000-square-mile area requiring 60,000 poles and 4,000 miles of line in North Dakota. VEC is seen as an innovative electric cooperative, often on the cutting edge of industry technology.

VEC implemented NISC's iVUE MapEdit. The solution provides the cooperative with an integrated enterprise GIS that includes an outage management system. The iVUE application is built on ArcGIS open architecture and tools. MapEdit shares information with VEC's customer information system, maintaining data integrity between applications. The GIS team can use MapEdit to create a circuit diagram. The solution works hand in hand with VEC's outage management system, providing a real-time graphic picture of the outages in progress.

iVUE | NISC
The vision to see. The power to do.

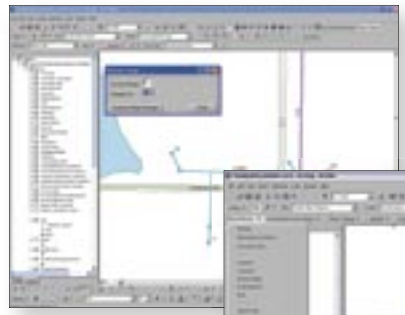


Real-time graphic image of an outage in progress

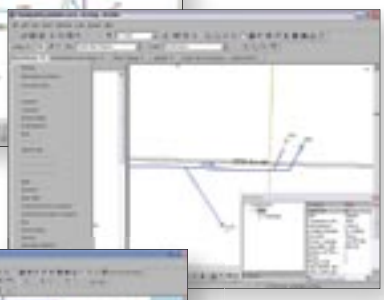
Case Study—Kandiyohi Power Cooperative

Kandiyohi Power Cooperative, a member of Great River Energy, serves more than 7,800 customers in Swift and Chippewa Counties in Minnesota. Kandiyohi migrated from CAD to ArcGIS and uses its personal geodatabase as the base for its GIS installation. With the help of United Services Group, Kandiyohi now has a fully functional GIS that is scalable and capable of integration with just about any of the cooperative's existing systems. It pulls information from several data sources including the customer information system, equipment maintenance programs written by USG, meter reader data from its Turtle meter reading system, and GPS data collected by the cooperative.

Kandiyohi maintains its GIS data using tools developed by USG on top of ESRI's ArcEditor for facility placement, data queries, network analysis, and data imports. The cooperative plans to include USG's automated staking sheet software that was developed using ESRI's MapObjects® and ArcPad software as a way to help update the cooperative's GIS data. The GIS data is used by all staff through the use of ESRI's ArcReader and ArcView®. The GIS data has saved the cooperative time and money in several areas, one of which is the calculation of transformer loading.



Phase change



Facilities management placement

Downstream trace report

ESRI Business Partners

ESRI's business partners for the electric and gas industry bring to municipalities and cooperatives leading industry applications. Consultation support, extensions, and customization help you get the most out of GIS. Presented here is a list of ESRI business partners featured in the stories in this brochure.

MetCalf & Eddy Inc.

MetCalf & Eddy Inc. provides GIS and engineering services to meet the needs of clients on a variety of project types including utilities, primarily water and wastewater management. M&E helps clients comply with government initiatives, such as GASB 34, and secure every available dollar of capital funding. Using ESRI software, M&E integrates spatial data with engineering tools to enhance clients' operations. Its information technology specialists can evaluate, recommend, and implement the required system architecture to achieve client goals.

Visit Metcalf & Eddy at **www.m-e.com**.

Miner & Miner, Consulting Engineers, Inc.

Miner & Miner, Consulting Engineers, Inc., a Telvent company, is a world leader in the development and implementation of ESRI's ArcGIS software for utilities. M&M's ArcFM solution is a powerful collection of tools for managing, modeling, and editing facility and land base data for the enterprise. It provides the framework to maintain consistent business rules in a simple, intuitive editing and viewing environment. ArcFM assists utilities in increasing productivity, lowering costs, and improving services by allowing them to effectively manage spatial information for design, maintenance, and outage management.

Visit Miner & Miner at **www.miner.com**.

MiniMax Corporation

MiniMax Corporation provides a wide range of solutions for the utility industry and is the industry leader in work order automation and staking (field design) software. StakeOut, MiniMax's flagship software package, automates the entire utility work order process—from field design to work order tracking to closeout. MiniMax's other solutions include ScadaCam, a Web-based security monitoring system for electric facilities; EaseOut, a field-based legal easement generator; and GIS field collection data development and management services as well as software customization.

Visit MiniMax at **www.minimax.net**.

National Information Solutions Cooperative

National Information Solutions Cooperative (NISC) is an information technology company that develops and supports software and hardware solutions for its member–owners that are primarily utility and telecommunications cooperatives. NISC provides software and hardware solutions such as Internet bill payment and presentation, graphical and mobile mapping systems, activity costing systems, and energy deregulated billing.

Visit NISC at **www.nisc.cc**.

Origin GeoSystems, Inc.

Power Delivery Associates subsidiary, Origin GeoSystems, Inc., is a software development firm specializing in GIS specifically designed for utilities. It offers Origin GIS, an ArcGIS extension to ArcEditor or ArcInfo, and a wide range of supporting software products and services that are designed to enhance the engineering and operations functions of utilities. Origin GIS is a MultiSpeak2 compliant product that uses the ESRI MultiSpeak data model. Origin GeoSystems offers utilities a range of implementation, data conversion, and integration services.

Visit Origin GeoSystems at **www.OriginGIS.com**.

Patterson & Dewar Engineers, Inc.

Patterson & Dewar Engineers, Inc., is a full-service engineering firm that has been committed to serving the utility industry for more than 50 years. Its team of engineers and GIS/GPS professionals have many years of experience working in the utility market. P&D was established in 1947 with a focus on providing quality services at an automated mapping solution that easily interfaces with all appropriate software solutions. PDMap contains programs that run within ESRI's GIS software. Patterson & Dewar is conservatively managed and continues to provide the kind of service and expertise the industry has come to expect.

Visit Patterson & Dewar at **www.pd-engineers.com**.

Southeastern Reprographics, Inc.

Southeastern Reprographics, Inc., provides mapping and field inventory services to the electric, gas, and water utility industries. Its name was derived from the methods employed in that era for map creation, which generally used photographic and cartographic processes. SRI has an excellent reputation within the utility industry for services related to GIS implementation. Services include basemapping, field inventory and verification services, digitization of distribution facilities, software and project consulting services, scanning, and desktop mapping.

Visit Southeastern Reprographics, Inc., at **www.srimap.com**.

Tadpole Technology

Tadpole Technology-Geospatial Solutions Division provides enterprise field information systems to utilities, telecommunications, and public service industries and deploys ESRI-based technology in the field. Tadpole Technology's ESRI software-based offerings include CAD, raster, and redline extensions to ArcPad; ArcPad project and application services; GeoSync, an embeddable synchronization engine built in ArcObjects™ for ESRI; ArcReader, ArcView, ArcEditor, and Miner & Miner's ArcFM Viewer and Designer; and CAD and raster extensions to ArcGIS.

Visit Tadpole Technology at **www.tadpoletechnology.com**.

Telcordia Technologies

Telcordia Technologies-Geospatial Solutions Group provides geospatial network management products, services, and solutions to electric, gas, water and wastewater, and Utelco companies. Partnering with Miner & Miner, Telcordia Technologies resells the ArcFM solution and provides best practices in project management, systems integration, and consulting services. For the expanding utility providing telecommunications services, Telcordia Technologies offers Network Engineer—an ArcGIS software-based engineering application—to manage the complete network infrastructure of multiple technologies including fiber, copper, coax, and so forth.

Visit Telcordia Technologies at **www.telcordia.com**.

United Services Group

United Services Group (USG), a business services unit of Great River Energy, uses ESRI software for providing AM/FM/GIS services to its member cooperatives. Great River Energy is a generation and transmission cooperative that serves 28 distribution cooperatives in Minnesota and Wisconsin. USG was established by Great River Energy as a shared services organization to provide engineering and technical services to cooperatives and municipalities in the Midwest.

Visit United Services Group at **www.usgweb.com**.

UAI, Inc.

UAI, Inc., is a leading developer of cutting edge technology that enhances the use of GIS in the automation of day-to-day operations for gas, water/wastewater, and electric utilities. Outage response, electronic staking, work order management, mobile crew tracking, and fleet management are enhanced by UAI's UtilityCenter™ solution. UAI seamlessly integrates customer information systems, automated meter reading, work management systems, interactive voice response, and other third party systems while using the Intranet to push information across departmental lines via Web enabling modules. Complete GPS field inventory, data conversion, and pole/line inspection services are also available.

Visit UAI at **www.uai.com**.

For more than 35 years ESRI has been helping people manage and analyze geographic information. ESRI offers a framework for implementing GIS technology in any organization with a seamless link from personal GIS on the desktop to enterprisewide GIS client/server and data management systems. ESRI GIS solutions are flexible and can be customized to meet the needs of our users. ESRI is a full-service GIS company, ready to help you begin, grow, and build success with GIS.

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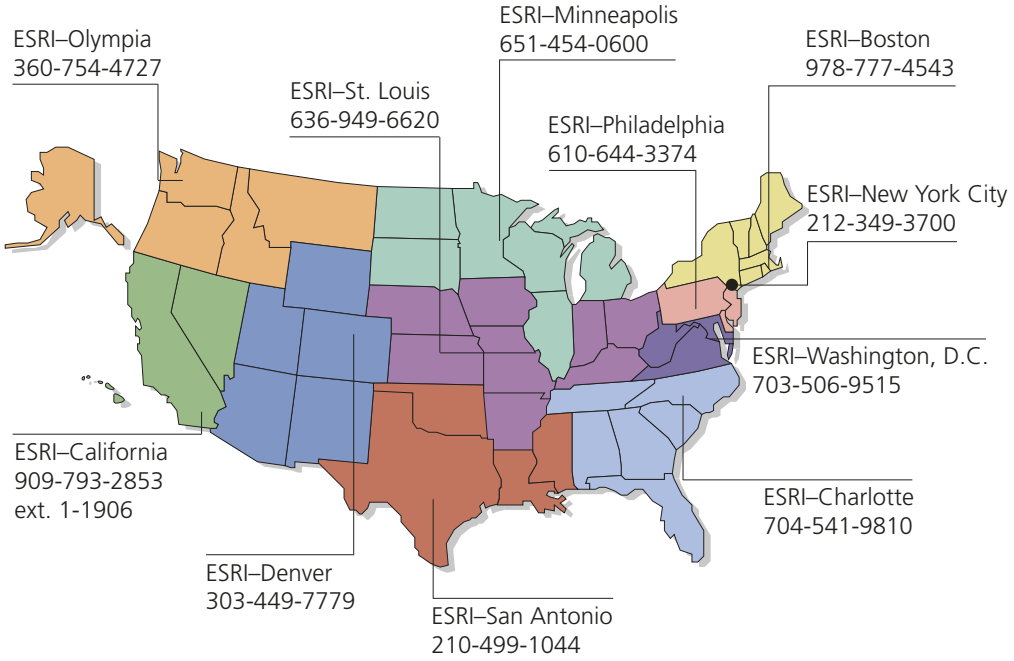

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