Energy Currents

ESRI • Summer 2007 GIS for Energy

Dane Power Companies Use GIS to Splice into Telecommunications Market

By Jesper Idorn, Informi GIS A/S

The broadband market is growing rapidly in Denmark. In 2006, the Organisation for Economic Co-operation and Development (OECD) reported that Denmark had the highest broadband use per capita in Europe at 29.3 subscribers per 100 inhabitants. Danish electric companies are edging into the fiber market by adding telecom services. Geographic information system (GIS) technology is an important player in planning and maintaining these utility telecommunication, or Utelco, operations.

Several major power companies have banded together to launch fiber-to-the-home rollout plans to cover large areas of Denmark. The initial project plan targeted more than 500,000 households and businesses in the first one-month period and eventually will extend to more than 1.2 million households. The goal is to deliver networks ranging from speeds of 2 to 10 Mbps up to an ambitious 100 Mbps to accommodate radio and television content.

For example, the EnergiMidt company has earmarked an investment equal to its current annual net sales revenue, approximately DKK 1 billion (US$168 million), to start up its fiber broadband division. EnergiMidt is a large cooperative utility company located in the central area of Jutland and owned by its 162,000 customers. Within five to seven years, the company expects to offer fiber broadband connections for delivering lightning-fast Internet, worldwide television channels, and a series of broadband services to all its customers.

The first challenge EnergiMidt and other

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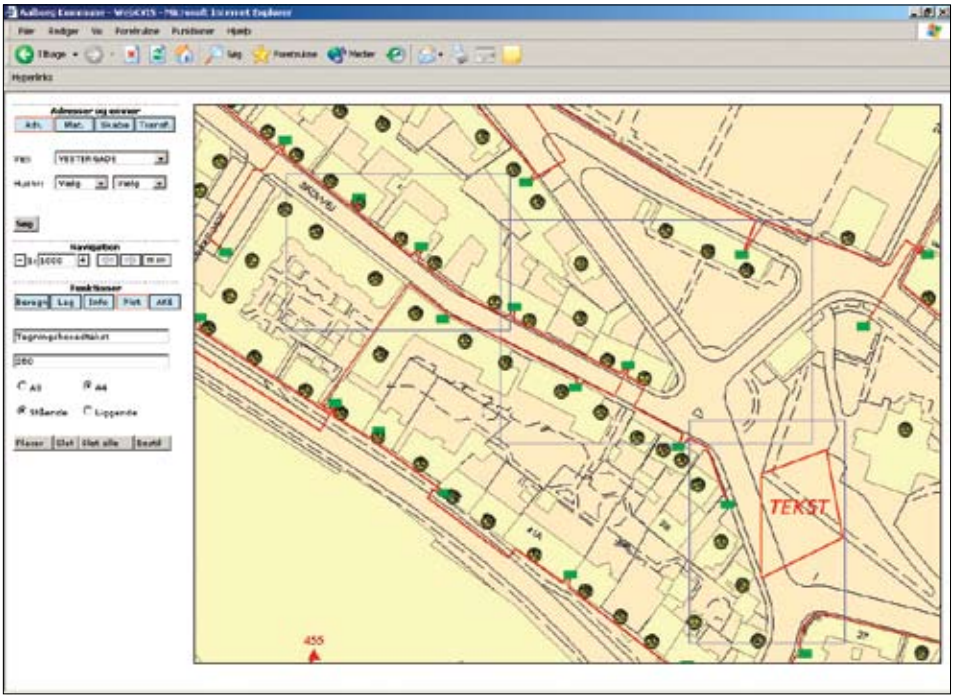

Danish utilities use e-NET Cable to access cable network information; e-NET Info is the service's tool to search, display, and query.

In This Issue

ESRI on the Road

ESRI European User Conference 2007
September 26–28, 2007
Stockholm, Sweden
www.esri-sweden.com/euc2007

AMRA Autovation 2007
September 30–October 3, 2007
Reno, Nevada
www.amra-intl.org

Electric and Gas User Group (EGUG) 2007 Meeting
October 8–11, 2007
Nashville, Tennessee
www.esri.com/egug

Itron Users' Conference
October 21–23, 2007
Orlando, Florida
www.itron.com

DistribuTECH 2008
January 22–24, 2008
Tampa, Florida
www.distributech.com

TechAdvantage Expo 2008
February 19–25, 2008
Anaheim, California
www.techadvantage.org

GITA
March 9–12, 2008
Seattle, Washington
www.gita.org

2008 ESRI International User Conference
August 4–8, 2008
San Diego, California
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To register for ESRI events,
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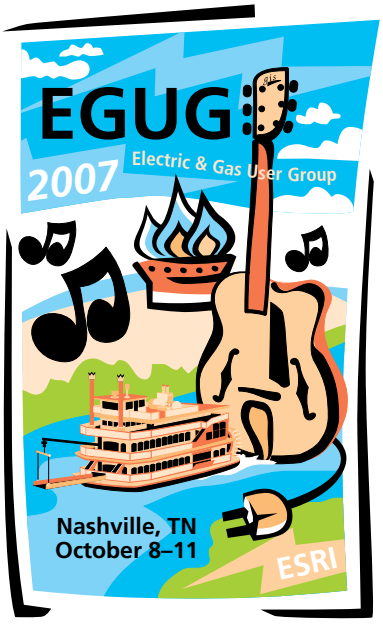
EGUG Goes Country

The Electric and Gas User Group (EGUG) will meet in Nashville, Tennessee, the soul of country music, to discover what is new in ESRI software applications for utilities. The October 8–11, 2007, event, to be hosted by Nashville Electric Service, promises to be outstanding.

This year's EGUG meeting will be held at the beautiful Gaylord Opryland Resort and Convention Center. GIS users from around the world will gather there to share their experiences about how they author, serve, and use geographic knowledge for successful utility operations. Discussions will include the latest online and desktop innovations. Presentations on subjects such as getting the most from your data and taking your GIS "on the road again" with mobile solutions will offer insight on how to build and improve GIS projects.



EGUG members will show off their favorite maps in the Map Gallery. An exhibition hall will put users in touch with GIS vendors and consultants whose services meet the most challenging of projects. ESRI staff will be on hand to demonstrate the latest in ArcGIS technology.

Keynote speaker Paul H. Allen, vice president of operations (engineering) at Nashville Electric Service, will discuss the importance of geospatial technologies in his company's facility and business operations. He will describe the IT road along which the company has come and the vision for the utility's technological future.

GIS users can participate in the 2007 conference by presenting a paper about a successful GIS implementation, application, or other related topic. To see the conference themes and submit an abstract, go to http://www.esri.com/egug/papers/call-for-papers.

Learn more about EGUG 2007, register online, and see the session schedule at www.esri.com/egug.

EGUG Officers for 2007

President—Larry Wilke, Burbank Water and Power

Vice President—Ted Kircher, Public Service Company of New Mexico

Conference Chair—Michael Buri, Nashville Electric Service

Electric and Gas Professionals Share Info at ESRI UC

Electric and gas professionals from around the world gathered together at the ESRI International User Conference (ESRI UC) held in June 2007 in San Diego, California. A special utility track helped attendees concentrate their session schedules to get information relevant to their projects. The annual Electric and Gas Utility Group (EGUG) business meeting conducted by EGUG officers convened to approve session topics for the fall meeting. A luncheon and social were also provided to members.

EGUG thanks the following sponsors for supporting its ESRI UC events:

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What's New in ArcGIS 9.2

ESRI's new release of ArcGIS 9.2 is designed to make your work easier. It offers extended geodatabase management, a new file geodatabase format, advanced archiving and replication options, the concept of cartographic representations, massive enhancements in the model builder concept, hundreds of detailed improvements for better usability, and a new Web-based processing environment from ArcGIS Server. Two hundred shortcuts have been added.

"The new release of ArcGIS 9.2 contains hundreds of detailed improvements and brings a fundamental change to spatial reasoning."

— Florian Fischer
GEOinformatics

"The wait was worth it. ESRI got more than a few things right with this release, and plenty more surprises and additions are included in the ArcGIS Desktop 9.2 release. What you don't know about this product can put you at a competitive disadvantage."

— Jeff Thurston
Geoconnexion

Learn about ArcGIS 9.2 at www.esri.com/arcgis.

3D Scene: Substation Electrical Network

Download ArcGIS for AutoCAD for Free

ArcGIS for AutoCAD, a free client application to ArcGIS Server, gives users the ability to see and query GIS information from their CAD environment without conversion. This application provides access to ArcGIS Server georeferenced map service images through the map service view without the need for special data connections. Learn more and download the application at www.esri.com/software/arcgis/arcgis-for-autocad.

ArcGIS for AutoCAD allows CAD users access to all the data formats available from ArcGIS Server as well as the benefits of GIS from within the CAD environment.

GIS/SAP Integration Helps Utilities Execute Business Processes

ESRI and SAP are collaborating on designing enterprise services, which is revolutionizing the power industry's geospatial capabilities. ESRI demonstrated GIS and enterprise resource planning (ERP) systems integration at the 2007 Geospatial Information Technology Association (GITA) Conference held in San Antonio, Texas, on March 5. The integration of GIS with SAP is critical for utilities because they typically have unique tasks: managing assets and infrastructure distributed over a wide area; supplying mobile field forces with access to corporate data; and ensuring optimal utilization of assets, infrastructure, and people in the field through fast, accurate, and easy access to data and tools.

In the late 1990s when ESRI and SAP became strategic alliance partners, integration efforts were typically project specific. Today, with the emergence of the Web and its associated standards and development of enterprise platforms, new applications can be easily created from the shared services of other applications in a loosely coupled, standards-based, and system-independent environment.

To implement operational GIS pervasively across the enterprise, project-based point-to-point integration approaches must be replaced by flexible, reusable integration components that merge SAP and GIS transactions into task-level enterprise services. Users and applications tap into these services to deliver information and insights on demand, transforming SAP and GIS applications from stand-alone products to reusable, shared enterprise services that make integrated applications easier to build and use. These services become vehicles to launch operational processes and tasks from within a user's primary application, whether SAP, GIS, or a portal or dashboard. Users take advantage of the services to monitor key business events, trigger alerts and workflows, or execute tasks within operational applications.

The technology to implement composite applications is provided by both SAP and ESRI in their respective platforms. Both companies embraced Web services and loosely coupled systems early on, support service-oriented architecture (SOA) standards, and provide coarse-grained and fine-grained services. SAP and ESRI also provide traditional object-level APIs for developers who may know little about GIS or SAP; or who may be experts in either application and need to create custom services. Much of the basic functionality of these applications has already been exposed as services; however, services to build and expose coarse-grained components for supporting specific

business processes, roles, and tasks are in the early stages of development. Customers must still write custom code to orchestrate basic services or develop new ones.

The next step is to understand specific business processes well enough to define a set of supporting services that can be flexibly used to model not only the basic process but also the process variations customers employ to gain competitive advantage. To address this demanding task, ESRI and SAP have again partnered to help define and deliver services for specific industry and cross-industry business processes, roles, and tasks.

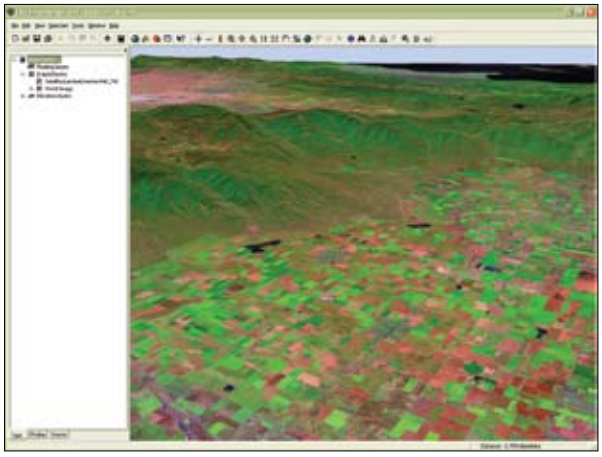
A broad initial review involving SAP and ESRI solution managers, as well as customers, resulted in more than 200 scenarios where GIS could add some value, and the most promising ones were grouped into the areas of geoenterprise asset management (geo-EAM) and customer relationship management (CRM).

The ESRI ArcGIS platform enables the development of GIS visualization and geoprocessing services that can be easily used by other platforms, such as SAP NetWeaver, to create composite applications for a wide variety of industries and application areas.

"These composite applications will not replace stand-alone GIS tools," said Jack Dangermond, ESRI president. "Rather, they will make the functionality offered by them more readily available. By embedding GIS functionality within applications and processes that drive the business, these composite applications will make GIS more precise, easier to use, and pervasive—key challenges facing the new generation of enterprise GIS adopters."

For more information on the integration of ESRI products with SAP solutions, visit www.esri.com/sap. For more information on ESRI, visit www.esri.com.

ArcGIS Image Server Speeds Enterprise Imagery Distribution and Processing at CenterPoint Energy



Landsat raster data is quickly displayed with ArcGIS Image Server.

CenterPoint Energy now deploys ArcGIS Image Server for an advanced, enterprise application infrastructure that allows employees to quickly and easily access valuable geospatial imagery. While the application is initially being used by clients in Minnesota, it will be made available to all CenterPoint Energy employees in the seven states the company serves. The new solution delivers rapid deployment of imagery for multiple simultaneous users, providing high-performance, on-the-fly image processing that aids decision making and boosts productivity.

"We set ambitious goals for using our imagery data, and we needed fast processing times to meet the demands we set up for ourselves," says Cynthia Salas, GIS manager, CenterPoint Energy. "When we tested ArcGIS Image Server, we found designers, technicians, and digitizers were all very pleased with the processing time. It was twice as fast, in some cases even faster, than previously. And they were impressed with the resolution. It was much better. This is the first time since I've been here that we tested a new technology and had staff come to us requesting that we immediately go into full production."

CenterPoint began using ArcGIS Image Server in Q4 of 2006. The application was initially configured to support mission-critical needs in the event of a large-scale natural disaster, such as a hurricane, that disrupts service to CenterPoint customers. The value of digital image data was recognized as vital to the restoration of service. CenterPoint wanted to implement a solution that would enable fast, quality delivery of image data immediately after such a large-scale event. ArcGIS Image Server is poised to fulfill those requirements, providing quick access to imagery of the impacted area and damaged assets. This type of information will enable strategic decision making about restoration plans as well as provide the information needed to deliver initial assessment to the media.

The demand for timely imagery led to the opportunity for using image data for numerous other challenges at the utility such as new construction and maintenance. Future uses will include land management, right-of-way management, environmental concerns, pipeline integrity, high-consequence analysis, and customer service. For example, CenterPoint engineers can look at aerial photography to see hospitals, schools, day-care facilities, and other high-population centers to determine the best locations for adding new pipeline or other assets. Overlaying and integrating imagery data with proposed network data provides a complete view for making the best possible decisions.

ArcGIS Image Server provides fast access and visualization of large quantities of file-based imagery—processed on the fly and on demand. Output imagery can be displayed nearly instantly for a number of users working simultaneously, without the need to preprocess the data and load it into a database management system.

For more information on ArcGIS Image Server, visit www.esri.com/imageserver.

Geographic Information Landscape Undergoes European Continental Shift

By Barbara Shields, Energy Currents *Editor*

A growing reliance on geographic information on the European continent, from small retail to international governing bodies, is changing the international face of the IT landscape. Growing Web infrastructure capabilities are serving up standardized data and applications that are creating whole new approaches to business processes, decision support, application development, and technical computing applications.

Some large European adopters of GIS are shaping a body of geospatial tools that will influence the information technology culture for years to come. The European Commission uses GIS for applications from monitoring coastline cleanup to mapping sustainable development indicators. The European Space Agency uses GIS as a core component of many of its programs. Recently NATO awarded its Core Geographic Services contract to the Siemens Enterprise Communications (SEN)-ESRI team. New GIS-embedded capabilities will enable commanders, analysts, and other NATO network users to fuse geospatial content from Core Geographic Services with other forms of information for command and control, intelligence, and logistics applications.

These agencies recognize that emerging GIS technology is about creating knowledge, understanding our societies, and discovering our world. GIS is most powerful when it is integrated into the IT infrastructure. An enterprise GIS is more than a digital mapping system, it is a strategic spatial information platform.

Because geographic location is connected to virtually all aspects of an electric company's business and operations, geospatial information and GIS technology have become strategic imperatives. As evidenced by its recent successes, ESRI has the core enterprise technology platform, software products, and industry domain application business partners to help the electric industry meet these needs. Global and midsized electric transmission and/or distribution companies, as well as small electric utilities, have selected ESRI GIS technology to manage their networks and integrate the spatial dimension in many of their daily business processes.

Austria

Energie Steiermark-Steweag, one of central Europe's leading multiutilities, provides networked services throughout Austria. Steweag is a longtime user of ESRI technology, using GIS for utility management as well as vegetation and parcel management. One application can sort parcels and owners along the length of a power line to streamline field operations. By using ArcIMS for its intranet, Steweag employees can access map data and integrated GIS applications on the Web.

The Czech Republic

CEZData, s.r.o., of the Czech Republic, part of the CEZ Group (the largest electric utility provider in central Europe), is deploying the full suite of ArcGIS products in an open, scalable, and standards-based GIS architecture throughout the entire CEZ Group operation. The GIS will integrate with and leverage existing CEZ IT resources to meet a broad range of business and engineering needs today and in the future. The CEZ Group serves approximately seven million customers in the Czech Republic, Romania, and Bulgaria.

Germany

Energie Baden-Wurttemberg AG (EnBW), one of Germany's largest energy suppliers, is implementing an integrated company-wide network for its geospatial data that is accessible to more than 1,700 users. The enterprise solution, based on ArcGIS and related software products, is used for technical area organization, technical plant management, and network control. SAP integration for the support of business processes is an integral part of all project phases.

EnBW uses ArcGIS and complementary software for network data analysis, allowing the company to efficiently evaluate its asset and network data and use this information for corporate decision making. The company is integrating GIS with its existing SCADA system. In the future, local authorities and construction companies will have access to the reporting capabilities of the GIS.

SWM Magdeburg (the public utility of Magdeburg) defined various GIS projects, the most important being integration with SAP, integrated planning, connection with network calculation systems, mobile GIS, redlining, and document management. SWM Magdeburg aims to integrate SAP and ArcFM UT as the main pillars of its corporate IT. This way, the utility ensures that the data is kept up to date and consistent in both systems but is, at the same time, fully applicable through the bridging of SAP and GIS in the respective complementary application. All further network-related graphic applications in the utility are either replaced by the GIS or connected to it; therefore, all spatial data lies originally in the GIS. With the new utilities application from AED-SICAD, SWM Magdeburg has a corporate and highly integrated solution for all spatial processes.

Völklingen, a German public utility, provides a complete energy and water supply to its customers. It uses Telvent Miner & Miner's ArcFM UT View software with the Designer component for project planning purposes. By means of Internet viewing using ArcFM UT Web and a GIS portal based on ArcIMS, up to 20 additional staff members of the public utility can access geographic information for their daily business routines.

The Netherlands

The Dutch energy company DELTA uses GIS from ESRI to optimize the quality and life cycle of its infrastructure and manage its assets at lower cost. GIS helps DELTA rapidly identify affected areas of infrastructure during excavation work, utility breakdowns, and other maintenance projects. The solution for DELTA

is based on the ArcFM UT product manufactured by AED-SICAD.

Sweden

In Gävle, Sweden, the distribution networks for electricity, heating, and fiber optics are all managed by the municipal energy company Gävle Energi using GIS. The company migrated away from its proprietary software, found to be unsuitable for managing the company's complex distribution grids, and turned to ArcGIS because it could coordinate information about various distribution networks. Another important feature is that the software is extendable, allowing the company to apply a modular implementation approach. Using ArcGIS, the company can plug in new modules when it is ready.

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

ScottishPower Takes High Road with Mobile GIS

ScottishPower's recent contract for ESRI ArcGIS Mobile applications will enable up to 800 engineers, working across 70,000 miles of ScottishPower's United Kingdom electricity networks, to access and record map-based information while in the field. To enhance its network operations capabilities, the power company will use ArcGIS Mobile to give field engineers immediate access to accurate information such as the location of cables and other remote equipment. Field engineers will be provided with the latest mobile technology, including rugged notebook and Tablet PCs, to replace legacy field mapping and inspection platforms, giving them access to a complete set of mapping, operational, and infrastructure data. This will ensure better service for customers by minimizing the need for engineers to travel to company offices to access network information, thus increasing operational efficiency and reducing costs.

The contract includes software and services from ESRI (UK) Ltd. as well as ArcGIS Engine, a development tool for building customized, geographically enabled software applications, and GeoField Network Map Viewer, a comprehensive field mapping application designed for the utility industry and developed by Sigma Seven Limited, an ESRI (UK) Ltd. business partner. Consulting services are also being provided by ESRI (UK) and Sigma Seven to tailor the field-based software for ScottishPower and integrate it with the utility's existing systems.

Headquartered in Glasgow, Scotland, ScottishPower provides electricity transmission and distribution services in the United Kingdom, supplying more than 4.3 million homes and businesses in Scotland; Merseyside, England; and North Wales. Investment in the latest GIS tools furthers ScottishPower's business goals of continual improvement and operational excellence and also supports its initiative to provide timely information to field engineers, enabling them to be more effective.

The ESRI-based system will integrate mapping information and geographic data with other documents, for example, new proposals, plans of substations, and asset inspection schedules, so that field engineers will have all necessary information at their fingertips.

Learn more about ArcGIS Mobile applications at www.esri.com/arcgismobile.

Remote Sensing for Vegetation Management

By Dal Chappell, M.J. Harden Associates, a GeoEye Company

Electric utility companies are constantly focusing attention on making sure that the creation, transmission, and delivery of electricity is safe, reliable, and affordable. A topic that has received much attention in recent years is the subject of reliability, especially related to vegetation management. Large percentages of annual budgets for utility companies are spent on vegetation management activities. Recent federal regulations require owners of electric transmission lines to report annually on their vegetation management programs. This context of reliability, expense, and regulatory requirements sheds light on the importance of vegetation management. Application of multiple geospatial disciplines should be considered when discussing the topic of vegetation management as geographic data.

Today's geospatial "technical toolbox" is extensive, and having access to dependable geographic data is critical. Geospatial information, that is, information pertaining to a geographic location, is growing rapidly in both volume and application. The use of geospatial information in the energy market is no exception. ESRI provides a high-quality environment to create, merge, and manage data that is supplied through numerous sources. Fortunately, there is no shortage of tools to help decipher information in ways to make geospatial data useful.

At the convergence of vegetation management and geospatial information is an application for remote sensing. The science of remote sensing provides an alternative perspective not traditionally employed in the area of vegetation management but can be a cost-effective tool for managing and monitoring vegetation.

Photogrammetric products derived from aerial imagery have a well-documented history of success. Mapping of planimetric features and assets has traditionally been a geospatial product for the energy industry. But with the advances in aerial digital imagery and GPS technologies, another function, or tool, can be applied to vegetation management—the concept of using remote sensing. The National Oceanic & Atmospheric Administration (NOAA) 2005–2015 International Remote Sensing Research report predicts that the aerial digital sector will have the highest revenue growth worldwide in the remote sensing industry. Remote sensing with digital aerial imagery can be a powerful tool for managing a right-of-way. Most large-format digital aerial platforms capture black-and-white, color, and color infrared data. The infrared data collected with digital aerial cameras contains information beyond what is detectable with the naked eye and can be an effective tool in vegetation management. The NOAA report asserts, "Spectral imaging data allows extraction of features not detectable in conventional imagery." The infrared data collected with the digital camera can be used to map and monitor vegetation health and coverage.

Tree height values are displayed as points created from the same digital aerial imagery. ArcGIS 3D Analyst is used to identify tree canopies that put the network at risk.

A process for using infrared data in mapping vegetation health would be to transform the imagery into a Normalized Difference Vegetation Index (NDVI). This index is an indicator of vegetation hardiness. This technique is widely used in the agricultural industry for monitoring crops during the growing season. For right-of-way managers, this technique, or tool, can monitor the effectiveness of herbicide treatments or vegetation regrowth. The approach provides hard data for managing herbicide types, cycle times, or application techniques.

Another application of digital aerial imagery is to create tree canopy models. The distances between trees and power lines are a constant concern in the electric transmission sector. A solution is to use light detection and ranging (lidar) to create and map relationships between tree canopies and power lines. Point cloud data collected by lidar is postprocessed to design models for utility assets, terrain, and tree surfaces. Digital aerial imagery can be used to create tree canopy surfaces within most standard photogrammetric workflow practices. This allows for efficient turnaround time from acquisition to analysis. Imagery can be analyzed in ESRI's 3D Analyst to identify tree canopies that may be areas of concern because of their proximity to structures and conductors. This information is used to plan future field activities or monitor the effectiveness of current ones.

Both approaches provide managers with useful additional information to incorporate into the decision-making process for vegetation management. The ESRI GIS software environment promotes compatibility among various types of geospatial data. Additionally, the capabilities of mobile GIS can transport these multiple data types from the desktop computer to mobile devices for equipping field personnel with up-to-date and accurate information.

It is an enormous challenge for utility companies to manage budgetary expenses while delivering reliable, affordable electricity to their customers. Geospatial technology is providing valuable solutions to support this task. Remote sensing is a cost-effective tool that can be used to support the vegetation management efforts of right-of-way managers.

Learn more about M.J. Harden Associates at www.geoeye.com.

Integrating AMR into Enterprise GIS Applications

GIS Offers Crossover Analysis for Meter Reading Data

By Brian Crow, PE, ESRI Utility Team

GIS helps power companies put their data to work in ways that make their businesses more efficient and effective. Meter reading data, which is a utility's bread and butter, is also valuable for monitoring and improving the distribution network. Leveraging the utility's investment in GIS solutions provides an advantage by turning the meter database into a tool for assessing trends, recognizing patterns, and analyzing load flows in ways that were only dreams a few years ago. GIS significantly extends the capabilities of outage detection and notification systems, engineering analysis programs, and other enterprise applications through interfaces with automated meter reader and automated meter information (AMR/AMI) solutions.

Utilities are using GIS to process AMR/AMI data to quickly determine the extent of outages by plotting outage calls on a map. The user traces the primary conductor the outages are associated with and selects all meters down line of a protective device or other network device. Next, the user sends the meter list to the AMR/AMI server and "pings" the meters to check for voltage response. The information that returns, or does not return, is then plotted in the map and the true extent of the outage is easy to see. At the end of the restoration, prior to crews leaving the area, the software user again pings the meters in the outage area to see if any single meter is still without power.

Engineers and analysts can use interval meter data to view system changes in voltage and load flow throughout the day. Hot spots on the system are noted, and a history of these problem points can be displayed to show a trend. By adding weather and temperature data to the analysis, causal factors become evident and scenarios can be projected for assessing future impacts. Understanding the relationship of the data to position on the distribution network aids planners with upgrading and maintaining facilities. Reasons for reoccurring problem points become apparent through spatially displayed maps. For example, an area that seems to be a hot spot based on daily maximum readings may, in fact, only be a hot spot during a time of day when the majority of the feeder is producing baseline readings. Low-voltage events can be easily quantified in specific areas and procedures instigated to remedy the problem. GIS server technology can allow this analysis to automatically be performed and notify interested employees when events occur that are outside the norm.

To perform transformer loading studies, an analyst can aggregate meter data up to the transformer. Underutilized transformers can represent no-load losses on the system, which cost the utility hard dollars. The analyst uses GIS to study locations where a high density of underutilized transformers is located and best determine where to send crews to change out groups of transformers to the appropriate size. GIS calculates and shows costs and savings associated with targeted asset management.

Aggregating tools, such as ArcGIS Spatial Analyst software, are useful for highlighting areas where transformers are at risk of being overloaded. Many urban neighborhoods are undergoing revitalization where old homes are being renovated or torn down and new, larger homes are being built. During renovation or rebuild projects, the existing transformer size is not analyzed by the utility. Over time, the load increases on the transformer without anyone knowing it.

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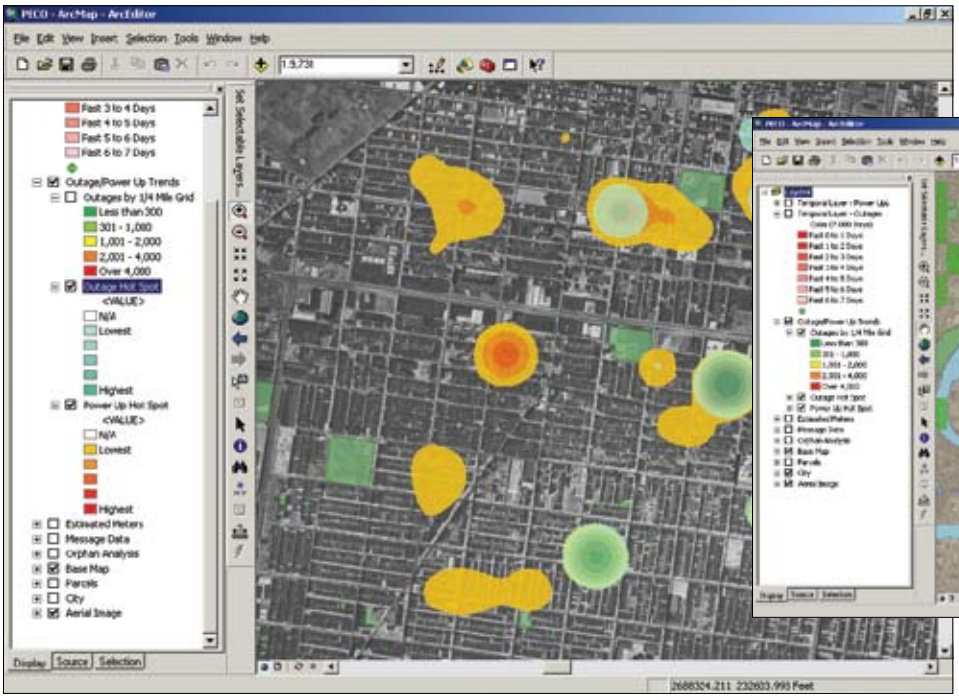
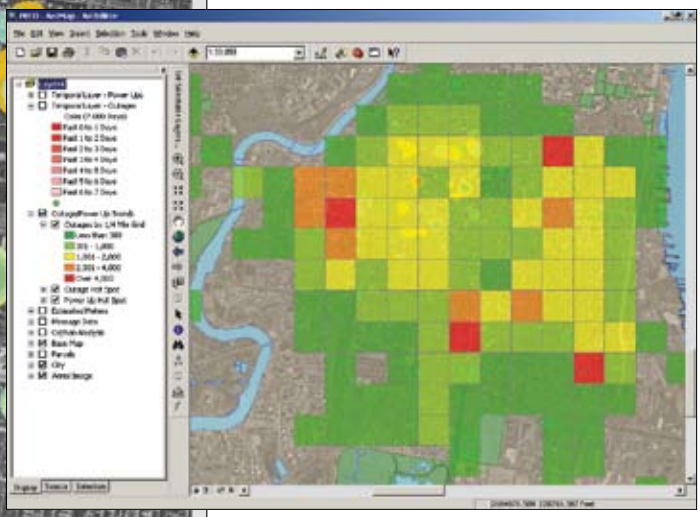


An analysis view shows spatially located outages recorded by AMR devices versus the corresponding power-up messages. It identifies areas where power-ups are occurring quite often but no corresponding outages have been identified. This could signal reliability issues or theft.



Distribution coincidence of outages is shown across a quarter-mile grid section. Areas with high concentrations of outages are easily identified by means of color range codes. This signals the locations where more in-depth investigation can yield large results.

In-the-Field GIS Innovations Prove Golden Apple for Gas Utility Services

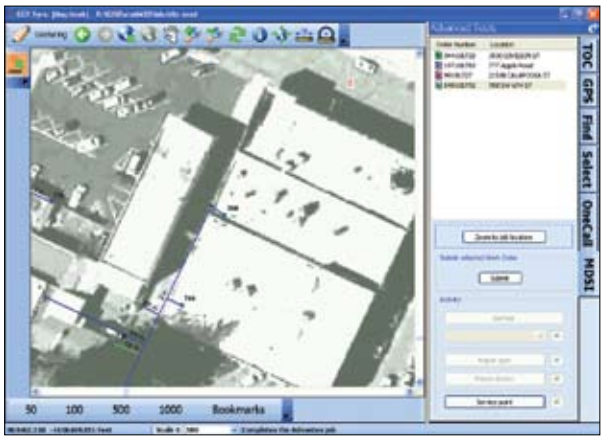
Avista Mobile GIS Integration Gains Efficiency Success

Avista is using GIS to gain ground in mobile response. Avista's mobile dispatch GIS application is rendering a return by decreasing manhours in the field, lowering costs, and increasing efficiency for gas service response.

Avista provides both gas and electric services in the northwest region of the United States, but here we will focus on the gas chapter of the company's story. The utility serves approximately 300,000 gas customers in a 26,400-square-mile area. To improve its service and efficiency, Avista sought to implement a wireless, real-time, mobile workforce management system that includes GIS applications for gas meter and compliance orders.

Since 1996, Avista has been using ESRI GIS software products for better customer services. Originally the company used the Regional Dispatch Monitor, referred to as the "red dot machine." It took a customer's trouble-call ticket data and placed a red dot on the map to show the customer's location. Later, the company began using ArcGIS as part of its facilities management system and continues to add new tools to the system so it evolves with emerging GIS technologies.

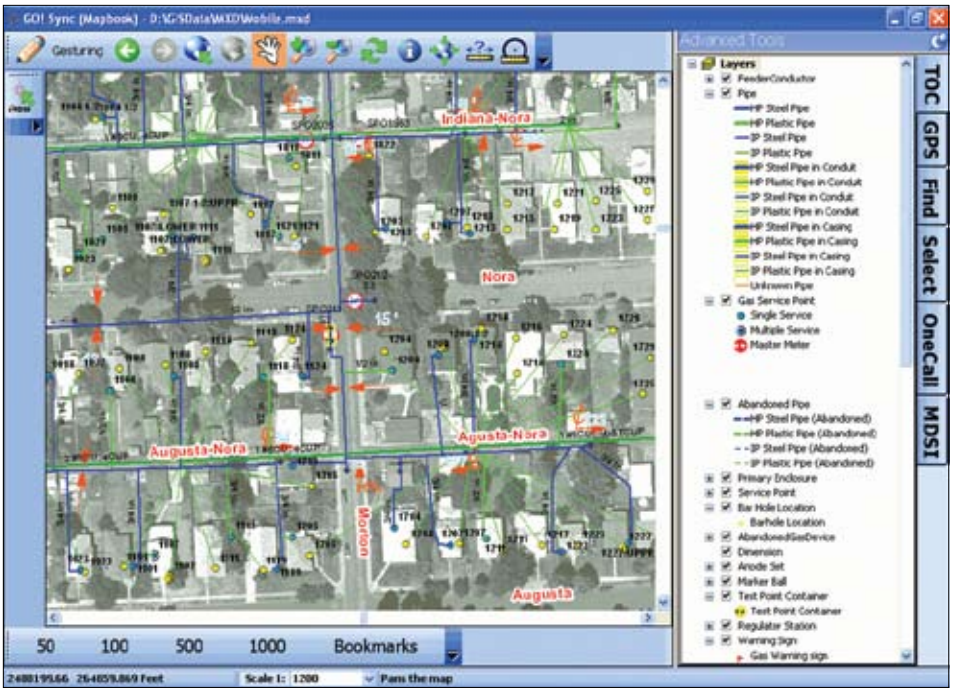
The Avista Facilities Management (AFM) system uses Oracle software for its facilities management database. ESRI's ArcGIS software functions are used to manage facility data and design and build the electric and gas facilities network. In addition, ArcGIS is used for complying with gas transmission regulations; performing engineering analysis; and currently, speeding up the mobile dispatch process. More than 400 employees use the system.



Dispatcher uses Advantex application built on ArcGIS. When the export button is clicked, orders are automatically uploaded and displayed on Mapbook. Here the green is a gas service ticket (allows placement of service point). Red indicates a gas trouble ticket (allows placement of repair on pipe or device and barhole). Blue indicates a gas follow-up ticket (allows placement of barhole).

Before GIS was part of dispatch operations, the mobile team processes were more time consuming. The company had 11 gas dispatch centers within its service area of Idaho, Oregon, and Washington. Orders for gas service, gas trouble calls, and compliance inspection were received by phone or computer. Service orders were then dispatched to the field workforce via paper tickets. Field-workers returned comments on forms and completed their time sheets on paper.

Through staff and service analysis, Avista's managers set measurable goals for improvement. The top priority was to reduce the effort required to assign, dispatch, monitor, and close gas service trouble and collections work. The field-worker-to-dispatcher ratio had been 8:1; confidently, managers set an ambitious target goal of 14:1, a reduction of more than 50 percent.



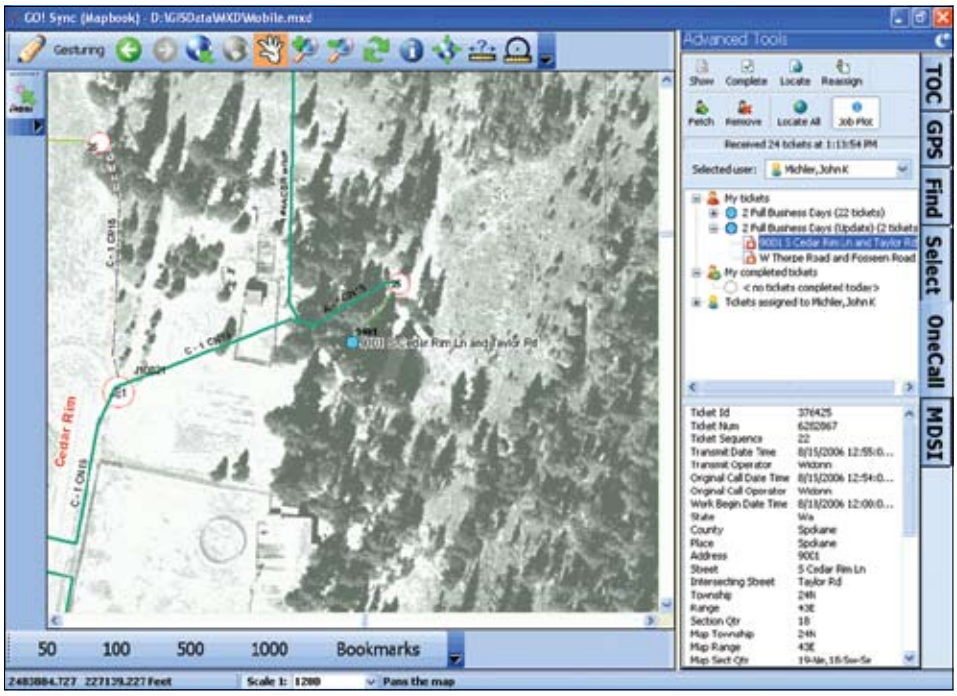
Overview of the GO! Sync Mapbook Application on the Mobile Device supports gas facility network updates in the field.

Another goal was to improve gas service personnel and collectors' productivity through routing of work, real-time dispatch of daily orders, home starts for field personnel, and elimination of paperwork. During an 8-hour shift, 4.4 hours were actually spent completing service work. The project goal was to add an hour to this. Thanks to the new mobile GIS, Avista met these goals.

Avista is using an Advantex application to complete infrastructure and to plan, schedule, and execute all types of fieldwork. The application provides mobile workers with information and wireless capability to retrieve work orders, view work information, and input work results. Dispatchers manage workflow by assigning and dispatching work to the field using location, priority, availability, and skill sets. And real-time data allows dispatchers to monitor progress of work in the field, providing even greater efficiencies.

Sixty-eight field-workers were affected by the project. By implementing mobile technolo-

gies, such as Tadpole Technology GO! Sync Mapbook on laptops and digital notebooks for data posting and updates from the field, fieldworkers did not need to check in at the office but could now leave from their homes and go directly to their work sites. Avista leveraged the same capabilities to ensure gas compliance task completion. Wireless connections made certain that field work order data was current, making it easy to communicate with the dispatch office. They could geographically see where they needed to go, the asset and inclusive information they needed to work on, and how to get to the site. This eliminated nearly all the old paperwork processes and made for more accurate records.



Line inspectors use OneCall maps to ensure the safety of the public and create compliance records with state authorities.

The golden apples of geospatial innovation helped Avista meet its challenges and gain even more success from its GIS. Avista achieved its objectives of improving dispatch-to-worker ratios and also leveraged the system to capture meter-installation and trouble location data in the field and feed it back to the corporate GIS. The dispatch application shows the location of the mobile workforce and keeps GIS-fresh data flowing to and from the field crews.

GIS has also reduced miles driven per hour of job time from more than 13 miles to about 10 miles. That translates into less time in the truck, less time at the pump, and more time actually performing field tasks. In addition, service teams complete 90 percent of their day's scheduled appointments.

Avista's mobile dispatch application has improved customer satisfaction and company efficiency.

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Integrating AMR into Enterprise GIS Applications

Low-voltage events may be a precursor to future problems. GIS is useful for aggregating load data from the meters connected to the transformer to show the true measure of operation.

Planners can also use GIS to allocate load across an area. For example, calculating kilowatts per square yard/meter supports the analysis of load growth across a surface. Load growth visualization can be useful in determining areas that need facilities upgrades or new substations. This allocation review could also aid in targeting areas for specific management during emergency load shed events.

Historical blink or outage data is valuable for analyzing right-of-way. For example, blink data can indicate a trend, when viewed over time inside the GIS, that might have otherwise been unnoticed. Historical playback of outage events over a time period using time-based GIS analysis can also relay an underlying pattern or frequency that is unacceptable. GIS network maps highlight areas that may need attention prior to their regularly scheduled maintenance date. This spatially displayed data is an effective and exact tool for increasing reliability and improving restoration times during major storm events. Utilities historically maintain right-of-way on a strict multiyear schedule. Additional analysis using GIS and AMR/AMI data could prove that the schedule is too long, too short, or should be customized to the particular patterns of specific substations or feeders.

Efficient routing of drive-by meter reads can be accommodated with GIS. New technology for calculating radio frequency propagation reduces the route miles traveled by meter readers. Visual notification of successful reads on a map will allow the driver to backtrack and capture data from misread or nonread meters prior to leaving an area. GIS offers dynamic route management and optimization. In the face of inclement weather, traffic problems, or other types of delays, the smart-routing software can recalculate routes on the fly.

GIS also aids managers with the day-to-day operations of the automated meter-reading network. A fixed collector system can map the relaying hops the data takes on its way to the collector. Inefficiencies in the network traffic are quickly noted on a map and investigated. Address matching and verification can be checked by cross-referencing customer address data with commercially available street network data and coordinate data from the meter location.

Business departments can also take advantage of the enterprise GIS. For example, marketing department staff may want to track habitual

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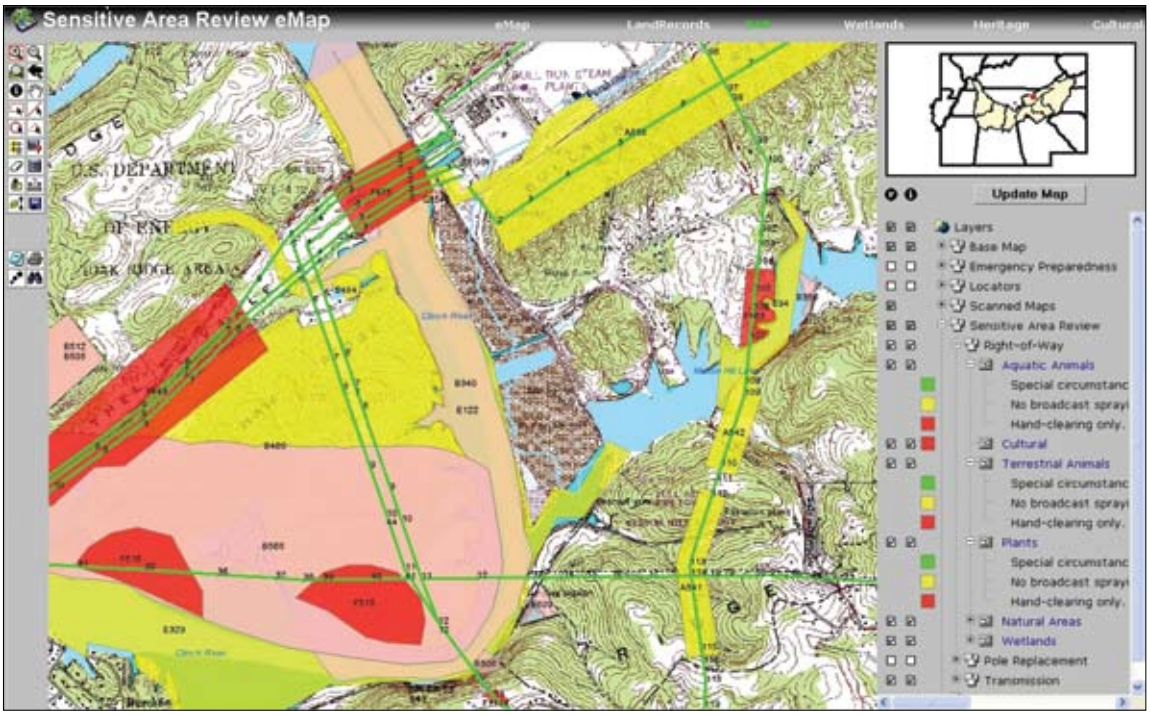
Power Provider's Land Managers Use GIS to Manage Resources

Tennessee Valley Authority

The largest public power provider in the United States, Tennessee Valley Authority (TVA) uses GIS to track landownership. TVA has been a longtime user of ESRI GIS to support the many aspects of its integrated resource management mission including evaluation of siting alternatives for TVA projects.



TVA land managers use eMap forms and maps to track land rights and monitor shoreline development.

The authority uses its Resource Stewardship Information System Integration Project (ISIP) to help manage land operations including agreements for interim and long-term uses of federal property. ISIP is composed of many layers of information pertaining to TVA land rights including fee lands. The system also includes disposals (sales or transfers), ownership, land-use permits, special use permits, and easements. In addition, the system is used to maintain related resources information, such as eroded shoreline to be repaired and sensitive areas, wetlands, and archaeological sites that could influence the location of particular facilities. All this data is stored in TVA's enterprise GIS using ArcSDE.

TVA needed an efficient way for land managers to evaluate real-time data before issuing land-use permits on the reservoir shoreline or public lands. It also needed a way to monitor the status of private facilities along the shoreline and locate violations and encroachments on TVA lands and waterways.

Since the ISIP data is stored within ArcSDE, TVA chose to continue using ESRI GIS software to gain access to this data. Most TVA desktops are not equipped with GIS software, and many land managers have little or no experience using GIS. The organization decided to use ArcIMS to deliver the necessary GIS data over the Web to its land managers. TVA made the application as simple as possible by creating a user application on top of ArcIMS called eMap. The eMap application allows users and managers to access, view, and query the TVA ISIP data through an easy-to-understand user interface.

The eMap application is built on top of the ESRI Java Integration Toolkit (JITK) and is a JavaServer Pages (JSP) viewer. The eMap Web application is available over the TVA intranet, allowing managers to view the inventory of data, generate maps, and create external datasets such as landowner information. Managers have found the application intuitive, eliminating the requirement for intensive training. Managers now use eMap to perform in-depth spatial and data analyses.

ArcIMS Metadata Services is also used to create a central, online metadata repository that allows TVA to easily publish and browse metadata for the ISIP database and other geospatial data over the intranet. The metadata is published through an ArcGIS Desktop application using industry-standard and user-definable style templates. ArcIMS Metadata Services allows the metadata to be optimized for rapid and efficient searches using a variety of clients including lightweight browser-based clients such as eMap and ArcGIS Desktop. Searching for metadata is quick and efficient now. Users can perform searches based on any combination of geographic extent, content type, data format, or keyword.

The eMap application allows users to access enterprise-wide data in the office. They can also access it via a wireless network in the field. Users and managers now make better decisions about land- and water-related issues and identify problems involving violations and encroachments. This cost-effective application promotes information collaboration, data consistency, and sharing. It allows users to coordinate requests with other users and provides a tracking system to monitor these processes.

For more information about GIS applications at TVA, contact Roy J. Teal, senior manager, Geographic Information and Engineering, Tennessee Valley Authority, at rjteal@tva.gov.

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Dane Power Companies Use GIS to Splice into Telecommunications Market

utility companies faced was how to efficiently deploy these fiber-based services in a highly competitive environment. For help they turned to Informi GIS A/S, ESRI's distributor in Denmark that has been providing GIS solutions to the Danish utility market since 1993.

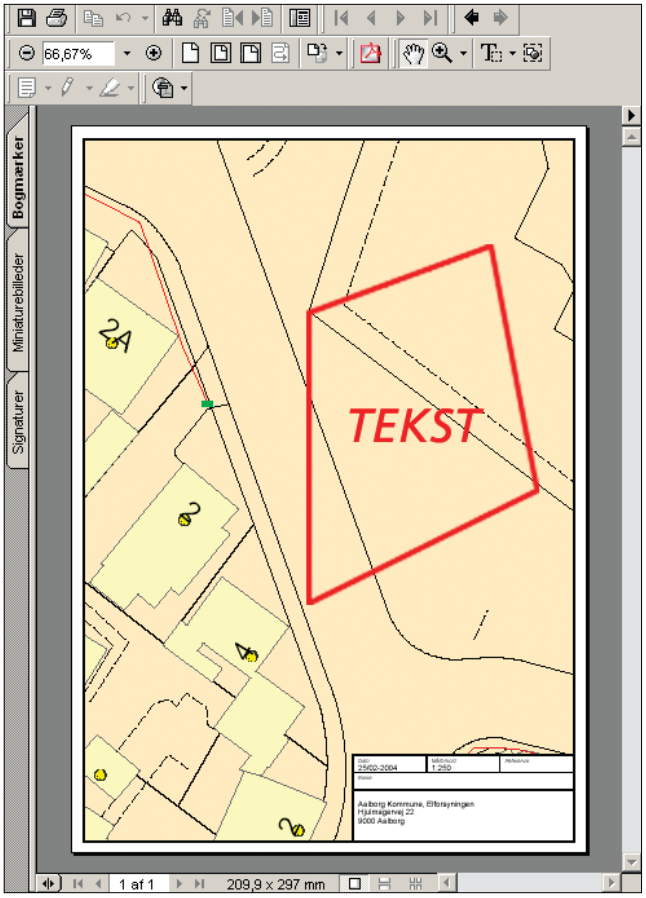
When the fiber cable concept started gaining widespread acceptance, Informi quickly saw the need for a specialized solution to handle the new fiber network, and it began looking for quality products that could fulfill market demand and integrate with the ESRI solutions the utilities were already using. Network Engineer, a communication network application made by New Jersey-based Telcordia Technologies and based on the ESRI ArcGIS platform, proved to be a solid and powerful solution that could handle the requirements for designing, documenting, and managing the fiber deployments.

DONG Energy, which, among other activities, distributes electricity to more than 1 million customers in the Greater Copenhagen and north Zeeland areas, is laying more than 3,000 kilometers of optical fiber cables to prepare its broadband network. Its enterprise GIS not only keeps track of the fiber network but also integrates its customer database. As a result, customer service personnel are able to view an online map of the actual distribution network when fielding calls from customers and potential customers.

Thor Gerner Nielsen, GIS manager for the DONG Energy fiber project, reports that service agents now have a visual picture of the exact serviceability area, which is a great improvement over the previous method that required searching through potentially inaccurate lists of customers who live in a covered area.

"Using the ArcIMS connection and our customer database, our customer care people can easily visualize information about the client, which is a great benefit," says Nielsen. "We know where all our cables are located, who can be connected, who requested a connection, and who is already connected. We can also generate reports."

As a result of the successful use of GIS for fiber deployment in the Danish market, personnel from nine of these utility companies formed a GIS user group to discuss technical challenges and development projects they hold in common. The user group soon realized that as the fiber projects grew, other organizations needed access to the new network information. They needed an easy-to-use solution to monitor the network and perform simple editing tasks.



Reviewing Ordered Plots Using e-NET Info

Informi came up with two Web-based solutions to meet these needs, e-NET Cable and e-NET Info. The e-NET Cable application is an Internet-based plot service application that uses Network Engineer data and ArcIMS to automate the tedious task of gathering and distributing information about the network. The companies were committing significant resources to handle map ordering, plotting, and delivery requests from contractors and other utility companies, and the process to gather all the relevant updated network information was inefficient and cumbersome. With the e-NET Cable solution, companies can offer a Web-based interface where copartners and other types of utility owners access valid and current information about the cable network. Data is updated daily. The e-NET Info application provides specialized tools for viewing, searching, plotting, and querying geographic data over the Internet or intranets. It saves time previously spent contacting mapping office personnel, identifying and requesting maps, and waiting for their delivery.

Learn more about ESRI's solutions for telecom at www.esri.com/telecom. Visit Informi GIS at www.informi.dk.

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Integrating AMR into Enterprise GIS Applications

nonpaying customers. They can use GIS to create a map that shows consolidated areas with significant numbers of these habitual customers. Based on these findings, staff could create a plan to target those customers to solicit prepaid metering or remote disconnect AMR devices.

The applications for GIS combined with AMR/AMI technology seem endless. The power that GIS brings to data analysis and visualization tied to the quantity and quality of data from the AMR technology significantly links these two enterprise technologies together. Utilities are realizing the more their employees use GIS, the more possibilities they are finding for effective applications that reduce costs and improve service to their customers. The evolution of GIS technologies that now includes Web services and GIS server technology for application development is creating a fertile bed for power companies to design solutions that are affordable and improve operations within many of their departments.

For more information about these applications, contact Brian Crow at bcrow@esri.com or visit www.esri.com/electricgas.

APDM and the Business Decision of Selecting a GIS Platform

By Chad Zamarin, Colonial Pipeline Company, and Debra Rohrer, NiSource

The selection of an enterprise data management platform is a significant business decision with long-term implications that increasingly drives or limits a company's future success. When selecting a platform, decision makers should consider factors including (1) existing infrastructure and data management systems, (2) near- and long-term business needs and desired functionality, (3) current and future product availability, (4) broad industry support, and (5) short- and long-term cost implications. In many cases, the ArcGIS Pipeline Data Model (APDM) proves successful in balancing the short- and long-term needs of users with the cost of implementation.

Common data management issues often faced by organizations include data redundancy, data segregation versus integration, multiple data formats and reference systems, labor-intensive data maintenance, poor data quality control, limited security, and costly customization. An effective enterprise data management platform must be one that helps solve these issues while empowering an organization to effectively implement, maintain, and expand new technology. Stakeholders, whether employees, owners, regulatory agencies, or the public at large, are increasingly demanding actionable information.

Integrity management combined with increased public awareness presents the pipeline industry with new, evolving, and complex challenges. This study explores a process for navigating business decisions associated with implementing a new platform or upgrade of an existing system to meet those challenges: in many cases APDM can be the ideal solution.

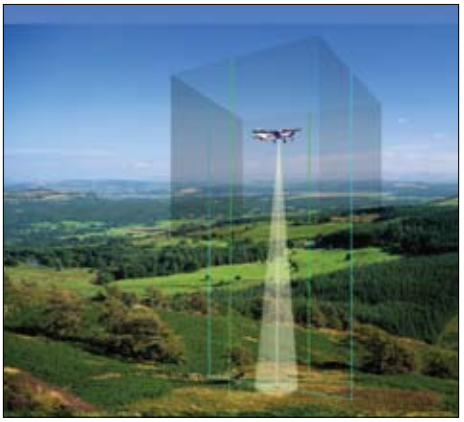
If you would like a complete copy of this article, contact Craig Wilder, APDM steering committee chair, at Craig.Wilder@bp.com. For more information about APDM, visit www.apdm.net.

Airborne Natural Gas Emissions Leak Detection Service

ESRI ArcGIS Image Server, together with ITT's Airborne Natural Gas Emission Lidar (ANGEL) Service, combines a leak detection method (Differential Absorption Lidar) with a high-resolution digital mapping camera and digital geovideo system. The service is operated by ITT personnel and delivers the most comprehensive natural gas pipeline leak survey available. To put its advantages in perspective against traditional leak detection methods, the ANGEL Service is more than 100 times faster, scans 500 times more right-of-way, and samples greater than 9 orders of magnitude (10^9) more atmosphere searching for gas emissions.

The service's Differential Absorption Lidar (DIAL) gas detection and measuring sensor is integrated within the company's aircraft, which flies at 120 miles per hour at approximately 750 feet above the pipeline right-of-way. Using customer-provided geospatial information of buried pipeline locations, the sensor scans the corridor at 3,000 laser pulses per second and automatically collects gas emission and geopositioning data. A computer-controlled optical pointing, scanning, and tracking system automatically maintains precise laser pulse aim at the pipeline to ensure accurate information capture. The optical pointing system provides greater than 98 percent pipeline centerline leak survey coverage.

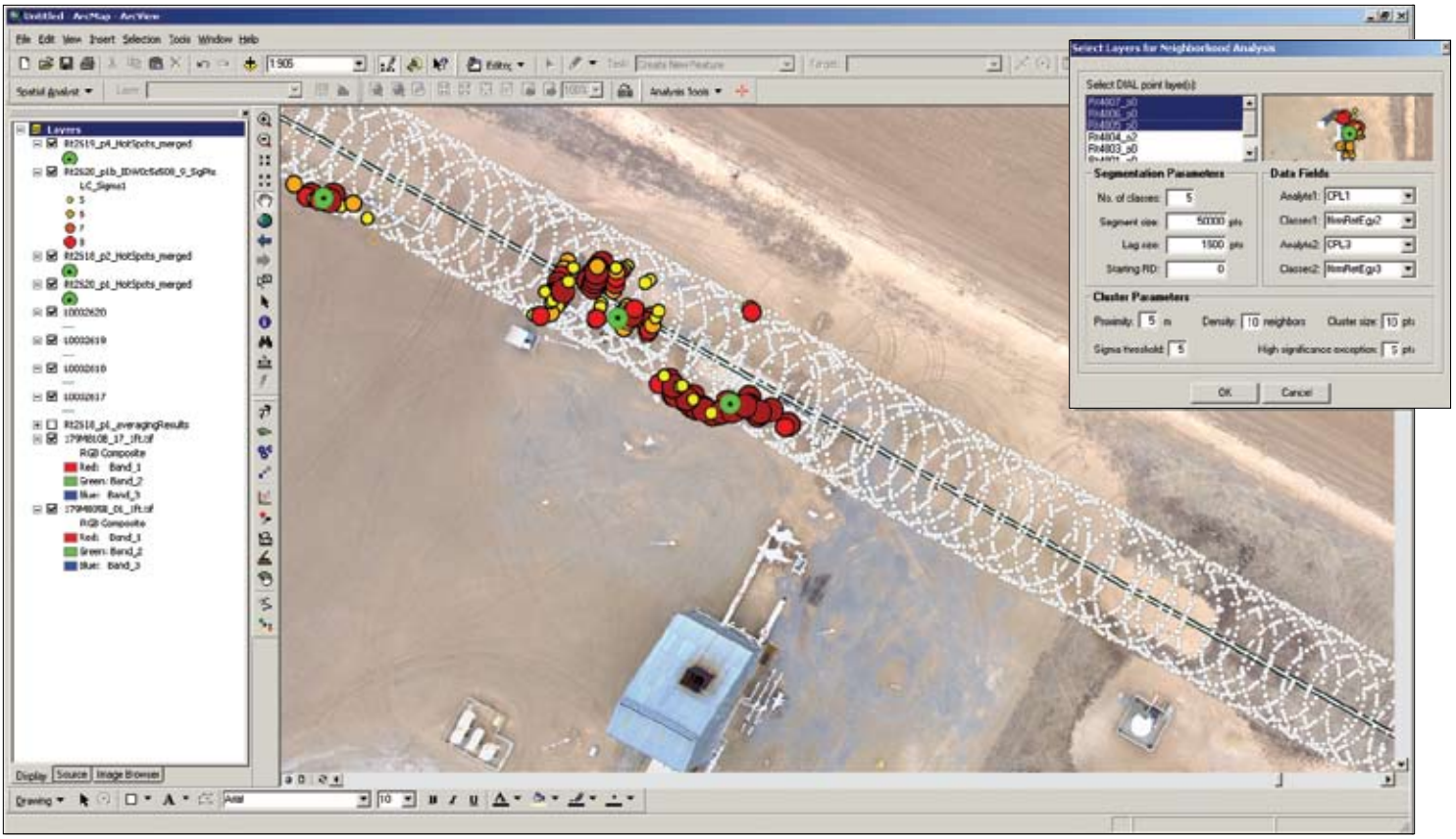
To determine emission levels and accurately identify leak locations, ITT personnel collect and process gas emission and geopositioning data. Geospatial mission planning, data analysis, and customer reporting is completed using ESRI ArcGIS software. The user can visualize, manipulate, and fuse this data with aerial imagery to enhance analysis and generate comprehensive reports. GPS-encoded video data of the route is processed to create an animated map, depicting characteristics of pipeline features along the flight path.



A gas detection and measuring sensor is integrated into aircraft that fly over right-of-way corridors.

The geospatial enterprise database with ArcSDE and Microsoft SQL Server creates a fully automated, queryable environment and supports efficient processing of thousands of pipeline miles each month.

For additional information about ITT's ANGEL Service, e-mail angel@itt.com or visit www.ssd.itt.com/angel.



ArcGIS screen shot shows DIAL results of an aboveground facilities leak with identified and color-coded emission concentrations. Inlaid subwindow displays spatial processing tool used to evaluate high concentrations of methane.

Cooperative Selects ArcGIS to Better Manage Utility Networks and Assets

Rushmore Electric Power

Because cooperatives are highly connected to the districts they serve, they need systems that effectively interpret data about the community and can interact with operations that improve service delivery. A cooperative is challenged to gather quality information and, more important, to integrate and manage the data it has. As a practical matter, it is no longer possible for traditional maps to meet the demands of electric service decision makers, who must have the ability to see the interaction of different combinations of elements within the same space simultaneously. GIS software enables its users to produce composite maps on demand, combining information as needed.

GIS helps cooperatives support rural development based on providing electricity, telecommunications, and wastewater treatment to their service communities. For an electrical engineer, GIS is a way to combine, analyze, and visualize the various kinds of information that describe a geographic area. GIS is primarily a way to track developments as they occur in space and time and to manage ongoing operations.

Rushmore Electric Power Cooperative is implementing a powerful enterprise GIS platform based on ESRI's ArcGIS software that will optimize how its electric distribution cooperatives monitor, manage, and grow their utility networks. The enterprise GIS centralizes data management and provides a powerful, highly intuitive method for deploying spatial data and applications both internally at Rushmore Electric as well as externally to Rushmore Electric distribution cooperatives.

"We wanted to move to a true database-driven mapping environment that could also easily integrate with existing applications such as accounting, staking, engineering analysis, and outage management," says Angie Blansett, GIS manager, Rushmore Electric. "We also wanted a cost-effective solution that was intuitive, enabling us to perform implementation, customization, and development services in-house. After careful consideration, we recognized ESRI software would meet these needs. In addition, we liked ESRI's position as GIS industry leader, its many proven implementations in the energy market, and its extensive user community we could draw on for expertise."

"Rushmore Electric is providing rich functionality and data to support a wide range of efforts," says Michael Schlecht, utilities account manager, ESRI. "They are supplying cooperatives with more efficient and improved data management and distribution services. The cooperatives can pass the benefits on to their customers in the form of better service. It's an excellent example of using shared resources as a business strategy to better manage and improve utility service."

Rushmore Electric Power Cooperative is a wholesale purchaser of power for its members. The co-op consists of eight electric distribution cooperatives in South Dakota. Rushmore Electric's engineering services division provides many services to its members including SCADA implementation, system analysis, and system design as well as mapping, which had historically been performed using CAD technology.

Even though previous methods worked well for managing graphic data, Rushmore Electric wanted a more effective solution for maintaining facilities and asset information. After visiting a digital mapping conference, senior-level mapping managers at Rushmore Electric began exploring how GIS could better centralize data previously maintained in disparate formats.

After an extensive evaluation process, Rushmore Electric chose ESRI as its GIS platform. The company is currently implementing ArcGIS Desktop and ArcGIS Server. As part of the implementation, Rushmore Electric will use advanced network analysis and visualization tools for editing and maintaining all types of facility, asset, land base, and distribution service data. In addition, ESRI Web GIS and desktop solutions will be available to non-GIS professionals in customer service, accounting, and marketing as well as to workers in the field. For instance, work crews can access network data from their laptops while performing field inventory and staking tasks. This replaces manual methods with digital tools for faster, more efficient remote data capture and updates.

Future applications for member cooperatives may include GIS integration with SCADA, outage management, and automated meter reading.

ArcGIS Server Helps Utility Manage Data and Boost Productivity

City of Mesa Utilities Department

GIS data can be distributed online. If it resides on a server, it can be directly downloaded as a layer into the user's GIS display. Users can author maps and globes or design geoprocessing tasks on their desktops, then publish them online using ESRI's ArcGIS Server. This makes it possible for GIS functions and data to be delivered as services throughout the company.

This server technology makes it easy and cost-effective for map creators to promote their work on the Web. Application developers can build new applications or customize existing ones without having to become GIS experts. Casual GIS users can employ GIS-based Web services via focused ArcGIS Server applications that fit into their regular workflows.

Depending on the level of integration with other enterprise systems (such as CRM or ERP), users may not even realize they are implementing GIS techniques and processes because they can consume these services, published by others, within their own daily routines. IT administrators integrate GIS services within work order management systems, financial systems, supply chain management, business intelligence reporting, and executive dashboards.

A long-standing user of ESRI's GIS software, the City of Mesa, Arizona, Utilities Department (Mesa Utilities) has had a vision of making GIS available to as many people in the organization as possible for everyday decision making. Even though GIS had provided plenty of productivity gains in specialized utility departments, such as engineering, operations, and design, Mesa Utilities wanted to provide these same tools in a cost-effective, user-friendly environment to other city departments.

After investigating ArcGIS Server and recognizing its potential benefits, the utility decided to implement the technology and move GIS operations from single-client GIS seats to an enterprise GIS platform via a service-oriented architecture. Once the new architecture was in place, several applications immediately went into full production including the Inspector Activity List, Gas Valve Maintenance, Mailing Address Report, and Web-Based Utility Output Map Generator.

The Inspector Activity List application provides field crews with property and asset data needed to do the job. Available remotely via laptop computer, the GIS application integrates with an Oracle database, combining spatial asset and property data with work order data to create custom inspection reports. It serves 15 building inspectors and is anticipated to grow to serve about 50 inspectors citywide.

The Gas Valve Maintenance GIS application allows gas utility workers to interactively track gas valve maintenance. It is accessible both internally and externally, serving 5 members of the field crew via wireless laptop computers and 15 office support staff in three different departments. It is also being configured for use in other areas within the city that perform similar tasks and services.

With the Mailing Address Report application, construction office staff interactively select properties from a digital map to create custom mailing lists to notify residents of upcoming construction projects. The application integrates with the county parcel data and the utility billing system to retrieve property ownership data for generating the mailing lists. It will soon be rolled out citywide to serve the

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Basin Electric Power Cooperative Deploys ArcGIS Server to Improve Processes and Deliver Business Value

By Jesse Theodore, ESRI Staff Writer

Basin Electric Power Cooperative now uses ESRI's ArcGIS Server for an enterprise GIS environment that delivers business value and improves internal processes throughout the organization. The server-based solution maximizes GIS investments by providing open access to GIS capabilities via the Web. Basin Electric employees, without any previous GIS experience or training, can access powerful digital tools via a simple, easy-to-use interface.

Basin Electric, headquartered in Bismarck, North Dakota, is one of the largest electric generation and transmission cooperatives in the United States, generating and delivering electricity to 120 member cooperatives. These member systems then provide power and services to 2.5 million retail consumers located in nine states.

The ArcGIS Server implementation answered Basin Electric's need to ensure that, as other companies added microwave radio systems within Basin Electric's service territory, these systems would not cause radio frequency interference to any of Basin Electric's existing radio sites. Basin Electric currently operates radio systems from more than 80 radio towers to provide data and voice communications for telephone circuits, SCADA, mobile radio, system protection, and more.

"The main goal is to allow employees to use the power of GIS with minimal training through user-defined Web applications," says Jason Brekke, GIS/mapping specialist, Basin Electric Power Cooperative. "Anyone from a GIS specialist to an electrical engineer or an administrative assistant can complete projects using these applications. You do not need to know the ESRI GIS software to complete the task. Productivity is extremely higher."

"Basin Electric recognized the opportunity to use ArcGIS Server to empower staff outside the GIS department with greater capabilities for enhanced problem solving and decision making," says Mike Goggin, account manager, ESRI. "They cleared two hurdles: supplying timely information across the organization and freeing up GIS resources to focus on new business challenges."

Patrick Engineering, an ESRI business partner, developed an application based on ArcGIS Server for Basin Electric and performed a user needs assessment, customized the application, and provided implementation services. In addition, Basin Electric used the ESRI Developer Network (EDN) to prototype and test the new application. EDN is an annual subscription-based program that provides software developers with the resources needed to build solutions that embed ESRI desktop and server technologies.

The delivered application allows a large group of simultaneous users to perform queries, access resulting data, and see whether there might be an interference problem with potential new microwave radio systems.

The success of the application was immediate. Engineers were able to quickly and easily perform their own analysis without submitting requests to outside departments and waiting for others to carry out the task. This gave them direct access to the data they needed and freed up GIS analysts to perform more technical, GIS-centric work for the organization.

The initial success of the radio transmission application led to the deployment of a second ArcGIS Server application, also developed by Patrick Engineering. Basin Electric maintains more than 200 remote facilities located throughout its territory. To meet regulatory guidelines, the company must maintain up-to-date routing and emergency information for each facility including routes to each facility, contact information, and nearest hospital. Much of this information was maintained in hard-copy form, including paper maps, for each facility. Basin Electric migrated the previous paper-based information into ArcGIS Server to provide an automated method for better maintaining the data and for allowing easy information access to any employee throughout its nine-state service territory. Facility maps and related data, now available throughout the organization, began to be used for other business purposes including procurement bids and land management.

Basin Electric is now investigating possible future applications including using GIS to generate map books as well as developing a mobile asset maintenance application.

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

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ArcGIS Server Helps Utility Manage Data and Boost Productivity

entire city employee base of 1,300 people.

Finally, the Web-Based Utility Output Map Generator application creates template maps on the fly. Users in any department can generate maps of customers, assets, land, and other data to meet their specific needs.

"ArcGIS Server provides a developer-friendly environment for creating Web services," says Jason Bell, IT services leader, City of Mesa. "The biggest gain is the first step toward moving our enterprise to a more Web-centric GIS focus. This new strategic direction allows the City of Mesa to make available more enterprise GIS applications to the masses without high installation and training costs."

Mesa Utilities is using ESRI's ArcGIS Server as an enterprise GIS platform for providing robust, user-friendly applications to its employees. The results have included better data management and improved productivity both in the office and in the field.

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

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