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What Is GIS?

Making decisions based on geography is basic to human thinking. Where shall we go, what will it be like, and what shall we do when we get there are applied to the simple event of going to the store or to the major event of launching a bathysphere into the ocean's depths. By understanding geography and people's relationship to location, we can make informed decisions about the way we live on our planet. A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions.

GIS organizes geographic data so that a person reading a map can select data necessary for a specific project or task. A thematic map has a table of contents that allows the reader to add layers of information to a basemap of real-world locations. For example, a social analyst might use the basemap of Eugene, Oregon, and select datasets from the U.S. Census Bureau to add data layers to a map that shows residents' education levels, ages, and employment status. With an ability to combine a variety of datasets in an infinite number of ways, GIS is a useful tool for nearly every field of knowledge from archaeology to zoology.

A good GIS program is able to process geographic data from a variety of sources and integrate it into a map project. Many countries have an abundance of geographic data for analysis, and governments often make GIS datasets publicly available. Map file databases often come included with GIS packages; others can be obtained from both commercial vendors and government agencies. Some data is gathered in the field by global positioning units that attach a location coordinate (latitude and longitude) to a feature such as a pump station.

GIS maps are interactive. On the computer screen, map users can scan a GIS map in any direction, zoom in or out, and change the nature of the information contained in the map. They can choose whether to see the roads, how many roads to see, and how roads should be depicted. Then they can select what other items they wish to view alongside these roads such as storm drains, gas lines, rare plants, or hospitals. Some GIS programs are designed to perform sophisticated calculations for tracking storms or predicting erosion patterns. GIS applications can be embedded into common activities such as verifying an address.

From routinely performing work-related tasks to scientifically exploring the complexities of our world, GIS gives people the geographic advantage to become more productive, more aware, and more responsive citizens of planet Earth.
GIS for Municipalities, Cooperatives, and Rural Electric Utilities

Electric utilities rely on GIS technology from Esri to better meet the needs of customers. GIS provides utilities with an efficient, integrated platform for data management, planning and analysis, workforce automation, and situational awareness.

To further assist electric utilities, Esri developed the ArcGIS Data Model for MultiSpeak, a ready-to-use geodatabase template that conforms to the latest release of the widely used, industry-standard MultiSpeak specification. The ArcGIS Data Model for MultiSpeak meets the needs of ArcGIS users who design and maintain electric networks and associated infrastructure in the United States. The MultiSpeak Initiative is a collaboration of the National Rural Electric Cooperative Association (NRECA), leading software vendors for the utility market, and utilities.

By taking full advantage of GIS technology across the enterprise, electric utilities are prepared to successfully deal with the latest industry challenges including infrastructure improvements and smart grid implementation.
Moving from a Simple to Enterprise Mapping System

By Comfort Manyame, Ph.D., GIS Manager, Mid-South Synergy Electric Cooperative

Mid-South Synergy Electric cooperative serves more than 23,000 customers in a service territory that spans six Texas counties (Brazos, Grimes, Madison, Montgomery, Walker, and Waller). In its seven decades since inception, the co-op has endeavored to provide reliable yet affordable electricity. One major step the co-op has taken to develop this mission is to implement an enterprise GIS.

Lightning-density map reveals the hardest-hit areas in relation to electrical assets. This information helps engineers see vulnerable areas in need of lightning arrestors and forecast the likelihood of outages during storms.
Previously, paper maps derived from a CAD mapping system were used for all the co-op's important geospatial functions. Growth within the service area made the CAD-generated paper mapping system inadequate and cumbersome, and the need for GIS was imminent. The co-op sought to centrally manage its data and make it available for a variety of uses by other departments within the organization. Staff experimented with a CAD/GIS connectivity plug-in but found it offered limited opportunities and lacked the myriad of functions a dedicated GIS application provides. A better solution was needed.

To begin its GIS project, Mid-South Synergy initiated a systemwide inventory of all company assets, an exercise that lasted about three years. Early in the project, the co-op's GIS team attempted to maintain GPS data using Microsoft Access and incorporated map data in a convoluted, multistep process that caused delays to system updates. To correct this, the team went on a yearlong search that led to Origin Geosystems' product Origin GIS, which is built on Esri's ArcGIS software. The co-op immediately purchased one ArcSDE license, one for SQL Server 2003, and two for ArcEditor.

The next step was to convert all CAD data into the GIS format. The co-op hired Electrical Systems Consultants (ESC) from Colorado to make this conversion. At the beginning of the year, the co-op temporarily halted all its system updates and delivered its CAD model to ESC for conversion. Fortunately, the old model had the ability to export shapefiles, which made the data conversion easier.

Using custom tools, ESC created the necessary geometric network and, by early spring, successfully completed the conversion. The new geodatabase was loaded into ArcSDE. Next, the GIS team resumed all system updates in GIS and spent a few weeks tweaking the geodatabase and implementing interfaces with staking software and the customer information system (CIS). By summer, the GIS was in place and working as expected. It communicated with the CIS and staking software and was exported to an engineering analysis model. Other departments within Mid-South Synergy, such as engineering and customer services, could access and see the co-op's GIS maps via a map viewer from Partner Software. It will not be much longer before ArcGIS Publisher assumes the map publishing tasks.
The customer service representative views work order information via the co-op's map viewer and efficiently assigns work according to crews' proximity to jobs.

GIS has improved several of the co-op's operations. For instance, prior to the GIS implementation, updating the system map with GPS data had been a multistep process involving a consultancy firm and a monthly fee of close to $10,000. The new system now makes it possible for the team to do the GPS work and subsequent postprocessing in-house. Bringing the new GPS data into the GIS is an easy, single-step process.
Migration from CAD to GIS has made maintaining current data for asset management and customer service easier. Service area maps can be viewed from all co-op employees’ computers.

Previously, all as-built features had to be manually drawn on the existing map, obviously resulting in positional error. The automated staking application seamlessly interfaces with GIS and eliminates the task of manually drawing lines and other network features. This means there is no more double data entry or data redundancy, and most of the associated human error is reduced. Staff can easily import plats of new developments into the GIS, facilitating the timely updates and easy management of the land base.

Using an Origin GIS engineering analysis model export plug-in, staff exports system geometric network model data for both the engineering analysis and dispatch outage management system.
every week. This is a great improvement and ensures that the dispatch department has the most up-to-date model for outage management.

CIS information (customer name, address, telephone numbers, billing and usage information, and connect and disconnect dates) is imported from the CIS into the GIS using an API connection called OLE DB. Previously, this conversion had to be done in multiple steps outside the mapping system. This has proven to be very useful, especially for spatially representing growth in the service territory.

The new GIS technology has been fully embraced by both field-workers and company executives. The co-op’s customer representatives use GIS technology every day. Some employees are not aware they are using a robust GIS when they view assets with their map viewers—they do not have to think about how it works. It is simply a tool for getting the job done. The ability for more staff to access valuable data is saving the co-op money and time. For example, all jobs that are ready to be scheduled can be accessed via the system map. If multiple jobs are located in the same area, the responsible customer service representative assigns them to staking technicians working in proximity to those work orders. Previously, a staking technician would most likely drive all over the territory from one job to another. Now the crews can work more efficiently.

Another step Mid-South Synergy’s GIS department is taking to improve efficiency and decision making is to use the ArcGIS Spatial Analyst extension for analyzing lightning strike data. Lightning causes approximately 50 percent of all the co-op's power outages. Within the past year, more than 22,000 outages were attributed to lightning strikes. These outages left more than 20,000 customers without power for varying periods of time. High outage incidences translate to high costs for power restoration and therefore justify the need for this study. By bringing lightning strike data from the National Lightning Detection Network into GIS, the team is able to create lightning strike density maps for the co-op’s service territory. The main objective of such a study is to establish lightning strike trends. Methodology includes using Esri's ArcGIS Geostatistical Analyst extension software to analyze at least five years of lightning strike data within the coop's service area. The outcome of the study will help engineers intelligently decide where to focus lightning outage prevention efforts such as installing lightning arrestors.

Learn more about Origin Geosystems at www.origingis.com.

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AMR and GIS Combine to Close Outage Tickets

By Jessica Wyland, Esri

Residents of northern Idaho experienced a severe, debilitating windstorm last year that flattened the distribution system. Kootenai Electric, the member-owned cooperative based in Hayden, Idaho, was prepared for the outages. With a sturdy geographic information system (GIS) and automated meter reading (AMR) and advanced metering infrastructure (AMI) system in place, the cooperative was able to restore power to affected areas within a couple days. Without this technology, the job would have taken two to three weeks. The addition of AMR/AMI to its GIS has dramatically improved the utility's response time to outages.

The cooperative serves 22,000 homes around Coeur d'Alene and grows by about 1,000 homes each year. Since the 1990s, Kootenai has used Esri's GIS technology to link its customer information in the billing system with the outage management system (OMS). In 2003, the utility implemented an Aclara high-speed power line carrier AMR/AMI system. Kootenai coupled the upgrade with the already implemented ArcGIS Desktop and ArcGIS Server.

The Aclara AMR/AMI system allows meters to be queried and checked in real time—a process called "pinging." The system allows active pinging of single meters or groups of meters to quickly determine the extent of the outage. It then gives accurate counts and locations of customers affected. Staff members at Kootenai are pleased with the system's easy-to-use menu and large choice of output report formats.

"When a cooperative member calls the outage hotline, an automated system matches that member's information with a location in the GIS," explains Keith Brooks, one of Kootenai's GIS analysts. "The dispatcher, who is notified via e-mail and cell phone page that there is an outage, will consult the GIS to see the location of the outage call."

Through the GIS, a ping is sent to the meter using the Aclara AMR/AMI system. Within seconds, the meter responds to the system by showing the dispatcher whether the meter has power. If the meter response indicates that it has an active power connection, the dispatcher will call the cooperative member with the information. In such a case, there may be a problem with the member's service equipment. If the meter response indicates a disconnection of power, the dispatcher initiates an
upstream ping, which selects a meter from each phase on each side of every protective device all the way back to the substation.

"Not only does the AMR system tell us whether a meter has power, it allows us to display which phase each transformer is connected to without physically tracing out the distribution system," Brooks says.

The results of the ping are shown in the GIS with the problem fuse or recloser identified. Within moments of the initial outage call, the numbers of members and phases affected are known, an
outage ticket is created, and a crew is dispatched. After the crew has made repairs and notified the dispatcher that power has been restored, a downstream ping is initiated to test meters on each side of every protective device within the outage section to ensure all power is restored. If all meters ping green to indicate the power is on, the dispatcher informs the crew and closes the outage ticket. Affected members and phases, as well as outage times, are recorded for later reporting and system analysis.

If a meter pings red to indicate that the power is still off for those areas, the GIS identifies the common protective device that is still open. The crew is notified that an outage still exists. At this point, the dispatcher can close the outage in stages. Once power is restored to all members, a customer service representative will close the outage ticket.

Ping results are analyzed and a common open device is automatically selected.
"It's hard to quantify what the GIS combined with the AMR/AMI has saved Kootenai Electric," Brooks says. "We have relied on GIS since 1996 and installed our AMR/AMI system in 2003. Integrating the systems gave us the ability to dispatch crews directly to problem spots or to eliminate trips altogether. The solution has been a real savings in money and time."

For more information about GIS for outage management, visit www.esri.com/electric.

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Centralizing Locates with GIS

By Ena Forbes, GIS Administrator, Bluewater Power, Sarnia, Ontario, Canada

Bluewater Power, in the town of Sarnia, Ontario, Canada, recently decided to take a GIS approach to managing locates—a decision that quickly produced improvements and savings. Within a year of implementing GIS, the utility reported a 50 percent reduction in locate-related labor costs. Customers are now seeing speedy responses. Locate requests are cleared at a much faster rate.

By upgrading to Esri's ArcGIS, the power company is able to better manage its field processes. Before the upgrade, Bluewater Power had been operating like many utilities. Locate requests from the one-call center were printed, sorted, and sent to the field as paper records. The sheer volume of printing and sorting paper tickets was a daunting task—one that consumed many internal resources. The idea to restreamline locates within the already existing GIS started at an Esri user group meeting. An Esri area representative referred the utility to Dig-Smart, LLC, an Esri business partner located in Buffalo, New York.

With GIS, the utility could meet four key objectives: reduce internal operational costs by at least 60 percent; be more efficient in processing ticket requests, which would increase the contractor's efficiency; reduce the lag time for the waiting customer who filed the original dig request; and maintain a database-driven document management system that served as the official archive for all received and processed locates.

Once the decision was made to move forward, the installation of the Dig-Smart software was completed within one day. With a few minor TCP/IP changes, Bluewater Power was receiving locates directly through its GIS. The implementation of both the Dig-Smart Enterprise and Field modules has streamlined the utility's processes considerably.
The utility wanted to avoid the cumbersome process of having to print and physically handle each locate. Each day, field personnel would report to the office, pick up their stack of tickets, and spend time sorting them before heading out. At the end of the day, the completed locates would be sent to the customer and handed over to office staff to be entered into a database. It took a lot of time to manage the paper system. By moving to an electronic solution, Bluewater’s locators can focus on what they do best—performing locates.
Bluewater Power uses Dig-Smart Enterprise and Field modules and Esri's ArcGIS to handle locates.

"At first, the change in workflow seemed a bit daunting," said Randy Hull, operations manager for Bluewater Power. "We were a little unsure about using all this technology, but I have to admit I can't imagine going back to paper."

To change the workflow from paper based to electronic, the utility purchased Tablet PCs for the vehicles. At the start of each day, Ontario One Call sends tickets electronically. Documents are opened with GIS and a tool is used to quickly verify location and create a PDF document. Instead of taking a stack of paper locates to the truck, field personnel now connect to the database and can download all the locates that have been mapped and analyzed using ArcGIS. Upon checking out the active queue from the database, a map of the site, along with the original
ticket, is embedded into the record. This gives field personnel the ability to view a current map of the entire area along with the original request from the customer.

When creating reports, field personnel simply select from drop-down menu items such as "This site has been analyzed and located by Bluewater Power." After completing the daily ticket queue on the tablet, field personnel reconnect to the database and post their results. Using ArcInfo, each ticket is finalized with the response, e-mailed or faxed to the customer, and archived by date and ticket number.

At the onset of transition from a paper-based process to GIS, some managers were apprehensive. The concerns soon proved unnecessary. Long-term personnel were using the electronic system within days. Both systems were run concurrently for about a week with the intention to go a little longer. At the suggestion of the field personnel, the paper system was abandoned completely before the set deadline.

"I was pleasantly surprised that the field personnel took to it so easily," Hull said. "I expected that we would have quite a learning curve, but the software is intuitive and easy to use."

Learn more about Esri's ArcGIS software at www.esri.com/arcgis.

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Design Process Evolves for GIS-Based Utility

The design process for Central Lincoln People's Utility District continues to evolve as the utility strengthens its enterprise GIS. Fifteen years ago, the publicly owned utility, headquartered in Newport, Oregon, converted from a paper-based system to one that is automated. The utility now relies on an enterprise GIS based on Esri's ArcGIS Desktop and the ArcFM solution developed and implemented by Telvent Miner & Miner (TM&M).

In January 2007, Central Lincoln went into production with TM&M's Designer, a graphic design extension of ArcFM that affords an interface between the GIS design process and other corporate systems. The GIS team implemented the application with specific utility tools that enable distribution engineers to streamline estimate creation and other job design processes.

The Designer application quickly creates an estimate and parts list and facilitates asset accounting from data generated during the design process.
Once the design extension was interfaced with costing information stored in the utility’s accounting system, there was no need to manually enter individual parts when creating an estimate. For example, when adding a line extension that requires a new pole in the field, Central Lincoln’s extended application will build a list of compatible units and connect with costing information to create a list of prices for that unit. The extension will return an estimate for the parts needed to complete the job without the need for a spreadsheet or manual calculation tool.

In addition to design, the automated workflow benefits other departments of the utility. The parts list generated by costing is used by field crews when they complete the job. The list of estimates associated with each job helps the utility determine the worth of its system and to satisfy Federal Energy Regulatory Commission (FERC) accounting procedures.

"By using GIS and the design extension, we are able to add more information to the entire process during the design phase," explains Neal Myers, GIS supervisor for Central Lincoln People’s Utility District. "By automating much of the design process, we not only increase efficiency for our employees but also remove the possible errors associated with transcription. This has led to a huge productivity gain in the design process."

Central Lincoln provides electric services to 38,000 residential, commercial, and industrial customers. The distribution line includes 1,613 miles of poles hugging the weather-intense central coast of Oregon.

For more information, visit www.esri.com/industries/electric.

(Reprinted from the Fall 2008 issue of Energy Currents newsletter)
Cooperative Improves Outage Response with Enterprise GIS

By Jessica Wyland, Esri Writer

Located in one of the Denver, Colorado, metropolitan area's burgeoning suburbs, United Power is expanding to serve more than 65,000 meters. To keep pace with growth and reduce outage response time, United Power turned to enterprise GIS.

Before United Power's upgrade to GIS, outage management was handled by track calling software that would save messages entered by interactive voice response. The utility was looking for an alternative solution to reduce outage response time and increase efficiency in prediction and planning of the electrical network's needs.

The utility decided to employ enterprise GIS from Esri to manage outage response, service area needs, and resources. In the field, United Power now sends and receives data with a mobile GIS that includes TC Technology's GO! Sync Mapbook. The GIS mobile application, developed using ArcGIS Engine, bridges the gap between paper maps and traditional GIS. It provides an easy-to-use and easy-to-deploy map viewing application with an underlying extensible framework for adding customizations and integrating with third-party systems.

With United Power's mobile GIS, field crews are able to view all customer data, perform electric tracing and redlining, and use GPS navigation. The process for the fieldwork begins with an update of all GIS data in the enterprise. The crews use that data to make any redlines, displayed in the form of flags and in different categories. Additionally, United Power's customized application enables mobile-based mapping, spatial query, sketching, GPS integration, and wireless data access to the GIS enterprise database. The application's tracing tools enable field crews to locate the exact source of the outage and the best possible route.
Using custom views in the GIS Enterprise Oracle database, United Power is able to display outages from the Outage Management System in ArcGIS and trace the protective device that needs to be verified in the field.

"We went from producing paper maps to operating with a fully integrated GIS enterprise. We implemented GIS in order to increase our productivity and safety and, ultimately, to improve our outage management response," says Diego Portillo, GIS coordinator, United Power. "We put digital maps in the trucks with our field crews and migrated our data to ArcGIS Desktop and ArcGIS Server. Our outage management system now is a key tool in our everyday operations. Our goal now is to maintain our enterprise GIS to the highest standards."

Since the move to GIS, United Power has reduced outage response time significantly and increased efficiency, prediction, and safety. Field crews using mobile GIS say they are often able
to locate both the reported outage in the field and the failed device. The modern user interface of Esri's ArcGIS software gives field crews and office personnel thematic and topographic mapping, map-based query and analysis, charting and reporting, and mapcentric geoprocessing capabilities. The high-quality maps and reports are introduced in a desktop environment.

With all its data in the GIS, United Power can do more than bring customer information to the field. Analysts can quickly verify which meters are active and discern the distribution load based on the number of customers and kilowatts used. Internal employees can view digital maps available on internal ArcIMS sites that are tailored to specific job needs, from locating equipment to creating work orders, or just view overall geographic information. To keep the GIS constantly updated, information from the field—such as phase, feeder, or substation data—is delivered by field crews, operations personnel, engineers, and designers.

"We include all layers in our maps, from the electric features, such as overhead/underground lines, substations, transformers, meters, streetlights, and devices, to land base information such as parcels, roads, lakes, wells, cities, ZIP Codes, and sections. By seeing all the different layers, even a person who does not have a technical background can understand the whole picture."

Learn more about GIS solutions for electric and gas at www.esri.com/electricgas.

(Reprinted from the Fall 2008 issue of Energy Currents newsletter)
GIS Clips Hassles in Vegetation Management

By Christopher Kelly, Cofounder, Clearion Software, LLC

In a move to track and analyze its right-of-way (ROW) line-clearing program, Habersham Electric Membership Corporation (EMC) implemented Vegetation Management Solution by Clearion Software, built with Esri's ArcGIS Engine Developer Kit. The application uses land base and electrical facilities data from existing GIS as a reference for vegetation management records and stores data in a familiar enterprise geodatabase.

Vegetation control, essential for infrastructure safety and reliability, is one of the largest operational expenses for companies that manage right-of-way. Prior to the software upgrade, the Georgia co-op's ROW supervisor tracked line-clearing work on a paper wall map using colored highlighters to indicate different years. With this method, all analysis was manual, making it virtually impossible to measure progress throughout the year or to evaluate crew productivity. Habersham faced the impending retirement of its ROW supervisor and the vice president of operations. Without a means of measuring and storing data, the utility risked losing details about the ROW program—a situation that could adversely impact customer service, environmental compliance, and system reliability.

More risk is something Habersham could not abide. The co-op maintains 1,800 miles of overhead primary lines. By using a GIS solution, Habersham is able to quickly and accurately track, plan, and analyze ROW line-clearing and vegetation management information.

Clearion developers rely on the ArcGIS Engine Software Developer Kit to build stand-alone applications and extend existing Esri applications to provide utility-focused spatial solutions for GIS and non-GIS users alike. Developers reported that the ArcGIS Engine Developer Kit—equipped with diagrams, utilities, add-ins, samples, and documentation—was fundamental in creating fast, comprehensive, and cost-effective electric and gas applications.
The co-op uses a Vegetation Management Solution by Clearion Software, built with Esri's ArcGIS Engine Developer Kit, to deploy mobile units.

The co-op put its new software solution to work immediately with the data entry of weekly line-clearing records. Templates allow the ROW manager to input date, crew, and other attributes once and simply highlight power lines that were cleared. The system also works in a mobile, disconnected environment, facilitating data entry in the field at the time of the work audit. With support for GPS devices, the software can automatically center the map on the present location to speed up navigation. Data conversion is not required. The ROW information can be shared with all users, not just the GIS savvy, thereby reducing cost and training.

Habersham pays contractors for time and materials to perform ground-to-sky line clearing. It attempts to clear each circuit every five years, with the exception of the rainy Rabun County
circuits, which are trimmed every three years. The ROW manager reviews the work of the contract line-clearing crews at the end of each week. Weekly reports go into the vegetation management software using overhead primary lines as an ROW centerline reference.

In addition to recording the ground-to-sky, or “full cut” activities, the ROW manager inputs other line-clearing activities such as service trims, cycle busters, and tree removals. All activities are stamped with a date, crew, feeder ID, and other relevant information. Managers enter invoice information into a table in the GIS database linked to individual line-clearing activity records.

By entering weekly line-clearing records and invoice information into the GIS, the utility can take advantage of the vegetation management reporting tools developed by Clearion Software. These reports provide insights into many aspects of the co-op's line-clearing program including weekly, monthly, and yearly work summaries; work progress by feeder; crew productivity comparisons; and average cost per mile. Habersham is also mapping vegetation that requires more frequent treatment to ensure that these fast-growth or customer-sensitive areas can be tracked and managed more effectively.

With Esri's GIS software tools and a commitment to GIS-based ROW work tracking, Habersham is building an information system that will aid in managing one of its costliest ongoing operational expenses. Because of its GIS investment, the co-op is accelerating return on investment. Habersham is fulfilling the vision for its GIS by leveraging the hardware, software, data, and training to enable the vegetation management software initiative.

Learn more about Clearion Software at www.clearionsoftware.com.

Learn more about ArcGIS Engine at www.esri.com/arcgisengine.

(Reprinted from the Summer 2008 issue of Energy Currents newsletter)
Upgrading to GIS for Managing Outages and Updating Data

When Mid-Carolina Electric Cooperative (MCEC) was started in 1940, the utility provided electricity to rural homes in Lexington, Richland, and Saluda counties in central South Carolina. By the end of its first year, MCEC was serving about 1,200 consumers on 417 miles of distribution line. Today, the cooperative serves approximately 50,000 consumers on about 3,900 miles of line.

How has MCEC managed to grow steadily and continue to satisfy customers and members? The utility keeps careful watch of its outage and asset management systems with GIS.

In October of 1995, MCEC began converting its 450 blueprint maps to an automated GIS. The maps were first scanned as raster images, then scaled and placed into a user-defined coordinate system. The raster format was transformed into a vector format with the use of AutoCAD. By digitizing over the vectors with the aid of Gentry Systems’ GenMap, MCEC was able to build a section-based connected model. By 1998, it was maintaining a fully functional computerized GIS.

After the acquisition of Gentry Systems by AutoDesk, MCEC had to make a business decision on the future of its GIS as well as its outage management system (OMS). It selected ArcGIS Desktop from Esri and ArcFM from Telvent Miner & Miner (TM&M).

"Within nine months of deploying Esri software, we were up and running on a functional geometric network along with a new OMS," says Brian Sandifer, engineering services supervisor with MCEC. "When outage management was based on computer-aided drafting maps, we updated our existing OMS only once a week through a conversion of an access database. With the new Esri and TM&M GIS, we are able to update the system daily and complete work orders in a much more timely manner."

When MCEC customer service personnel receive an order for a new power connection, the order is sent to an engineering technician, who will visit the site to determine what materials will be needed to provide power. With Designer, a staking application built by TM&M, the technician will create a work order that creates a material list to construct the job to provide power to the new customer.
One of the subdivisions served by MCEC, represented in ArcMap, shows where transformers and underground primary and secondary cables are.

"If the connection requires 200 feet of primary wire, a pole, a transformer, and a service, the technician will enter the unit information into the application, and that generates a staking report," Sandifer explains. "A map and a staking report are provided to the crew to construct the job."

Once the job is done, work orders are returned to MCEC's engineering department to be updated in the GIS. Completed work orders are posted daily to the GIS. The updates are then extracted from the GIS and sent to the OMS.
"We reconcile and post work orders to the basemaps daily," Sandifer says. "What is built in the field today will be built into the system tomorrow. We are better prepared to take on outages in a more efficient manner than we were four years ago when we had our last ice storm."

With the upgrade to GIS, field crews are now able to view up-to-date maps on laptops in the trucks instead of sorting through paper maps that often did not include new housing and commerce. Field crews have access to a personal geodatabase where they can view all the attribute information in the GIS including customer information, sectionalizing data, and transformer data.

*In a commercial area close to the interstate, a map shows feeders leading to buildings in the business park.*
"With the constant and rapid changes to our distribution system, updating paper truck maps became a difficult challenge," Sandifer says. "Shortly after the implementation of GIS, we needed a mobile solution to keep truck maps updated in a timely manner. We decided to use ArcGIS Publisher and ArcReader to solve this problem. We equipped our line crews, as well as other vehicles, with laptops for viewing our GIS. We publish a personal geodatabase on a frequent basis and, with the use of wireless technology, updates for the mobile map viewing can be downloaded without having to take the laptop out of the vehicle."

**Joint Use Tracking**

The utility recently found another job for GIS. MCEC uses its digital maps and database to track joint use on its infrastructure. If a communication company requests to attach a telephone or cable TV line to one of MCEC’s poles, the cooperative is able to track in its GIS the company and the type of attachment.

"Prior to the GIS, we had no idea what was out there as far as joint use," comments Sandifer. "With GIS, we were able to field-verify any attachment made and update our joint use records. It's saved us a lot of headache and increased the revenue for rental space of our poles, which helps lower our costs."

**Vegetation Management**

MCEC keeps weekly records in the GIS on which lines were cleared by right-of-way crews and whether the route is sprayed with herbicide and/or cut by tree trimming crews.

"We used to keep up with vegetation management on paper maps with highlighted areas denoting completed jobs," Sandifer says. "Now we can run a query in the GIS to quickly see what was done. All the information is in the GIS. We can retrieve it anytime, and we're not going to lose data we've collected over years and years."

**Automated Meter Reading**

In 2006, MCEC completed the implementation of an automated meter reading (AMR) system. Soon after AMR was fully operational, engineers began to find ways to use GIS in conjunction with AMR. One effective use is to maintain the electrical phasing in GIS. Nightly QA/QC reports are generated by comparing the electrical phase the meter is connected to with the electrical phase the meter is connected to in GIS.

"If there is any discrepancy, the report will direct us to the transformer and meter in GIS that has the incorrect phase represented," Sandifer says. "Keeping accurate phasing in the GIS has made outage management and restoration more efficient."

Another tool that AMR provides is the sizing of transformers. If MCEC needs to add a new service to an existing transformer location, the utility has the ability to query the highest usage..."
on that transformer. The usage data helps technicians determine whether the transformer needs to be upgraded to a larger size for the new service or whether the transformer has adequate capacity to connect the new service.

"The Esri products we use at Mid-Carolina Electric play a vital role in the functionality of the company," concludes Sandifer. "The GIS technology has helped us perform tasks more efficiently and effectively. We are constantly finding different applications for every department in our co-op."

For more information, visit www.esri.com/electric.

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Pole Inventory Project Generates City Revenue

The City of Safford

The City of Safford, Arizona, utility division put teens enrolled in its Summer Youth Program to work capturing GIS data. Teenagers, who love all things techie, happily used GPS to grow the city’s GIS database. The utility division put GPS in the hands of these eager workers to capture pole locations and joint use data. This was input into ArcGIS to create maps and reports that earned the city dollars.

Safford’s Summer Youth Program was designed to encourage high school students to explore various occupations such as government jobs and engineering. Of the 60 participants, the city's GIS department employed 6 students to perform a variety of geocoding tasks and create maps including those for a utility project.

The outcome was a win-win situation. The youth had an opportunity to work with professionals, have respectable jobs, and get paid. The city had a low-cost workforce and accurate data with metadata attached and was able to increase revenue dollars from joint use rents.

Prior to the inventory, there was controversy between the telecommunications firm and the city about who owned assets, so billing was based on estimated rather than actual data. Revenue returns were much lower than they should have been. Joint use pole attachment rates had not been reviewed since the program’s inception, and the city was charging $15 to $18 less than the market rate for attachments. The city’s most recent pole inventory was 10 years old, and expansion of the system was not reflected in the pole use invoicing. In addition, there was disagreement about who owned the poles. It was clearly time to make a change. But quality assurance about the data had become an issue. The telecommunications company insisted on a report that included longitude-latitude points to verify the number of poles.

The Bureau of Land Management lent the city GPS units, and the utility division set up an out-of-the-box ArcGIS system to author and publish the data. Engineers remained undecided about using GIS to generate reports, so the department was not ready for a full-blown asset inventory. The success of the joint use project put a happy face on the technology. Raymond Brunner, Safford’s GIS administrator, found the revenue-generating program as a means of justifying additional GIS
investments for city operations, since revenue gained was a way of offsetting costs of growing the city's GIS.

Skeptics of the program were concerned that because these teens were temporary employees, they would be ambivalent about data accuracy. But they were not. An assignment area for one team would overlap with the assignment area of another and the results of that intersection were compared. The results showed few discrepancies. In this way, the project's manager was able to validate quality. Students looked forward to the daily outdoor work and thrived in a good-natured competition to collect the most accurate data.

"Youth were eager to learn the technology," says Brunner. "It was practically second nature to them. During training, they were zooming ahead of the talk, pushing buttons, and exploring the data. For example, I was explaining a satellite map, but some students had already checked it
out 20 minutes earlier. Another advantage of using youth was that the labor costs were at a rate such that we could afford to allow students to make multiple passes to get the information right. We were able to sweep the system, and if we need to go back and do it again next summer, we can afford to do so."

The outcome was an accurate pole inventory that provided the final numbers needed for correctly renegotiating use charges and increasing revenues to the company. The documented count showed an additional 200 poles that had not been included in previous invoicing. GIS made it easy to generate a report that verified this data and cleared up claims of pole ownership. The return on investment more than paid for the project, and teens had an invaluable opportunity to explore career possibilities.

In addition to collecting pole data, the teens helped the city by collecting data about speed limits for a traffic control study. They also went to every building was the city limits and collected its house number to see if the addressing for the buildings was in code violation. That is, if the numbers were too small or not contrasted enough for visibility from the street, they were deemed substandard. Teens also worked to improve street centerlines for addressing and bus routing and collected library patron data to create a library patrons map. At the end of the summer, the youth gave a presentation to the city council to demonstrate the GIS applications and projects they had completed.

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GIS for Planning, Design, Operation, and Maintenance

By Matt Freeman, Esri Writer

Nashville, Tennessee, America's Music City, is the home of many country stars whose songs warm the soul. Unfortunately, the city is also plagued by inclement weather that wreaks havoc on the local power grid. Nashville Electric Service (NES) is working hard to keep its customers from singing the blues about power losses. The electric company is using geographic information system (GIS) software to assist in the planning, design, operation, and maintenance of its complex electric network. GIS has been instrumental in improving NES' operations management and decreasing storm outage recovery time.

Since a decade ago, when the company first implemented ArcGIS software, NES has added many more updates, and now most processes at NES incorporate some form of GIS applications. The company’s 87,538 distribution transformers, 253 distribution substations, 5,619 miles of power lines, and approximately 200,000 utility poles can all be viewed via the NES intranet, complete with company-wide access to GIS data and up-to-date information on its electrical system and basemap data. The entire enterprise now relies on a single GIS-based mapping system with applications for multiple assets such as circuit maps, property boundaries, pole attachments, street lighting, private lighting, an underground network, circuit profile, and communication infrastructure.

A component of NES' GIS that is used to manage both normal and emergency work on a daily basis is the company's automated vehicle location (AVL) system. It helps dispatch and service crews better serve the company's 351,000 customers within NES' 700-square-mile service territory, which includes all of Davidson County and portions of six surrounding counties in central Tennessee. AVL gives dispatchers the ability to view work crew locations in real time. The company's management reports that the system works well for dispatchers because it makes their jobs easier and allows them to work more efficiently. Since NES began using AVL, its hazardous energy control procedures are less complicated and more rapid. As a result, safety has been enhanced and reliability has been improved.
A three-dimensional flood map of a local river system flood zone provides a visual model useful for creating a disaster plan.

The use of NES real-time maps is not limited to just dispatchers. The Estimated Customers without Power Map Web page on www.nespower.com provides customers with their own view of NES work crew activities and locations. The real-time map highlights regions that have reported an outage and gives details of the time the outage was reported, the number of customers affected, a work crew assignment, and a street map of the affected area.

**Reduction of Tree-Caused Outages**

NES’ vegetation management workers rely on GIS to prioritize tree-trimming cycles, and for good reason. In June 2005, NES completed its initial three-year trimming cycle, and, as a result, power outages were reduced by 19 percent. NES has made trimming cycle information available to its customers via the interactive Tree Trimming Crew Activity Map Web page.
By integrating data from its outage management system (OMS) and its network analysis system into a single database, NES created a transmission and distribution (T&D) planning forecast, which is a 20-year forecast that includes 5-year increments of estimated calculations. In the past, the utility had outsourced this planning effort, costing the company approximately one million dollars. Using its GIS, NES has been able to perform T&D planning in-house with the same amount of effort but at a much reduced cost. The results will help determine NES’ projected land use for the year 2020 and provide an estimation of new customer numbers.

The projected land-use report is proving a helpful tool for NES operations teams as they plan future work cycles and pole replacement needs. NES is responsible for nearly 200,000 poles. By using an NES facilities map, staff can generate a needs assessment for each pole based on variables such as height, age, location, and number of customers the pole serves. NES work crews place or replace approximately 600 poles a year—sometimes many more. GIS generates a risk-based analysis of the variables that is used to prioritize the annual pole replacements.

GIS integration with OMS enables NES to track reliability statistics at the circuit level. After the company migrated its CAD drawings into ArcGIS, technicians were able to access this database and use applications for maintaining data and producing cost-efficient maps. The implementation of GIS into the utility’s OMS came none too soon. In 1998, a tornado ripped through Nashville east of downtown, taking out more than 500 poles and leaving 75,000 customers without power. With GIS in place, NES was able to restore power to all of its customers within a week—most within three days—a feat much hailed by customers and the media.
Projected Land Use Forecast for the Year 2020 is part of NES’ electric load forecasting program.

NES preparedness plans now include the possibility of flood-caused outages. Reports of leaks springing from the nearby Wolf Creek and Center Hill dams on the Cumberland River system have raised concerns for many of the utility’s customers. They are inquiring about NES’ disaster plan should the problem reach disastrous proportions before the dams are fixed by the U.S. Army Corps of Engineers. NES used its GIS expertise to implement flood maps of its service territory in the company system. By doing so, NES discovered that it has some power substations that were potentially in danger. More detailed investigation using an integration of its GIS flood map and a 3D map video confirmed that an NES substation is in the flood zone.

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Maui Electric Company, Limited (MECO), is using server-based geographic information system (GIS) technology, ArcGIS Server, to deliver applications for many people to use throughout the company. With support from Information Services supervisors, MECO's GIS shop implemented the in-house, online system and was soon delivering GIS applications and data to utility workers throughout the company, giving the company enterprise-wide access for use in daily routines as well as specialized analysis.

MECO's GIS assessment criteria included (1) functionality, (2) scalability, and (3) ease of use. Projects had to be manageable by the company's one-person GIS shop. This person needed a system that made it possible to create quality deliverables straight out of the box. For these reasons, MECO selected ArcGIS software. Initially, product outputs would include quality hard-copy maps showing MECO's transmission and distribution (T&D) systems and their relation to the surrounding geography. The application also needed to consolidate various available data sources.

In 2006, Eric Abe, MECO's GIS administrator, began using ArcGIS 9.1 to combine various types of data such as GPS-collected pole locations, county parcel information, county road information, CAD drawings, and aerial raster imagery. "The ArcGIS Desktop platform gave me the ability to take disparate pieces of spatial data and link and relate them geographically," said Abe. "I also used ArcGIS Desktop energy utilities data models that were available for download. These models provided a template in which I could store information about our T&D assets, which gave me a quick start in developing our geodatabases."

Using the desktop implementation, Abe produced high-quality maps. These GIS maps helped staff in the Engineering and Operations departments visualize MECO's T&D assets and make better and faster decisions for designing and operating the system. The maps also helped MECO communicate better with customers and the community about future developments and improvements to the company's infrastructure.
Seeing how GIS benefited the enterprise, Abe decided to take the next step: share information through a Web browser. This meant implementing an internal Web application for the company. During this time, Esri was releasing ArcGIS 9.2, an upgrade of its software that included a strong server GIS component. It would allow MECO staff to distribute maps, models, and tools that would fit into their workflows. Office and field employees would be able to query accurate, up-to-date data with minimal training.

"I participated in several online Esri seminars demonstrating the new capabilities of ArcGIS Server 9.2, and it piqued my interest," said Abe. By the beginning of 2007, MECO was using ArcGIS 9.2 on its desktop and server. "I was amazed at the ease with which I could create a Web mapping application on the 9.2 platform."
Using his basic knowledge of Microsoft Windows Server, Microsoft Internet Information Server (IIS), and Microsoft ASP.NET, Abe created an application for sharing mapped assets information on the company’s intranet. He commented, "I like delivering applications through the Web browser because it eliminates the need to install client software. The user just needs to point the browser to a particular URL and is instantly connected to the map."

Using an application wizard, Abe created a simple mapping application in which, after taking a 15-minute training session, users could navigate through maps and data. He also customized the application to add a search-and-query capability for the underlying parcel and road GIS data.

Following the initial implementation of ArcGIS Server, the potential scalability of the product for storing and sharing GIS data within the enterprise was obvious. Abe explained, "MECO took a systematic approach in selecting a product and developing the deliverables in this pilot phase of our GIS. ArcGIS has worked out as the ideal solution. When I took on this project, I knew very little about GIS, but with Esri training and support, I feel that we have made considerable progress in getting our facilities mapped. Esri’s Honolulu office, as well as Esri’s utility and tech support staff, have been instrumental in our success to this point. I know that Esri has some very large electric customers, but they treat me as though I am just as important as the big guys."

MECO serves approximately 65,000 customers on the three islands that make up the County of Maui (Maui, Molokai, and Lanai) in the state of Hawaii and is a wholly owned subsidiary of Hawaiian Electric Company, a public utility.
Parcel information and circuitry map is served on MECO's GIS intranet Web site.

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Utility Saves Costs of Call-before-You-Dig Program

PPL Electric Utilities

Like the roots of a forest, a nation's underground infrastructure supports its human landscape. Careless digging poses a threat to underground facilities and to people. Most states have established "one-call centers," which ensure damage prevention and increase excavation safety. Moreover, these states have made it the law for excavators to notify the system about their projects and for underground facility managers to confirm that the ground is free of assets before work begins. GIS is making it easier for excavator, facility manager, and enforcing agency to provide accurate data and to cut safety costs for compliance.

The Pennsylvania Underground Utility Line Protection law requires that all facility owners in the state locate their underground facilities within two full working days after receipt of a timely notification of excavation from Pennsylvania's One Call Inc. system.

PPL Electric Utilities, which provides electric service to 1.4 million customers in eastern and central Pennsylvania, recently upgraded its response capability by implementing an extract and-upload process to Pennsylvania One Call's PHOENIX mapping system. The PHOENIX program screens all PPL Electric Utilities' one-call tickets and only forwards those that are within the buffered area where the utility has underground cables. Prior to the PHOENIX mapping program, all locate tickets within the PPL service territory required a site visit, even if no underground facilities were present. The system has been in place for one year, and PPL is seeing about a 22 percent reduction in the total number of locate requests that require site visits.

PPL Electric Utilities' primary concern is the safety of contractors and the public. Protecting underground cables from dig-ins is a significant responsibility for the company, which receives more than 130,000 cable location requests annually. The number of One Call requests has been increasing by about 8 percent per year. By using GIS data through the PHOENIX program, PPL Electric Utilities has saved thousands of unnecessary trips to the field where underground cables are not present, and has provided workers with more time to perform locates where underground cables are present.
The challenge for PPL Electric Utilities was to develop a mapping process that would superimpose internal maps and objects onto a GIS system. Using Esri's ArcGIS software, the company's technology support center created maps that showed the underground facilities and overhead transformers that included underground services, then placed buffers around those facilities according to the high-consequence area regulation standards.

To ensure accuracy, PPL Electric Utilities tested the credibility of the new process. Service coordinators were sent into the field to verify buffer accuracy in both urban and rural areas. The data was accurate, so maps were made for all areas served by the utility.
PPL Electric Utilities sent its underground facilities map with buffers to the Pennsylvania One Call System. When the system receives a notice of excavation, it checks the location against the map. If the excavator is digging inside a buffer zone, PPL Electric Utilities receives a request to mark the underground cable location. If the digging is outside a buffer zone, Pennsylvania One Call clears the job.

After one full year in operation, PPL Electric Utilities is very pleased with the results. One of the most important factors in the success of this program is the weekly uploading of data by the Technology Support Group at PPL. Updated buffers that are sent to Pennsylvania One Call go into effect the next business day. A sampling of cleared tickets is regularly field tested to ensure data precision. The result is more accurate data for both state and company systems.

Thanks to Kevin Ruggiero, PPL’s consultant in Technology Support, for providing information for this article.

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GIS Eases Workforce Transition

IREA Boosts Efficiency with ArcGIS Server

Colorado utility Intermountain Rural Electric Association (IREA) recently confronted a significant business concern—several of its 185 employees will be retiring soon. The impending workforce shift portends a less experienced replacement staff and the potential loss of data stored in the heads of seasoned employees. The solution for IREA, and a growing number of utilities, is GIS based on Esri's ArcGIS Server and ArcGIS Desktop technology.

With 135,000 customers and more than 200 distribution feeders, IREA is one of the largest and fastest-growing of more than 900 member-owned electric distribution cooperatives in the United States. After a speedy and successful implementation, IREA has an enterprise GIS based on ArcGIS Server and ArcGIS Desktop along with ArcFM from Telvent Miner & Miner.

"The GIS we now have through Esri has opened the door to new ideas and new possibilities to solve problems," said Duane Holt, senior supervisor of GIS for IREA. "For years and years, we have had a lot of good data, but it hasn't been available to the enterprise. Knowledge about our network that was once passed along from person to person is now in the database and accessible to everyone."

The utility has already reported marked advantages after implementing Esri's ArcGIS Server and ArcGIS Desktop including out-of-the-box applications and services for spatial data management, visualization, and spatial analysis. ArcGIS Server complements ArcGIS Desktop by allowing GIS analysts to cost-effectively publish maps, globes, and data processing tasks that are authored in ArcGIS Desktop and make them available company-wide.

The ArcFM solution provides specific utility industry tools for editing, configuring data models, and managing facility information. ArcFM works with ArcGIS Desktop and ArcGIS Server solutions by helping the utility maintain electrical facilities, keep track of jurisdictional changes, and perform a variety of mapping applications. Corrected data and up-to-date maps can then be distributed throughout the enterprise.

"Our employees used to see pieces of the picture in their minds or on a scrap of paper," Holt said. "Now they can all see the whole picture and contribute to it."
GIS helps utilities retain data from retiring employees and quickly train new hires.

With the three-phase switching schematics, the Operations Department is able to plan and direct crews more efficiently during large load balance switching procedures.
In addition to buffering IREA from workforce changes, the ArcGIS Server and ArcGIS Desktop technology served as the catalyst for a much-needed data cleanup of the customer information system. GIS data is now compared to information in the billing system to ensure accuracy and ameliorate integration.

Utility companies need information systems to integrate with business and operating systems. IREA migrated its data from a computer-aided drafting (CAD) system to GIS and is now fully geospatially enabled. GIS technology offers data analysis capabilities and a range of functionality that clearly distinguishes it from CAD systems. The unmatched speed of GIS for accessing data and generating maps proved to be an immediate return on investment for IREA.
One major concern in undertaking the migration was downtime. Through effective workaround strategies and a diligent implementation, migration was quick and successful, with minimal disruption to work routines.

"A successful pilot by Esri and Telvent Miner & Miner allowed us to save a great deal of time and money," Holt said. "With their help, the complete expedited implementation finished right on schedule without a glitch. I couldn't be happier with the success."

Efficiency at IREA continues to gain momentum as the utility explores the possibilities of geographic information. ArcGIS Server houses layers of information including electric networks,
billing records, county data, and aerial photography. Data queries can be answered by simply pulling up a couple of layers in the GIS system.

"The system has allowed the GIS staff of three people to respond to varied requests much faster and more accurately," Holt said. "The company is only beginning to realize the capabilities of this seemingly limitless technology."

Learn more about ArcGIS Server at www.esri.com/arcgisserver.

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Load Demand Solutions for Mobile GIS Data Distribution

Rappahannock Electric Cooperative

By Barbara Shields, Esri

Rappahannock Electric Cooperative (REC) is able to deliver its full GIS and related data out to its field personnel for faster and better service to its members. Its new mobile GIS delivers applications, electric network data, and application updates to its field crews via a wireless system. Wi-Fi solutions are taxed by dense data and client/server traffic loads. REC worked with consultants to find a solution that not only accommodates current system demands but also presents a foundation for future growth.

In 2006, the cooperative standardized its GIS, which is based on Esri’s platform of GIS software. REC, headquartered in Fredericksburg, Virginia, finds GIS to be an invaluable tool for maintaining nearly 12,000 miles of power lines throughout a service area that includes 100,000 connections in 16 counties, from the Blue Ridge Mountains to the mouth of the Rappahannock River. REC selected Itron’s Origin GIS for its utility application and worked with Lockheed Martin (REC’s IT and strategic business partner) to integrate GIS and the co-op’s outage management system as well as a variety of engineering functions. REC then implemented TC Technology’s GIS mobile solution GO! Sync Mapbook throughout the utility’s field operations.

Lockheed Martin provides a wide variety of IT solutions to the company, and TC Technology offers a mobile GIS solution based on Esri technology and data formats. The configuration includes ArcGIS Desktop. REC chose this system because it was simple to deploy and maintain. Just as important, managers thought that field-workers at any stage of aptitude could easily learn and use the system. In addition, the co-op’s multiple districts receive online database updates and GIS applications for work processes.

Prior to the mobile solution, REC’s field service program had a 50-year history of working with paper maps. One district within the service area had map books weighing up to 30 pounds. Some field crews worked between several districts, so they were carrying two hefty paper map book libraries in the backs of their trucks. While on assignment, the field-worker would pull down the tailgate, prop up the map book, and locate the current job. This was particularly challenging when they had to deal with outage work orders during a rainstorm.
REC’s goal has been to make its field personnel more efficient with a product that is easy to use and cost-effective. By doing so, management believed that the co-op could serve its customers better and faster. REC chose the GO! Sync Mobile GIS system to wirelessly deliver up-to-date data without complex user interaction to field users throughout the REC service territory. In the initial implementation, 27 service trucks were installed with laptops, quickly followed by 40 more. The goal is to install Panasonic CF30 Toughbooks in all 110 service vehicles.

**Maximizing Pipeline Solutions**

The microwave T-1 broadband communications pipe between REC’s four offices is limited, and there is a large amount of data to distribute. TC Technology provided the foundation for the co-op’s future initiatives to pull data down, use objects from all applications, and serve data and applications to several client/servers in the service area. Every day, 110 mobile laptops will be accessing the system through the T-1 network and Internet connections for home agents. The main office has to serve up several gigabytes of data through this small communications pipe, and testing revealed that the system would always be overloaded. A revised solution was needed to solve the problem.

Working with TC Technology consultants, Lockheed Martin implemented multiple staging servers, and the data was then distributed from each district office site. The staging server is also able to distribute the application and any updates to the application configuration files. Originally, the T-1 data connection transfer time was between three and four minutes, but the staging solution reduced transfer time to about one minute. An updated dataset is generated every few hours, one in the early morning and a second in the afternoon, to distribute daily changes made in the GIS.

Field users have been put on a regulated download schedule, which has improved the communication traffic. Another traffic management trick is that field-workers who take their trucks home can download data from the staging server using VPN through the Internet.

**Data Security Solutions**

Even though REC’s data is going out via a server across Wi-Fi and LAN lines, the network remains secure. The system access is protected by passwords that change regularly. In addition, the laptops in the trucks are firmly bolted and battened down to protect them from robbery. Finally, the company is using disk encryption software on laptops so that data is secure in the event the laptop is stolen.

Future initiatives were considered when planning the current mobile data system. A network-based intrusion-prevention system (IPS) monitors the network for potential intrusion. IPS units are in place for every substation equipped with a wireless access point across the entire service territory.
Field crews that are normally assigned to a specific operating district may need to travel to other districts in the service territory. When they do, they can reliably download data from that district's staging server. This makes it easy for workers to roam as needed and get the information necessary for that out-of-area job.

In the near future, substations will also be sites that transmit data. Another option is the ArcGIS 9.2 file base geodatabase format that offers functionality for compressing the geodatabase so that it can be served more easily across limited bandwidth connections. This will ensure network availability for use by a wide variety of additional business processes such as outage incident data and work ticket inventories. By monitoring network traffic, Lockheed Martin can evaluate performance during system growth using comparison of usage patterns, capacity, and download demand.

Rappahannock Electric Cooperative purchased servers to put in each district office and WAP (Wireless Access Points) technology in addition to the GO! Sync software. All the while, REC was thinking of the long-term benefits the system would achieve from efficiency and customer service to recuperate these costs.
ArcGIS delivers system data to field-workers. They can see facility information from the substation, locate streets and parcel numbers, and view primary lines color coded by type and phase. In the field, workers can use applications that are specific to their tasks. Easy access to current data has made this an invaluable tool for REC’s crews.

The co-op’s goal for having field-workers adopt the new technology was achieved. Its GIS analyst, Brent Hart, notes, "From a change management standpoint, ease of use combined with value to the user has been a huge asset for us. Our field-workers had been using paper map books for a long time, and some of them were reluctant to join the computer world. However, once we provided them with training and put laptops in their trucks, they readily saw the benefits of this conversion and were very happy with the results. The mobile GIS is really easy for them to use and helps them do their work more efficiently. This was our initial goal. It is the job of the guys in the field to keep the lights on, not to be GIS operators. This GIS tool is one that they..."
have easily learned and are glad to be using."


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FERC Licensing: Studying Potential Effects of Dams

By Jessica Wyland, Esri Writer

For much of Idaho the Snake River is the lifeblood. The 1,040-mile tributary of the Columbia River provides water for drinking, irrigating, and generating approximately 50 percent of the state's energy through hydropower. The Snake River flows from Yellowstone National Park through a series of mountain ranges, canyons, and plains in Wyoming, Oregon, Idaho, and Washington. For Idaho Power Company, owner and operator of 17 hydroelectric power plants, preservation of the river is of utmost importance.

Idaho Power is involved in the generation, purchase, transmission, distribution, and sale of electric energy in a 24,000-square-mile area in southern Idaho and eastern Oregon with an estimated population of 982,000. It is one of the nation's few investor-owned utilities with a predominantly hydroelectric generating base in addition to two gas-fired plants and shared ownership of three coal-fired generating plants.

"Since we use the river system for power generation and public recreation, we are committed to being good stewards of our natural resources and environment," said Mike Butler, GIS expert with Idaho Power.

Each of the 17 dams Idaho Power operates along the Snake River is subject to a federal license through the Federal Energy Regulatory Commission (FERC). Each license is for a specified term and must be renewed over time. Idaho Power is in the process of relicensing dams throughout its system and complying with new licenses received in 2004 for Bliss Dam and Lower Salmon Dam, where a study is under way to ensure the viability of the Bliss Rapids snail, a species listed as threatened under the Endangered Species Act.
When an action is likely to adversely affect any listed species, FERC is not allowed to grant licenses without a formal consultation with the U.S. Fish and Wildlife Service (USFWS).

If Idaho Power restricted operations of its Snake River Dam, the utility could potentially lose substantial revenues and would need to seek costly alternative sources of energy to meet the needs of its customers. Instead, Idaho Power takes a proactive approach to relicensing its dams by employing a large staff of experts in biology, engineering, and GIS technology. The team primarily studies and monitors hydraulic, recreational, aquatic, and terrestrial resources within the utility's service territory as defined by FERC.
In 2004, Idaho Power began its five-year study of the Bliss Rapids snail. The gastropod may be considered an indicator species, one that defines the overall health of its habitat and the river system. Invertebrate biologists and hydraulic engineers at Idaho Power are charged with trying to locate and study habitats including the hydraulic environments of threatened or endangered snail colonies in the middle Snake River reach.

"We want to learn where and under what hydraulic and environmental conditions do we find listed snails," Butler said. "We need to be able to answer questions related to snail reactions as the water levels change during seasonal river flows and normal flow fluctuation from power generation."

Idaho Power's team of experts had to answer important questions. What are the habitats the snails occupy and what environmental conditions do they need? What hydraulic variables impact the snails? If the water level goes up or down, are the snails able to migrate to the new environment? Does the utility’s operation cause harm to the snails? If so, how will the utility alter operations to minimize its impact?
"Our mission is to collect the data necessary to accurately model the river flows and locate snail habitats," Butler said. "From there, we will be able to determine how best to minimize possible operating impact to the snails—if any impact is found."

**Determining Data Layers**

The utility's GIS houses a comprehensive set of layers for studying the river. A substrate layer identifies changes in the riverbed surface from boulders, cobbles, gravels, sand, silt, and muck. A channel classification layer distinguishes each region of the river as a bar, pool, riffle, glide, or rapid. Water temperature is tracked with a temperature data logger. Solar radiation tools in the ArcGIS Spatial Analyst extension help determine places on the ground within the river system where temperature changes need to be understood and monitored.
Since Bliss Rapids snails are approximately the size of a pinhead (2 to 3 mm) and, therefore, difficult to spot, the team uses Global Positioning System (GPS) technology to locate the populations. Population locations are stored in the enterprise geodatabase along with data for substrate layers, channel classification, water temperature, and water velocity.

"GIS allows us to look at the potential area of impact by flow and even duration of wetting and drying so we can try to minimize that area and simultaneously maximize operating potential," Butler said. "This is essential to our company not only during the relicensing process but also as we continue to produce affordable, renewable energy for the rate payers."

By linking GIS-based 3D terrain models with results from Danish Hydraulic Institute (DHI) 1D hydraulic models, the Idaho Power team is able to simulate through animation and portray with

Mapping and Modeling
the Snake River

This flood simulation shows the water flow potential at a low stage of 4,500 cubic feet per second (cfs) versus a flood stage at 20,000 cfs.
maps all flow regimes the company may encounter through normal operations. Researchers are able to overlay inundation polygons with known snail locations, mapped habitats, and channel classification polygons to quantify how much area of preferred snail habitats are wetted or dewatered at different operational flows.

With Esri's ArcGIS Spatial Analyst and 3D Analyst extensions, the team created a series of triangulated irregular networks (TIN) and surface grids that combine underwater topography, aerial photogrammetry, and various ground surveys into a seamless physical representation of the riverbed. Sonar devices are used to collect underwater topography, or bathymetry. Ground surveys are conducted by engineers who map the bed and water surface elevations using sonar, real-time kinematic (RTK) GPS, and traditional survey techniques. Pressure transducers were also installed in the river to log water surface elevations related to discharge. The river stage data was used to calibrate several one-dimensional hydraulic models that are ultimately used to simulate water flows.

"Now we have the physical environment mapped in GIS and modeled with hydraulic modeling software," Butler said. "We import results from our modeling work into our GIS to create inundation flood maps for specific dam discharges."

GIS analysts at Idaho Power developed a series of Visual Basic models to streamline the flood-mapping process and geodatabase design and implementation. When the inundation polygons are compared with the channel classification and substrate layers, suitable and unsuitable snail habitats are identified for each operating flow.

"We are now able to visualize the inundation area versus discharge relationships for the entire river reach and how they relate to snail habitats," Butler said. "Laboratory studies have determined that the snails being studied have high mortality above certain temperatures and under freezing conditions. So if we can alter operations to minimize exposing critical snail habitats to ambient air temperature and solar radiation, we can benefit the snail populations by reducing potentially harmful conditions, improve our stewardship in the river system, and still generate electricity at some of the lowest energy rates in the country."

For more information on Esri's ArcGIS Spatial Analyst and 3D Analyst extensions, visit www.esri.com/spatialanalyst.

(Reprinted from the Winter 2009 issue of Energy Currents newsletter)
GIS Pioneers Track Assets for Work Orders and Emergency Response

City of Paragould Continues Historic Growth

By Jessica Wyland, Esri

Two U.S. railroads crossed for the first time in 1882 through the heart of the country and the corner of northeast Arkansas. The Missouri Pacific railroad, headed by magnate Jay Gould, and the Cotton Belt railroad, led by line president J. W. Paramore, made their junction through a stretch of largely uninhabited land. After some ado, the newly formed community was named for the railroad presidents. The city of Paragould, Arkansas, was born.

Bolstered by a healthy timber industry, Paragould made fast strides toward becoming a flourishing town. By 1890, the population was 2,528. By the early 1900s, the city leapt to cosmopolitan status with paved roads, department stores, and a modern hotel. Within 10 years of the founding, both municipal water and electrical power plants were organized along with several private telephone companies.

To this day, Paragould Light, Water & Cable (PLWC) continues to serve the community as a not-for-profit municipal utility providing electric, water, wastewater, cable, and Internet services to the 25,000 people who now live in the city.
When Paragould's timber industry declined around the 1920s, residents turned to agriculture, and the city continued its steady growth. Today, the still-burgeoning area is expanding to the eastern Arkansas population centers in Jonesboro and West Memphis.

In an effort to keep pace with growth and customer demand, PLWC recently identified two necessary improvements. It needed to bring together all its data in an environment that could be accessed by everyone on staff, and it needed a system to track its assets for work orders and emergency response.

Finding a Solution

To meet its business and operational needs, PLWC selected GIS technology from Esri. With Esri's Small Government Enterprise License Agreement (SGELA) program, the City of Paragould was able to acquire unlimited deployments of Esri's core GIS software as well as training and maintenance. PLWC became the first city department to take advantage of GIS technology.
"We had all our maps in computer-aided drafting [CAD] and any other information was in spreadsheets, notepads, filing cabinets, and miscellaneous databases," said Lane Howerton, GIS coordinator for PLWC. "We realized GIS could bring it all together, and Esri's SGELA program made the technology affordable to us."

**Shared Access**

Once the utility was provided with enterprise GIS through SGELA, it was able to deploy Esri's ArcGIS Server Advanced, designed to provide a central, server-based GIS for distributing services across the organization or over the Internet. It provides PLWC with spatial data management, 2D and 3D visualization, and spatial analysis capabilities. The Enterprise level of ArcGIS Server supports an unlimited number of users via either direct connect or connection to an application server. It offers database management system support for IBM DB2, IBM Informix, all editions of Microsoft SQL Server, and Oracle. It has no limits on data or memory.

ArcGIS Server allows PLWC users to access maps and data through the company intranet using only their Web browser.
The utility is now using its custom-developed SQL Server asset management system, based on ArcGIS Server, to push data out to staff with desktop and mobile devices. The system is tied directly to facility data to support underground locates for workers in the field. Crews also have a direct connection to the customer information system. In PLWC's outage management system, the staff is able to geolocate trouble calls as they are entered.

"One of the greatest benefits of GIS technology is that now everyone on staff has access to the most up-to-date information," Howerton said. "Anyone within the utility is able to track individual problems and look for trends in outages, all within the ArcGIS Server application."

**Asset Management**
As soon as PLWC deployed its enterprise GIS, Howerton and his staff set to work converting the utility's asset data and land base maps to digital files. Within a geodatabase, the information was joined by data on streets, railroads, highways, and creeks and other waterways. Howerton imported the utility's CAD maps and set up attribute tables for each feature that was previously defined only in notebooks, spreadsheets, or various databases. PLWC also populated the geodatabase with digital photographs and GPS data for each pole and hydrant—data collected by the utility's field crews using mobile GIS technology.

**Mobile Maps**
The utility relies on mobile GIS technology for data cleanup and maintenance updates. Within the asset management system, the utility sets alerts for inspections and enters inspection information when the job is done. Crews can access asset data from the field instead of coming back to the office to look through files or deal with grid books. For example, a worker can search manholes by address or by manhole number to quickly access the most up-to-date information.

**Emergency Management**
When a recent storm left hundreds of utility poles broken, PLWC was able to refer to digital images and GIS-based maps to quickly restore poles to their original status.

"City executives were impressed with the overall ability to quickly assess and fix the power outages that resulted from the storm in such a short time," Howerton said. "We are now looking to deploy GIS technology for more city government functions."

For more information, visit www.esri.com/electric.

(Reprinted from the Fall 2009 issue of Energy Currents newsletter)
Digital Maps Go Mobile

*Butler Rural Electric Cooperative*

By Matthew E. Brown, Butler Rural Electric Cooperative

Butler Rural Electric Cooperative (BREC) in Ohio provides electricity to more than 12,000 members in parts of Butler, Preble, Hamilton, and Montgomery counties. When the utility was founded in 1936, its original mission was "to provide abundant, reliable, safe and equitably priced electric service." BREC is still committed to this goal. The utility recently upgraded its 12 field vehicles from paper to digital network mapping in order to improve customer service and outage response time.

This screen shot of the GIS system shows a portion of a subdivision served by BREC overlaid on an aerial image. Background images are available for the majority of the service territory.
In a rapidly developing environment, BREC utility staff needed immediate access to data. Traditionally, field crews relied on paper map books to access system information; this method presented a host of problems. The maps were initially hand written and later computer generated. Despite the introduction of computer-generated paper maps, it was virtually impossible to maintain current, up-to-date information for field employees. Another shortcoming of paper maps was the inherent lack of data. The maps showed the locations of lines, poles, electrical devices, and consumers, but no additional data.

This screen shot shows a portion of a subdivision served by BREC.

BREC recognized that paper maps were also an inefficient use of resources and time. Map books are susceptible to damage from water and wind, as well as general wear and tear from daily use. Therefore, even if no actual system changes take place—which is rare—the
map pages still require costly periodic replacement. An extraordinary amount of time goes into maintaining the electronic mapping system, creating layout and content for each map, printing the map pages, and compiling the individual books. In addition to drawbacks in terms of accuracy and efficiency, creating paper maps places great time demands on the mapping technician.

Clearly, with the inherent restraints of paper maps, an electronic solution was necessary. The new system had to be easily updated, accurate, and simple to use. BREC decided to deploy digital maps in its utility trucks with GIS technology from Esri. Since the utility already had a GIS in place, it did not have to convert all its paper maps to digital format. With ArcGIS Desktop applications, BREC was able to deploy digital map viewing capabilities to all 12 of its utility trucks. The utility selected HP Tablet PCs and a mounting system from Jotto Desk.

The next hurdle was updating map data, since it was not feasible to remove the computers and transport them to the office. BREC decided to update computers electronically through a wireless network in the utility garage area, accessible to all company trucks. Truck computers were programmed to notify the office computer via e-mail when the truck pulls into the garage at the end of the day. ArcGIS software allows field personnel to write notes on the map. Corrections and comments are marked, and a screen shot is e-mailed to alert the mapping technician of changes.
Field crews quickly adapted to the digital maps and are satisfied with the greater level of access to consumer information and equipment databases. BREC staff now has more of the information needed to respond to work orders with maximum efficiency. Expanding GIS technology to the field has enabled BREC to improve response time, increase data accuracy, and maintain high customer satisfaction—in line with the utility’s founding mission.

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Vegetation Management at the Touch of One Button

By William Mathison and Bill Blackmarr, Nashville Electric Service

Nashville Electric Service (NES) developed a GIS-based "one-button" application to create and print digital maps for vegetation management of its 5,700 miles of distribution lines and 200,000 poles. Previously, the utility relied on paper maps, which made the process time consuming and compromised data integrity. After the first year of implementing a three-cycle tree-trimming process supported by digital data, NES saved hundreds of hours of work.

Annually, NES trims 1,600 circuit miles of trees and has an average of 70 crews in the field daily. The company started its first aggressive trimming cycle in 2002 and is currently working on the third cycle. Before moving to digital data, NES provided contracted tree trimmers with bid packets containing 25 to 30 circuits, with some circuits consisting of 75 to 125 maps. Also, each map had to have 10 printed copies—two for in-house and eight for contractors—which meant many hours of work to create and print maps.

To streamline the process and alleviate excess work, the GIS department and its consultant, Ferguson, Jenkins & Associates, created the onebutton application. The one-button, or circuit application, uses a geometric network and GIS data layers such as distribution, source, and others, to trace out/select distribution lines from the substation source to all points downstream. When the application is run, the user specifies the circuit by substation and circuit number to be created. Data is collected and maintained by the GIS and mapping departments at NES.
As part of the program, NES creates a personal geodatabase every three years. The geodatabase is a "snapshot" in time of the production database, which preserves data integrity and allows NES and contractors to work from static data over the life of the trim cycle. With a saved geodatabase, the application allows NES to create circuits from all the substations in the system. Once created, the circuits can be exported to Esri shapefiles, digital maps (.jpg), or scaled paper maps for delivery to the contractor. With output flexibility, the application allows contractors to interactively view the circuits in ArcGIS Desktop or portable devices.

Over time, the application and process have evolved to include additional GIS data layers, such as switches, protection devices, and transformers, with ancillary information, such as roads,
customer information, tree species, and trimming type. Once the tree trimming cycle has been completed, the data, along with any changes, is placed on the Web-based system for planning and historical purposes.

For more information, visit www.esri.com/electric.

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Making Marked Improvements in Staking

By Marisa Meisters, Futura Systems, Inc.

Central Alabama Electric Cooperative, headquartered in Prattville, Alabama, serves more than 40,000 meters and 5,500 miles of line in a 10-county area. Recently, the utility implemented new GIS applications for mapping, staking, and workflow management from Futura Systems, Inc., an Esri business partner. Futura's staking and mapping software is built on Esri's ArcGIS Server platform.

With the GIS upgrade, Central Alabama has improved data accuracy and eased staking procedures. The utility's customer information system (CIS) is now integrated with its GIS, allowing applications in both the CIS and GIS to reflect data updates. Additionally, thanks to the GIS upgrade, the cooperative's inventory management has been simplified. New staking software allows the utility to make changes that are instantly reflected in the accounting system. Conversely, changes to a job that are made in the accounting system are updated automatically in the GIS.

"The construction data that we input just flows into the accounting side of the software; nothing additional needs to be entered," said Jerry Vines, the utility's staking supervisor.

The utility records new staking location points with GPS technology, then draws connective spans. The staker has access to a list of available construction units that can be quickly added to each location, removing the need to manually type unit names. Once points are drawn and the job is ready to complete, callout boxes are added directly to the map. The callouts show exactly what assemblies, materials, and quantities of each are required per location and whether they are new, retired, or existing.
New units (including 20 feet of 4/0TUX wire) are being added to a location within a subdivision.

“This process makes it extremely easy to visualize what needs to be done at each location and gives the crew enough information to build the job without any extra paperwork,” Vines said. "Once the job is built and posted to the map, the same data is also sent to the accounting system, keeping the staking and accounting records in sync."

Central Alabama Electric Cooperative linemen quickly adapted to the new system and now rely on the Futura Viewer to assist in the location of services and devices. When computers are down, the IT staff is notified immediately, because the field crews do not want to resort to paper maps.

The new method, backed by enhanced GIS capabilities, is not only convenient but also saves hours of valuable time. Crew members can now create temporary jobs from the field instead
of returning to the office for an assigned job number. For example, if stakers finish one job and want to take care of another nearby, they can do so without connecting to the company network. When they return to the office, they can create a permanent job and record everything in the GIS.

These sheets show labeled locations with white callout boxes. Some of the callout boxes contain new assembly units (in black text), and the red text assembly units in several of the callout boxes indicate that those units are being retired. Some locations contain both retired and new assemblies.
New units are added to replace assembly units that are being retired. The staker has added a note with a yellow text box indicating that the state Department of Transportation will need to be contacted prior to building the job.

Futura Systems is an Esri developer/reseller providing Web services-based mapping, staking, and work order management for utilities. Futura's products are fully integrated through MultiSpeak, allowing users to configure data and update databases in real time.

For more information, visit www.futuragis.com.

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GIS for Economic Development

Orion Technology, a Division of Rolta Canada Ltd.

In a global economy, efforts to attract new industry grow ever more competitive. For officials in Georgia, a state in the United States known for its genteel hospitality and culinary delights, the challenge is to get their message heard. The Georgia Resource Center (GRC), part of Georgia Power’s Community and Economic Development organization, recently worked to upgrade a custom-built application that matches prospective companies with available properties and communities in which they would be successful.

Georgia Power provides electricity to 155 of Georgia’s 159 counties. A key element of the utility’s business strategy is to promote to industry the advantages of establishing in Georgia. For the state, a new industry usually brings with it secondary and tertiary businesses, along with new residents employed in these new companies. For the utility, the influx of people adds to its base of electric customers.

To entice new businesses, Georgia Power decided to implement a configurable, commercially available Web-based GIS built with Esri software. GRC contacted Esri business partner Orion Technology for the OnPoint application that enables organizations to serve spatial data using Web technologies. Orion, together with its partner Rolta International, would meet GRC’s need for a Web-based GIS that could impress prospective customers.

The process began with Georgia Power creating a detailed set of requirements for how the new application would operate. The team referenced the existing application as a benchmark, along with existing data resources. The next step was to remodel the GIS database including spatial and nonspatial data. This modeling exercise was performed by Orion staff in consultation with staff from Rolta International and Georgia Power. The final model was an Esri GIS-based geodatabase, housing much of the data required for the OnPoint implementation. Next, Rolta International staff developed scripts to populate the database. Some records would require only a one-time load, while others would require a script that could regularly load data updates.

Since the GRC staff received configuration training early on in the project, they found it impossible to just sit on the sidelines and watch implementation mature. With direct involvement from the GRC staff, the implementation was a success. Now the GRC staff have the search capabilities they were
accustomed to, along with multilevel join capabilities and links to external Web services such as Google Earth and Bing Maps (formerly Microsoft Virtual Earth). With ruggedized laptops, the GRC staff have taken GIS to the field, showing a prospective company one available property, with the ability to compare it with another property on the spot through a wireless connection to SelectGeorgia.net.

Georgia Power’s Economic Development site shows water, sewer, and natural gas information coming from nonspatial databases using OnPoint’s multilevel join capability.

This GIS-based Internet application was recently launched by Georgia Power and is available to the public.

The site, used to support economic development projects, receives an average of 9,700 visits per month. Since the new GIS implementation in June 2008, the state has reported more than
$1.3 billion in new capital investment to the state and more than 5,800 new jobs. "Our old model for development was to create an application from scratch and expect it to do it all, but we no longer have time to write code for needed updates," said Stan Vangilder, GRC manager. "We can now simply adjust our application configuration as needed and use its extensive interoperability to link our system to other existing resources. This approach saves significant time and money and multiplies our effectiveness by taking advantage of other great applications and databases available to us."

Visit www.esri.com/electric for more information.
High Winds Mean High Time for GIS

Central Lincoln People’s Utility District Finds Affordable GIS Solutions

By Jessica Wyland, Esri

Living in the Kite Capital of the World means lovely Saturday afternoons for most residents of Lincoln County in Oregon, but for utility crews, it means extensive efforts to keep the power flowing despite outrageous winds that send trees crashing into electric lines.

Central Lincoln People’s Utility District found a faster way to prevent and fix such outages with vegetation and outage management based on GIS technology from Esri. The utility serves approximately 38,000 customers along the central Oregon coast—a strip 100 miles long and 2 miles wide.

"With extreme winds, a lot of our transmission and distribution lines are susceptible to trees," said Neal Myers, GIS supervisor for Central Lincoln People’s Utility District.

"Through GIS, we are able to link our voice recognition system with customer information. When we get an outage call, we are able to quickly create a work order and deploy field crews directly to the trouble areas."

Solutions for Small Utilities

Central Lincoln gained greater access to GIS technology by joining Esri’s Small Utility Enterprise License Agreement (SU-ELA) program. Through the SU-ELA program, utilities with 100,000 meters/connections or fewer are assured unlimited deployments of Esri’s ArcGIS platform to desktop, server, and mobile devices. Additional program benefits include maintenance and support for products, staff training at a reduced cost, and passes to Esri’s International User Conference.
Central Lincoln uses GIS to link information in the automated call system to corresponding services.

At the heart of the SU-ELA program is Esri's ArcGIS software, an open, scalable, and interoperable platform that provides a complete system to create, serve, and use geographic information. An enterprise GIS, based on ArcGIS technology, benefits designers, analysts, decision makers, field staff, and customers through mobile, Web server, and desktop applications.

For more information on the SU-ELA program and to listen to the SU-ELA podcast, visit www.esri.com/suela. To speak to an expert, call 1-800-447-9778, extension 2990.

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Doubling GIS Workforce Capabilities

Truckee Donner Public Utility District more than doubled its number of field crews equipped with mobile GIS thanks to unlimited licenses provided in Esri's Small Utility Enterprise License Agreement (SU-ELA) program.

Truckee Donner serves 12,000 electric meters and 11,500 water meters in Northern California. Through the SU-ELA program, the utility is ensured unlimited deployments of Esri's ArcGIS platform to desktop, server, and mobile devices, along with maintenance and support for products. Other benefits include staff training at a reduced cost and complimentary passes to Esri's International User Conference.

"We have saved significantly on deployment costs and now have unlimited licenses in addition to the software, maintenance, and training benefits we needed," said Ian Fitzgerald, GIS coordinator, Truckee Donner Public Utility District. "By signing the SU-ELA, we went from 8 to 20 workers with GIS capabilities. We are now able to expand GIS to an indefinite number of users and bring our entire crew up to the level of the foreman in terms of knowledge of what's in the field."

With information accessible via mobile GIS devices rather than paper maps, Truckee Donner's staff is able to make better decisions. Additionally, having accurate data on demand has improved the utility's response time and customer service.
Truckee Donner uses mobile GIS to respond to outages and emergencies.
"During our winter snowfall, it can be difficult to locate facilities, but GIS helps our crews quickly find and fix leaks," Fitzgerald said. "Also, our operations and maintenance personnel are able to use GIS-based intelligent modeling tools to quickly determine which areas need to be isolated to repair the leak."

For more information about Esri’s SU-ELA program, visit www.esri.com/suela.

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Since 1969, Esri has been giving customers around the world the power to think and plan geographically. The market leader in geographic information system (GIS) solutions, Esri software is used in more than 300,000 organizations worldwide including each of the 200 largest cities in the United States, most national governments, more than two-thirds of Fortune 500 companies, and more than 5,000 colleges and universities.

Esri applications, running on more than one million desktops and thousands of Web and enterprise servers, provide the backbone for the world's mapping and spatial analysis. Esri is the only vendor that provides complete technical solutions for desktop, mobile, server, and Internet platforms. Visit us at www.esri.com.