

Energy Currents

ESRI • Winter 2009/2010

GIS for energy

New Mexico Gas Company Starts from Scratch

By Jessica Wyland, ESRI writer

When New Mexico public utilities company PNM sold its gas assets in 2009 to Continental Energy Systems, the newly formed New Mexico Gas Company faced a significant

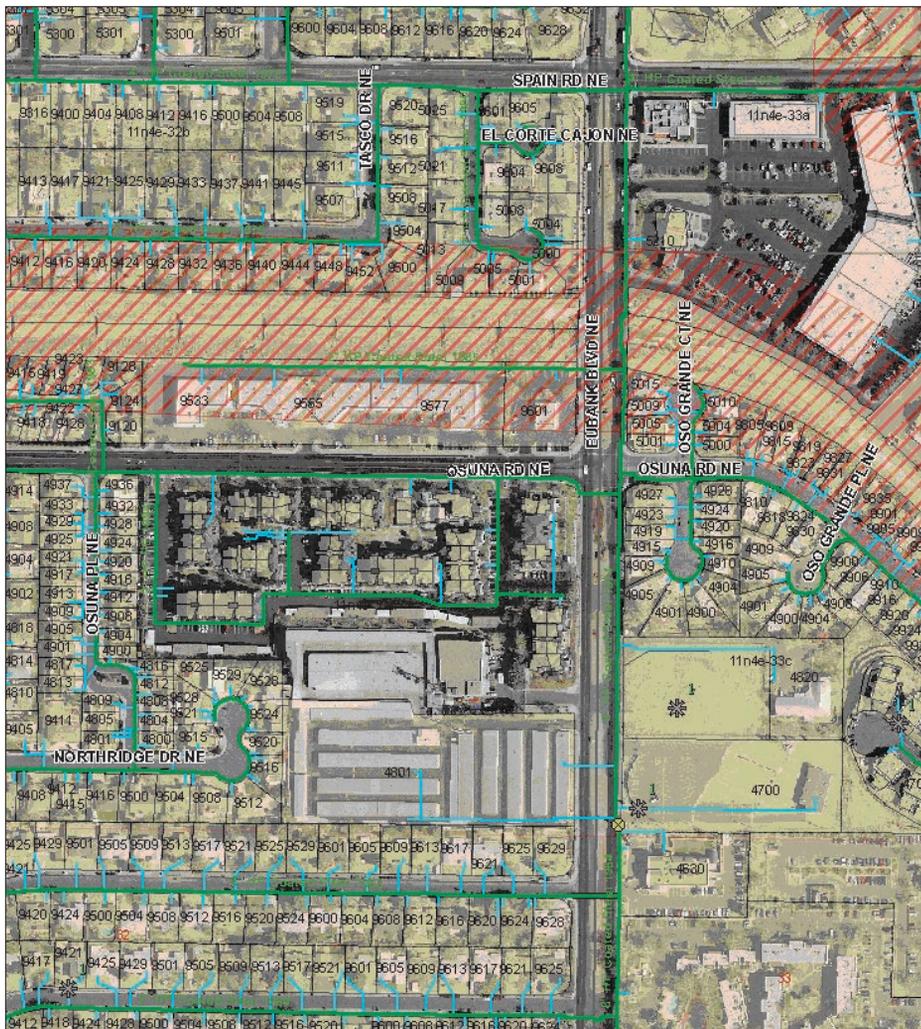
hurdle: maintain existing service levels for 500,000 customers while building an operations and engineering platform from scratch. The utility needed its distribution data—

information related to pipes, valves, meters, work orders, and customers—in one place where it could be stored, managed, and accessed by everyone on staff. A legacy geographic information system (GIS) and various computer-aided drafting (CAD) and paper mapping systems had to be converted to one GIS. In addition, the company needed a core technology solution to facilitate engineering work and field access to data.

New Mexico Gas Company selected ESRI's ArcGIS Desktop technology so that utility data could be used, shared, and edited for operations, maintenance, and engineering functions. Within three months, the utility had consolidated disparate data into one place and deployed GIS tools throughout the company. The GIS launch was speedy, budget constraints were met, and employees were trained in time to use the new technology.

"With GIS-based maps, we can see our entire state at once," said Curtis Winner, New Mexico Gas Company manager of land services. "I turn on the aerial imagery, and all of a sudden I'm in Carlsbad, a five-hour drive. It really helps staff evaluate projects and saves on travel. Using GIS tools, such as bookmarks, we can jump all over the state without leaving the office."

The first step was to migrate existing applications to the GIS. The second step was to focus on the data stored in its homegrown record-keeping database for gas distribution,



Task assistant tools have empowered New Mexico Gas Company designers with the ability to map designs for new construction and maintenance.

In This Issue

- Mapping Rooftop Solar Potential **P6**
- A Bright Future at Puget Sound Energy **p8**
- Smart Grid Preparation **p12**

continued on page 23

ESRI on the Road

ESRI Worldwide Business Partner Conference

March 21–23, 2010
Palm Springs, California

DistribuTECH

March 23–25, 2010
Tampa, Florida

GITA

April 25–29, 2010
Phoenix, Arizona

ESRI SERUG

April 26–28, 2010
Charlotte, North Carolina

WindPower

May 23–26, 2010
Dallas, Texas

Milsoft Users Conference

June 8–10, 2010
Nashville, Tennessee

APPA National Conference

June 19–23, 2010
Orlando, Florida

IRWA

June 27–30, 2010
Cargary, Alberta, Canada

ESRI International User Conference

July 12–16, 2010
San Diego, California

ESRI News

ESRI Online

Calculate Fleet Cost Savings

Visit www.esri.com/arclogistics to use the new Cost Savings Calculator. Type in your figures, such as the number of vehicles in your fleet, and determine the amount of money and emissions you could save.

Community Speaks Up at Spatial Roundtable

Pull up a virtual chair at www.spatialroundtable.com and join the conversation of GIS thought leaders as they address topics requested by the geospatial community.

Public-Facing Mapping Applications on Display

ArcGIS Server Live User Sites showcases some of the best public-facing mapping applications on the Web. Many of the sites provide direct access to state and local government information and programs. Visit www.esri.com/mapapps and submit your site.

Follow the ESRI Utilities Community on Twitter

Keep up with the latest GIS news, especially as it relates to the energy industry, by following ESRI on Twitter:

Industry writer Jessica Wyland: @EnergyGIS

Pipeline and gas industry manager Rob Brook: @robertgbrook

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Listen to Podcasts

GIS plays a strong role in gas distribution risk assessment and distribution integrity management programs. Listen at www.esri.com/dimp.

Stimulus funds are flying as utilities prepare to implement the smart grid. Hear how GIS makes the smart grid smart at www.esri.com/smartgrid.

Hear how the Small Utility Enterprise License Agreement (SU-ELA) program helped Rio Grande Electric and how you can join at www.esri.com/suela.

Webinars

Listen to a new series of monthly EGUG webinars with upcoming topics that include Mobile GIS, DIMP, and Networks. To learn more, visit www.esri.com/egug and click on the Webinar link.

2010 ESRI International User Conference

The ESRI International User Conference is the world's largest GIS event, where solutions are shared and innovative ideas are born. Thousands of professionals from across industries attend to learn, collaborate, and tackle today's challenges head-on using the geographic approach. Join us July 12–16, 2010, at the San Diego Convention Center in California.

The ESRI International User Conference has many presentations and events with hundreds of topics covered. To help you find your way to the Electric and Gas industry sessions and events, visit www.esri.com/uc.

Join us at the UC on Tuesday, July 13 for the Electric and Gas User Group meeting, EGUG Feedback session, and EGUG Social.



Join ESRI and Transform Your Future

Apply your industry expertise in a new way on ESRI's utility team. We are looking for talented professionals to leverage their industry knowledge, experience, and perspectives as account executives for electric and gas. Opportunities are available in several regional offices.

Learn more about career opportunities on our utility team and apply online at www.esri.com/utilitycareers.

National Grid Gas Selects ESRI GIS to Improve Operational Efficiency and Enhance Customer Service

National Grid Gas in the United Kingdom recently selected ESRI GIS for its gas distribution front office transformation program. With ESRI GIS and other IT upgrades, National Grid plans to improve operational efficiency and enhance customer service. National Grid chose ESRI (UK) Ltd. from a global pool containing all major GIS vendors.

“We ran a robust process to ensure we selected the best GIS product and supplier to deliver our requirements and also deliver the geospatial components into a wider business transformation program,” said Corinne Lury, senior IT manager at National Grid. “From a technical perspective, integration is key, requiring close working between all our product vendors. We are pleased to be working with ESRI (UK) as we move forward on our exciting journey.”

More than 80 percent of National Grid's operational and management decisions have a spatial context—from asset management, engineering analysis, and design to operations, marketing, and finance. ESRI GIS enables this information to be more effectively combined, analyzed, visualized, and shared throughout the company. National Grid Gas will take full advantage of GIS by integrating its asset and work management solutions with ESRI's ArcGIS software.



National Grid Gas recently selected GIS from ESRI (UK).

“We are delighted that National Grid has chosen ESRI to support such an important transformation project,” said Richard Waite, managing director of ESRI (UK), ESRI's distributor in the UK. “We pride ourselves on our domain knowledge and our ability to work with our customers to understand their specific needs. GIS is now recognized as a critical enterprise capability. We look forward to helping National Grid ensure the success of this project and to supporting its business longer term.”

Utility Best Practices Shared at 2009 EGUG Conference

By Barbara Shields, ESRI writer

Because everything in the energy business, from power generation to customer meters, is related to geography, GIS is a core business system for thriving electric, gas, and pipeline operations. Utility managers, technologists, and developers representing 90 power organizations gathered at the 2009 ESRI Electric & Gas User Group (EGUG) Conference to discover and share ways that GIS drives their business success.

The conference convened in Atlanta, Georgia, October 11–14. The event, hosted by Southern Company, drew 350 attendees to discuss issues such as economic downturn, smart grid readiness, and technological trends that improve efficiency and customer service.

In the Keynote address, Southern Company's vice president of distribution, Anthony L. Wilson, said, "Utility companies are struggling to plan ahead while facing an uncertain economy and new requirements for alternative energy sources. Uncertainty in any market is not good. Fortunately, GIS technology is a way through the uncertain times we face. For example, at Southern Company, we are using GIS to manage a massive installation project to upgrade to automated meters. These are already reducing our time in the field, improving safety, and giving us customer information.

"GIS is foundational to what we do at

Southern Company," continued Wilson. "Our operator systems are well connected to GIS. The system is also essential to meeting our objectives of safety, customer satisfaction, reliability, profitability, and talent development. Our customers' expectations for service are changing, and GIS is helping us meet those expectations."

2010 EGUG president Raymond Brunner, GIS manager for the City of Safford, Arizona, also spoke at the Plenary Session. "GIS brings our organizations together to work with other entities and participate in organizational workflows," he said. "With it, we are meeting the challenges of personnel turnover and asset and work management processes. GIS supports power optimization strategies and integrates with our business management systems."

Brunner extolled the power of user groups to solve problems and to formulate technological objectives. "EGUG is more than an event," he said. "It is a community. People in this group develop valuable connections. ESRI supports this group through webcasts, forums, and its newsletter *Energy Currents* to keep us informed and connected with the latest trends and GIS solutions."

In a video presentation, ESRI president Jack Dangermond talked about changes in the GIS arena. "The presence of GIS is changing in

the technological landscape. There is a stronger acknowledgment by energy companies worldwide that GIS is key to many of their activities. More companies are using GIS as a central technology for building infrastructure and are using geographic information to formulate science and plan projects. In fact, geographic information officers [GIOs] are becoming part of executive teams.

"GIS is much more than mapmaking software; it is a driver for better decision making. People are using our tools to go deep into the data," noted Dangermond. "The current version of ESRI's ArcGIS software delivers faster display, better maps, greater breadth of spatial analysis, and increased usability." This robust software is easier to use, giving it a wider range of purpose and ability to meet challenges of dynamic economic, political, and environmental climates.

Other GIS trends Dangermond mentioned include the incorporation of mobile workflows into enterprise IT, the development of situational awareness systems for emergency management and outages, and easily accessed online transparency information that shows the public where and how economic stimulus dollars are being spent relative to actual need. Imagery is another dimension of today's GIS that provides a means for in-depth environmental analysis of temporal change and land use.

ESRI technicians showcased ways GIS supports electric and gas business models. For example, a dashboard makes it easy to see many types of related data in one view and offers alerts. In the event of storm management, the user's dashboard could include weather, accident information, media coverage, customer outage calls, and SCADA outage reports. Based on this information, the user could then deploy a storm planning model, which shows risk levels by area that are related to the particular storm. Finally, the user could bring up a map to see, in real time, the proximity of field crews to outage and at-risk areas.

A data management demonstration showed



Participants reaped many benefits from the 2009 EGUG Conference.

ways to organize, manage, and disseminate information. Companies can use GIS to dig deep into their data and use it for multiple purposes. Technicians also presented various geoprocessing models, from modeling risk for storm preparation to devising vegetation management plans to planning a pole replacement project. In addition, they explained that customers are Internet savvy and use Web services on a daily basis. With GIS, utility providers can accommodate customer expectations by delivering hosted Web services that allow those customers to view power outages in their area and see what response efforts their service providers are making.

Throughout the remainder of the conference, EGUG participants presented papers about successful methods for meeting the demands of their businesses. Some of these papers will be posted on ESRI's electric and gas industry Web pages at www.esri.com/electric. GIS vendors exhibited their solutions for electric, gas, and pipeline industries. A map gallery of GIS-generated posters offered new perspectives on GIS applications. Following the close of the conference, Southern Company invited EGUG Conference attendees to an on-site visit at its nearby Atlanta office and showed them its enterprise applications in action.

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Bonnie Sroka, DTE Energy

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Wayne Boone, Alabama Power

Conference Co-Chairs

Barbara Saunders and Bryan Debus, DTE Energy

Save the date to attend the 2010 EGUG Conference in Dearborn, Michigan, October 17–20. Visit www.esri.com/egugconference.

EGUG Conference Sponsors Made It a Great Experience

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Accenture

Accenture offers comprehensive utility GIS consulting, system integration, and application support, providing industry-leading EAM-GIS and smart grid integration. Accenture's utility GIS experience confirms that transmission and distribution utilities seek sustainable enterprise GIS that delivers utility business processes, incorporates information governance policies, reconciles asset systems of record, leverages SOA integration technology, manages data of high quality and completeness, and empowers users with GIS applications on a high-performance architecture. Accenture provides enterprise GIS delivery assistance that helps its clients achieve these objectives, which are essential steps toward meeting the new frontier of GIS-enabled smart grid state connectivity, analytics, and visualization.



IBM

The Solution Architecture for Energy and Utilities Framework (SAFE) was introduced by IBM at GridWeek in Washington, D.C., on September 21, 2009. SAFE is an innovative, powerful software framework for business collaboration of solutions across the energy value chain. The framework is designed to integrate, manage, and optimize utility systems—inclusive of assets, devices, networks, servers, applications, and data—driving business agility and intelligent network transformation. Utility companies can build their own road maps for transformation using the framework approach to help deliver projects faster. ESRI is a key partner in the SAFE Framework: ESRI's GIS technology extends SAFE, providing the applications, workflows, analytics, and capabilities needed to manage the smarter utility. www.ibm.com/software/industry/energy_utilities



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Mapping Rooftop Solar Potential

The solar age has dawned in Germany. About 20 percent of the country's rooftops are suitable for solar power production, according to recent results from the SUN-AREA Research Project. The project aims to determine how solar energy resources can be optimized by placing photovoltaic panels on rooftops around the country.

The SUN-AREA project is sponsored by the University of Osnabrück and the TOPSCAN topographical information company and led by geomatics engineer Martina Klärle and researchers Dorothea Ludwig and Sandra Lanig.

"ArcGIS gives us an intuitive interface to implement necessary data and tools to model solar power. The system will detect locations with optimal terms for producing solar power based on laser scanner data and plain view data."

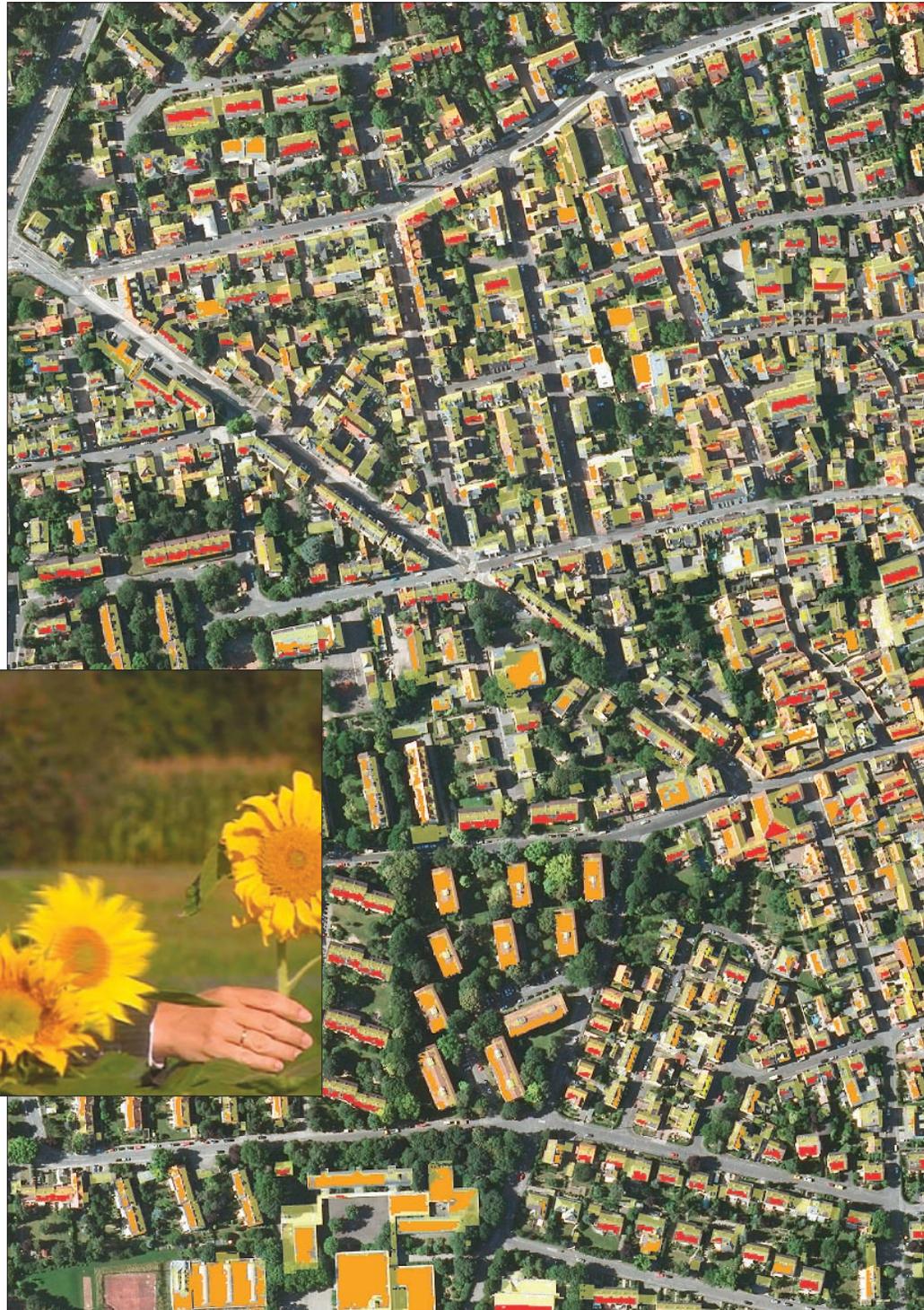
Martina Klärle, SUN-AREA Project

Preliminary findings of the SUN-AREA project estimate that, at full potential, solar power could meet the entire energy needs of homes throughout Germany. The team began its work with an examination of the northern German city of Osnabrück.

"We have proven that 70 percent of the city's total demand for electricity can be covered

using only the roofs that are already present in Osnabrück," Klärle said. "In other words, if all the roofs that are especially suitable were now fitted with photovoltaic devices, we could meet 70 percent of the electricity needs of all of Osnabrück."

Germany is very well suited to generate electricity using photovoltaic systems. The



Geomatics engineer Martina Klärle leads the SUN-AREA project, sponsored by the University of Osnabrück and the TOPSCAN topographical information company.

SUN-AREA researchers use ArcGIS Desktop applications to calculate the solar suitability per building for the city of Osnabrück in Germany.

majority of the population is not concentrated in urban centers, but spread out over rural areas. That means more space per person and more roof area.

“My vision is to use all suitable roof surfaces to make solar electricity,” Klärle said.

Now Klärle is trying to turn the SUN-AREA vision into reality. She gave city officials a

solar power potential map of Osnabrück with an exact catalog of all suitable rooftops. The data has been made public and has already met with positive response. The city is stepping up efforts to equip public buildings with solar collectors. Osnabrück has doubled its solar energy installations in the past year alone.

“We’re at the point where we can’t afford

to get our electricity from coal-fired power plants, and we don’t want to get it from nuclear power plants,” Klärle said. “I just won’t accept that we have all this potential on our roofs, and we don’t use it.”

The SUN-AREA Method

SUN-AREA researchers set out to develop solar power potential maps of each roof area, each city, and each county or district in Germany.

The team started by gathering data, then devised a digital analysis method for identifying high-potential areas. Rooftop data was collected with aerial laser scanners. Klärle spent time flying through the skies over Germany, seeing to the effectiveness of the scanning technology.

Using ESRI ArcGIS Desktop tools such as Spatial Analyst, the researchers identified all necessary rooftop data, such as outer form, inclination, orientation, and clouding. The team used an algorithm sequence, created with ESRI’s ArcGIS Desktop ModelBuilder application, to determine the solar potential of all roof areas. Important data included the angle and alignment of the roof, the sun’s path across the sky, shadows cast by a chimney or another rooftop over the course of the day, and the seasonal change in hours of sunlight. The SUN-AREA project also calculated solar suitability, potential power output, CO₂ reduction, and investment volume for each subarea of a roof.

“ArcGIS gives us an intuitive interface to implement necessary data and tools to model solar power,” Klärle said. “The system will detect locations with optimal terms for producing solar power based on laser scanner data and plain view data.”

The results of the Osnabrück pilot region are available to the public via an interactive online map created with ESRI’s Web GIS technology.

For more information on the SUN-AREA project, visit www.osnabrueck.de/sun-area.

Listen to the podcast on the role of GIS in renewable energy at www.esri.com/renewable.



A Bright Future at Puget Sound Energy

Washington's Oldest Local Energy Utility Fine-Tunes Marketing Programs

By Karen Richardson, ESRI writer, and Michael Wehling, David Mitcheltree, and Shaun McMullin, PSE

Washington State has always been forward thinking. When it passed some of the most progressive renewable energy legislation in the United States in 2005—Bills 5101 and 5111—it was par for the course. The bill passing was prompted by a severe energy crisis in 2001, when the Columbia River experienced its lowest water levels in 60 years. The state decided it was time to diversify and become a leader in energy efficiency. The Energy Freedom Program was set up in 2006, committing \$25 million in low interest loans and grants to provide the capital necessary to support production of green energy.

Washington State's oldest local energy utility, Puget Sound Energy (PSE), adapted quickly with a program that rewards customers with qualifying renewable energy systems. PSE continues to push the envelope for innovative ways of thinking about renewable energy and conservation programs. The utility is recognized by the American Wind Energy Association as the second-largest utility owner of wind energy facilities in the United States and owns two commercial production wind power plants. PSE has garnered national recognition for a variety of energy efficiency achievements recently, including the prestigious platinum-level Energy and Water Management Award from the secretary of the Navy and the U.S. Environmental Protection Agency's 2009 ENERGY STAR for its efforts in energy conservation.

PSE has been supplying energy to customers for more than 100 years and today serves more than 1 million electric and approximately 750,000 natural gas customers around the Puget Sound region. To meet the electrical energy needs of its customers over the next 20 years, PSE implemented a 2009 integrated resource plan that directs the utility to add 1,100 megawatts (MW) of renewable wind generation and 1,064 MW of efficient energy to its existing generation portfolio of hydro-electric, wind, gas, and coal power plants. As

energy efficiency becomes a leading resource addition, the utility has to become more innovative in targeting customers with energy savings potential and increasing their engagement with its energy efficiency programs. GIS technology is playing an increasing role in refining PSE's understanding of its customers and their potential efficiency gains.

A Lightbulb Moment

One of the easiest and most inexpensive ways for people to save energy is to replace incandescent lightbulbs with compact fluorescent light (CFL) bulbs. ENERGY STAR-qualified CFL bulbs use up to 75 percent less energy than conventional incandescent bulbs and can last about 10 times as long. To incent its customers to trade in old incandescent bulbs and try new CFL bulbs, PSE created the Rock the Bulb program and a targeted marketing campaign to draw customers to events in their service areas.

Using ArcGIS, the Energy Efficiency Services (EES) Group looked at hardware stores and the big-box home improvement stores and their proximity to customers. Creating a radius, EES selected customer and census-level household information to see if the stores were near service areas that housed a select number of customers who would be interested in turning in old lightbulbs for new ones. Using this data in planning and budgeting, the EES Group was able to estimate the number of participants that would attend and what ZIP Codes within the radius would be represented by those who would respond to a variety of marketing and social marketing applications. "In addition to making use of externally derived datasets, GIS enables PSE's EES division to gain additional value from its existing data by bringing together separate datasets, creating new capabilities to guide marketing and program efforts," said Bill Hopkins, manager for strategic planning, PSE.

From the success of this program, GIS is being used to assist in refining other energy efficiency marketing programs. By looking at

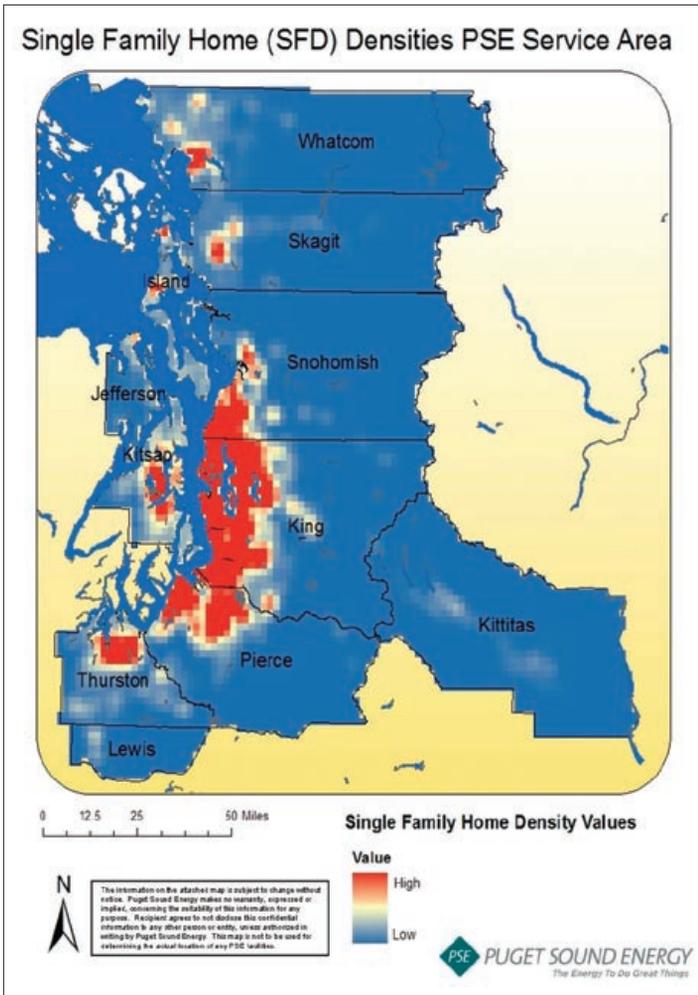
customers in ArcGIS, EES can find out what type of housing customers reside in and determine which areas have a larger number of homeowners as opposed to high concentrations of renters. Because homeowners typically have more interest in incentive programs for switching out energy-hogging equipment, such as water heaters and furnaces, marketing to homeowners is more effective.

GIS also helps EES staff look at the demographic profile of different areas. Understanding who lives in each area helps fine-tune marketing messages by understanding how "green" an area may be as well as finding out whether there might be language barriers. Some locations may require that marketing materials be printed in more than one language to reach the appropriate people.

Moving to More Efficient Fuels

The Natural Gas Development Group saw the usefulness of GIS and used the technology as well. The group was interested in contacting households about converting from oil heat to natural gas. To target messaging to the appropriate people, household information was mined according to geographic area. From the information, labels and maps were created for a campaign to contact households about conversion from oil heating to natural gas. This data-mining effort involved filtering all households in specific geographic areas and eliminating existing PSE gas customers. That filtered list was further reduced using data elements like type of heating fuel and proximity to gas mains. In the end, letters were sent to households having a higher likelihood of becoming new PSE gas customers.

"GIS provides value to PSE by introducing customer and operations data with external data, such as assessors' household information, and creating tools like mainlining lists and maps displaying where future customers live," said Liz Norton, manager, natural gas planning and development, Natural Gas



The density of single-family homes is easily displayed and analyzed using ArcGIS for various marketing activities at Puget Sound Energy.

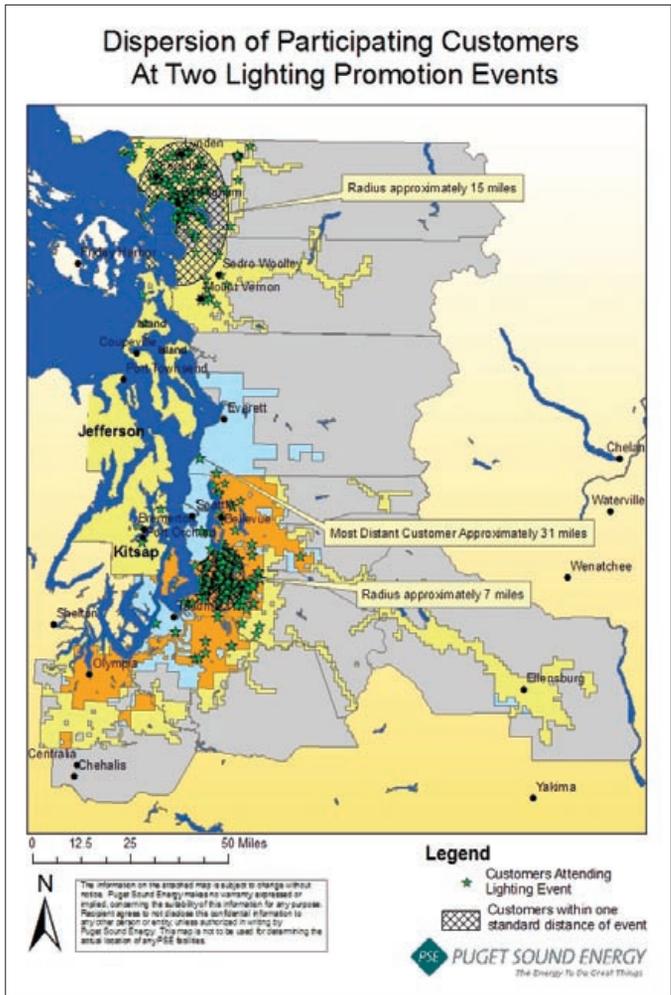
Development Group. The group is currently exploring the integration of systems planning data to further identify loads on the system and areas in which to concentrate future growth.

“GIS is much more than maps to us, because it provides a collaborative decision support tool for visualizing company data,” said Norton. “GIS has helped different groups and departments within PSE analyze many different datasets that traditional means cannot equal. GIS is a complementary tool that helps visualize data, improving decision making at all levels.”

Groups throughout PSE are hard at work improving how GIS is being used. Efforts so far have helped close the gap between what *can* be done right now and what *could* be done in the future. Those collaborative efforts are happening now and will continue moving forward.

Next Steps

PSE has come a long way from its first use of



Information from the attendance at two different Rock the Bulb events was used for further analysis—in this case, looking at demographics of the radii from the events around other potential retail locations.

GIS: producing maps to communicate projects internally and at community outreach program meetings. PSE hopes to continue realizing more widespread benefits of the technology. GIS allows each business group to have improved management and internal control of information and a means of analyzing and allocating their own resources.

For example, GIS is useful for energy conservation and efficiency programs by finding how surplus power in one geographic area can provide additional power elsewhere, in essence creating an additional energy supply. “GIS can help identify opportunities where combined electric and gas networks exist to reduce load on electric networks by moving customers to natural gas for heating when it’s available in their area and there is enough capacity,” said Hopkins. “This helps reduce electrical demand and can avoid costly upgrades to circuits.”

Because GIS has the ability to link datasets by geography, the technology facilitates interdepartmental information sharing and communication. By creating a shared database, one department benefits from the work of another—data is collected once and used again and again. As communication increases between individuals and departments, redundancy is reduced, productivity is enhanced, and overall organizational efficiency is positively impacted. This represents a shift from project-driven GIS to what is traditionally known as enterprise GIS. This shift will help PSE leverage operations and customer data for additional projects like those described above.

For more information on how to use GIS for marketing and other business functions, visit www.esri.com/business.

Smart Use of GIS

In upgrading its GIS, the utility aimed for efficient handling of technical, alphanumeric asset information. Not surprisingly, this information was spread across the entire company in many different, sometimes duplicated, databases. In outage situations, this raised practical questions such as, Which valves are inaccessible? Given these problems and the

GPZ goal to manage its business processes based on modern IT infrastructure, it was clear that the nonspatial data had to be integrated in a much better fashion.

The first step was to create a new data model that combined both the actual geographic data and various sources of nonspatial data. For this step, it was necessary to investigate daily workflows and business processes in the technical departments. The collected information was summarized in workflow diagrams and included in the new data model.

“The understanding of business processes is essential for the proper design of user applications,” said Mirella Subotić, head of GPZ Distribution Center. “This new GIS must give users much more than just storage and presentation of technical data of the gas network. The first aim of the GIS is to make daily processes as simple as possible by automating or semiautomating [them] through smart use of IT.”

Implementation

On the desktop side, GPZ implemented ArcFM UT, a solution from ESRI business partner AED-SICAD, to integrate all existing spatial and nonspatial asset data in one central

database. Because ArcFM UT offers advanced functions for database management and gas network maintenance and design, GPZ already used the application for planning and cadastral management. ESRI’s distributor in Croatia, GISDATA d.o.o., localized all interfaces into the native language.

In the center of GPZ’s new enterprise GIS is a GIS portal acting as a corporate conduit to versatile applications and datasets, as well as a central asset information platform for the communal geodata infrastructure. Most GPZ employees are connected to the GIS portal.

Bringing It All Together

For the final project phase, GPZ will integrate other important IT systems with its enterprise GIS.

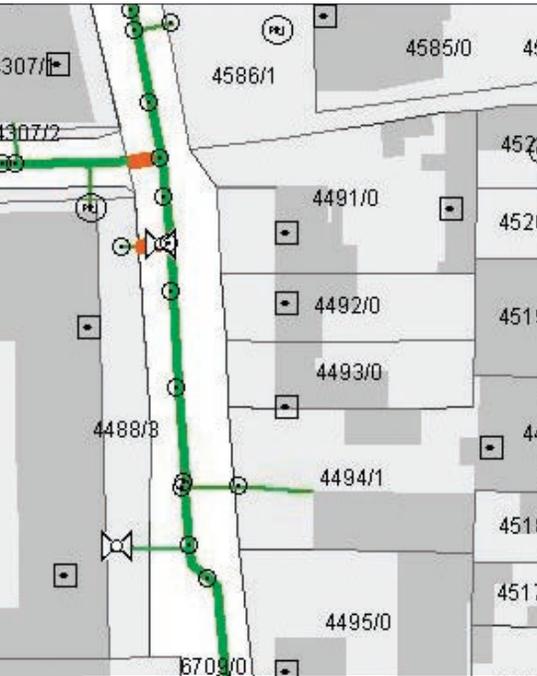
The utility’s document management system (DMS) contains thousands of scanned documents relevant to network assets and daily business processes. Every day, the DMS accumulates further documents. A large portion of this information is being saved to the new GIS-based asset management system.

Another highly important IT system to be integrated is the enterprise resource planning (ERP) system. GPZ foresees a bidirectional data exchange between the GIS and the ERP. The utility will use a service-oriented architecture (SOA) for the integration.

Through an enterprise GIS approach, all utility employees will have asset, document, and financial information at their fingertips.

For more information on AED-SICAD, contact Florian Brandi-Dohrn, florian.brandi-dohrn@aed-sicad.de.

For more information on GIS for gas utilities, visit www.esri.com/gas.



Croatia’s Capital, Zagreb



Mobile GIS Helps Imperial Irrigation District Prepare for Smart Grid Initiative

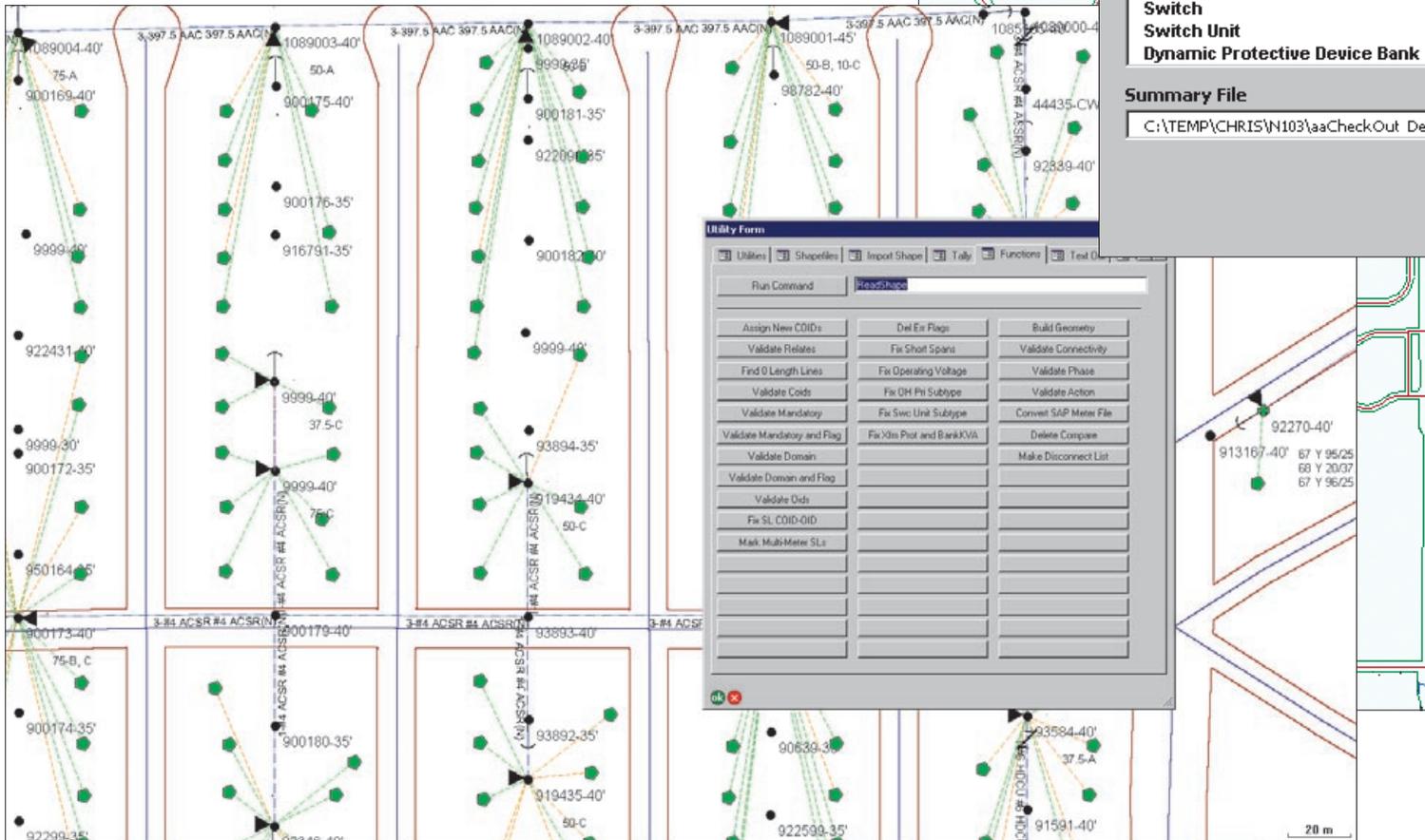
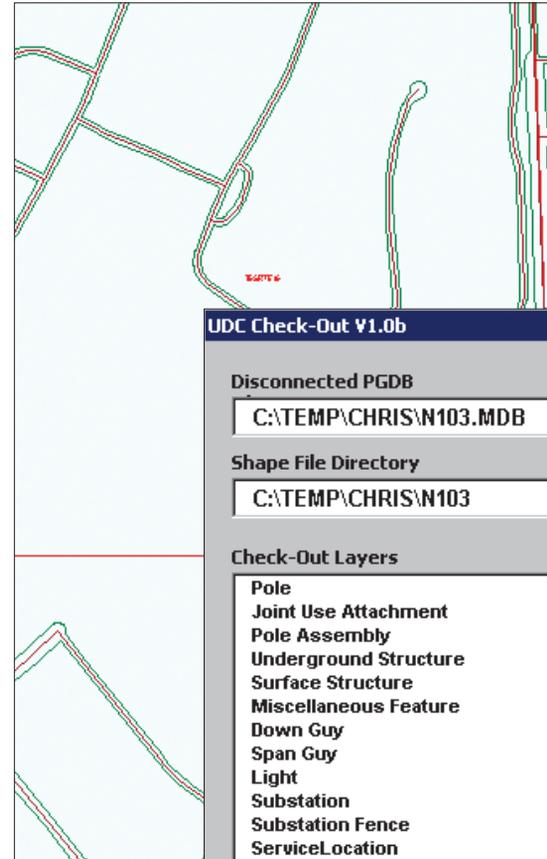
In preparation for its smart grid initiative, Imperial Irrigation District (IID) in California is using mobile GIS technology from ESRI to conduct thorough field collection of its overhead and underground facilities.

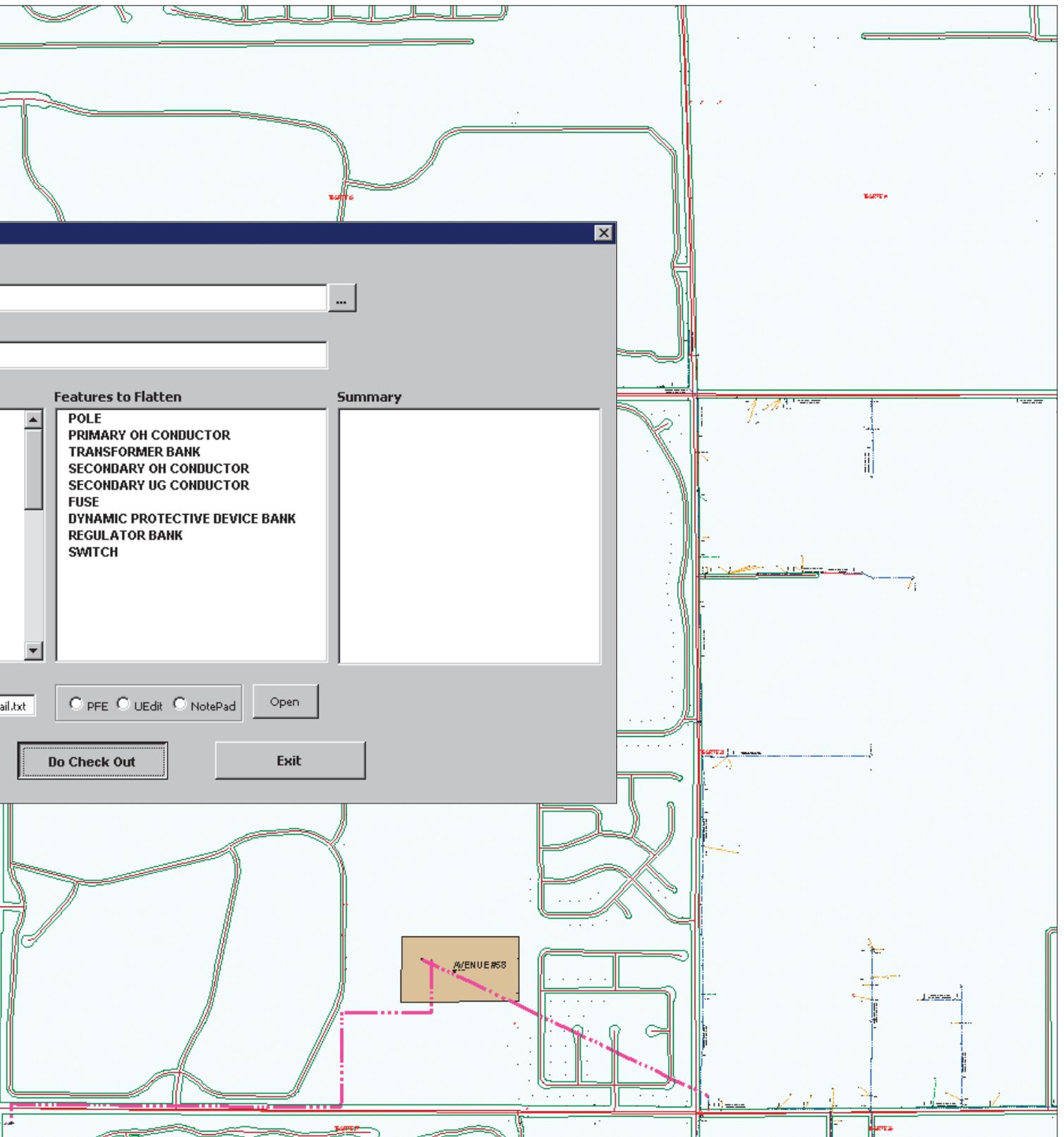
“Our GIS system is going to be really the heart and soul of the smart grid initiative,” said Bill Wickersheim, GIS administration supervisor for Imperial Irrigation District. “Our main goal is to collect all the data about everything we have in the field so that the proper departments can do the planning they need to do to upgrade our system.”

While IID prepares to implement a smart grid, the collected GIS data is already benefiting other departments. IID’s environmental department is using field data in its GIS for right-of-way and habitat analysis. The real estate department is using it for right-of-way negotiations, deed research, and territory negotiations with neighboring Native American tribes. The utility’s legal department is using GIS data to stay abreast of regulatory compliance. The right-of-way department is using the data to obtain permits for geothermal and mineral research.

“GIS traditionally plays a strong role in all aspects of the utility, and it becomes crucial when implementing a smart grid,” said Bill Meehan, ESRI’s director of utility solutions. “By enabling data management, planning and analysis, field collection, and situational awareness, GIS is what really makes the smart grid smart.”

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





Trinidad & Tobago Electricity Commission Makes Enterprise GIS a Reality

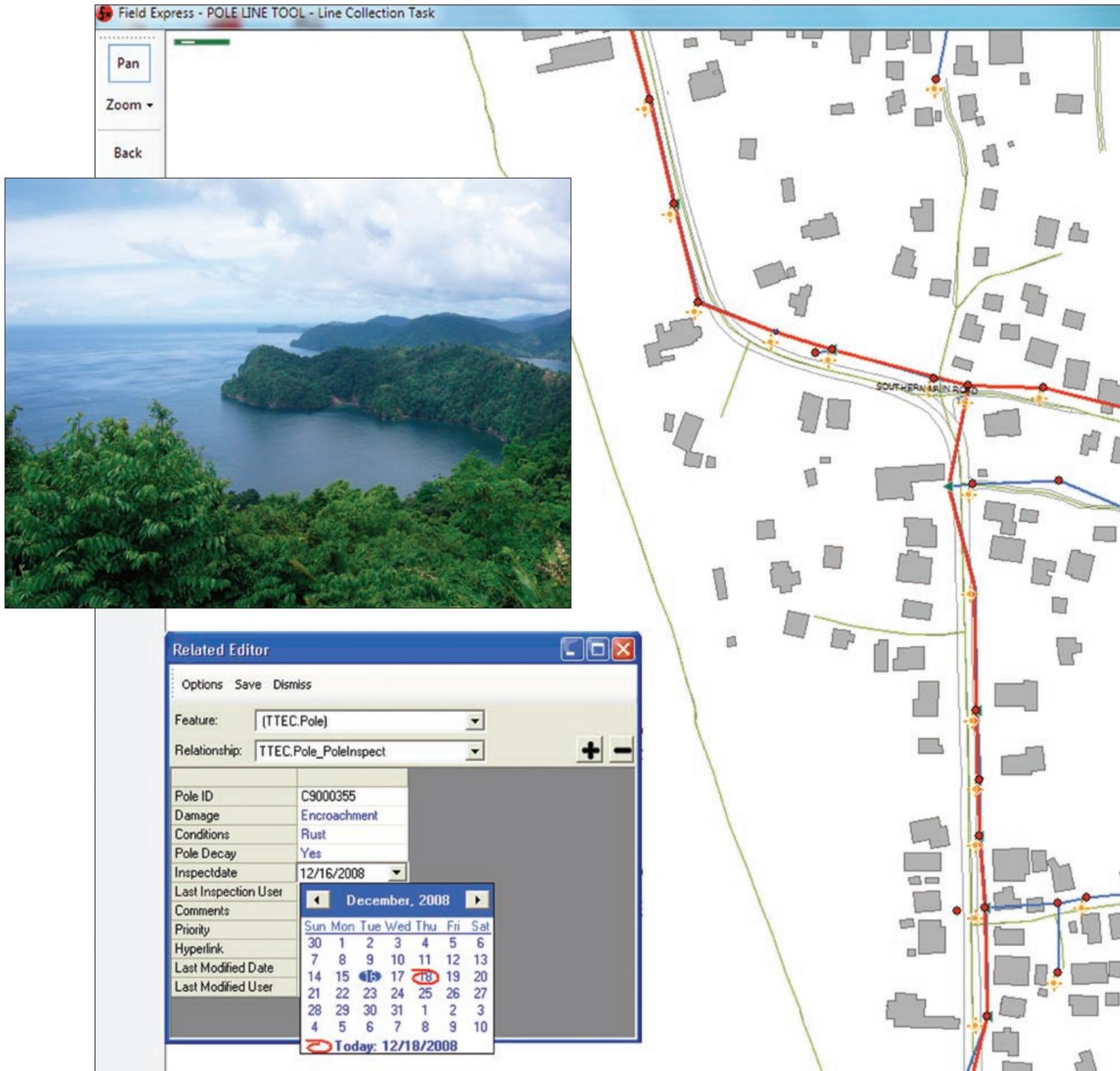
By Amy Garrison, 3-GIS

The Trinidad & Tobago Electricity Commission (T&TEC) provides power to the twin island republic of Trinidad and Tobago. Since its inception in 1946, T&TEC has been focused on the operation and maintenance of the country's

transmission and distribution network. T&TEC generates and distributes electricity to 400,000 domestic, commercial, industrial, and street lighting customers in five regional divisions. With the goal of improving reliability and

customer service, T&TEC recently identified the need to develop an enterprise GIS.

Among the business drivers, T&TEC wanted to improve customer service by enabling field crews to more efficiently locate customers



Using Field Express Chameleon, T&TEC field technicians can easily perform plant inspections, noting attributes and the inspection date using the related editor.

and assets. T&TEC saw GIS as being able to assist in asset management by tracking the equipment life cycle and maintenance information. With a solid inventory of its existing transmission and distribution assets, T&TEC

could make appropriate decisions as to the maintenance and/or replacement of assets. Finally, the commission anticipated improved reliability and quality of the distribution supply for customers stemming from the analysis

of load flows, protection coordination, and load balancing.

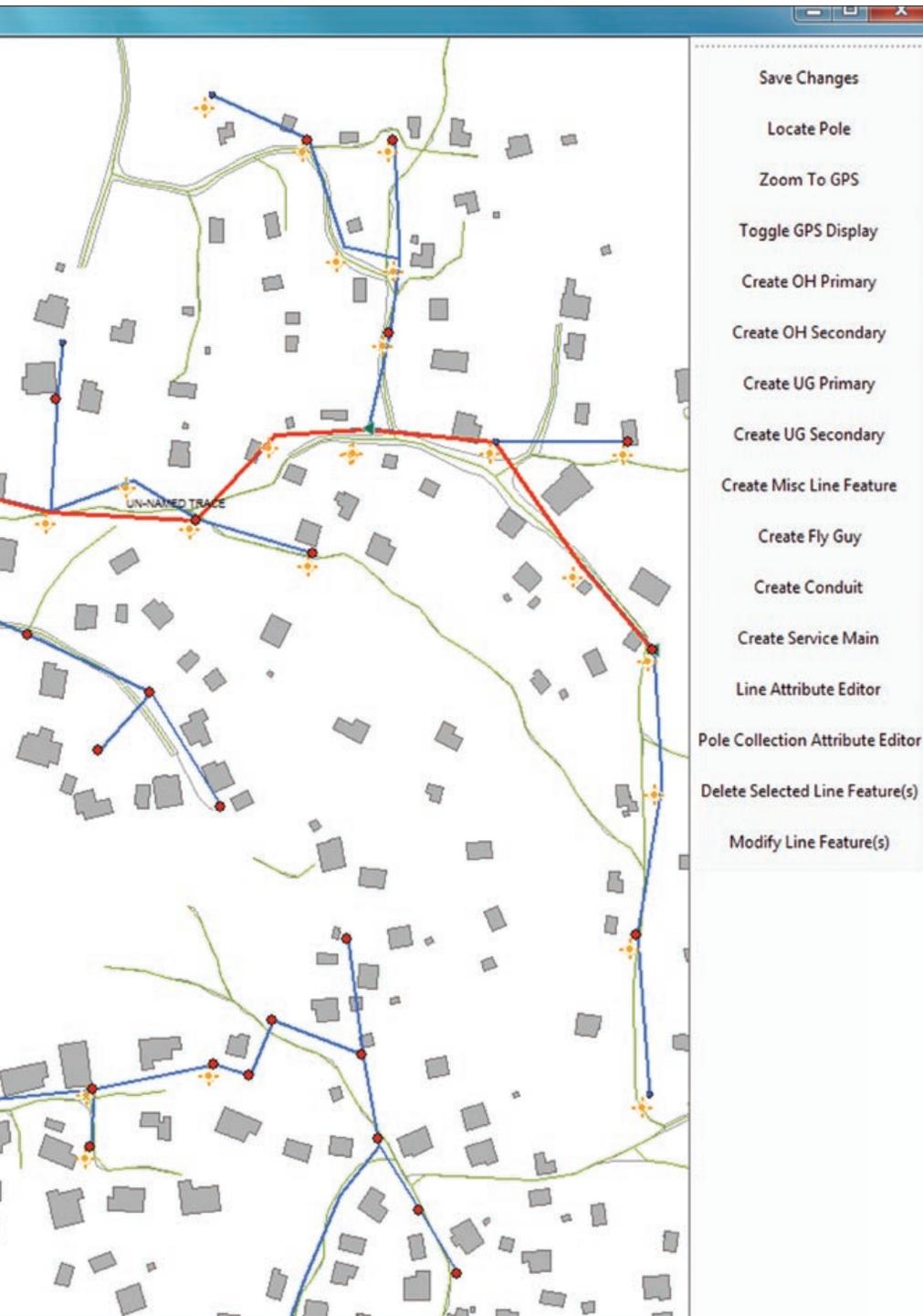
To realize these benefits, T&TEC relied on GIS technology from ESRI and GIS consulting from ESRI business partner 3-GIS. After extensive workshops with T&TEC, 3-GIS developed a data model for the company's transmission, distribution, and communication departments. The next step was to migrate T&TEC's existing land base data from shapefiles, CAD files, and other proprietary formats into a geodatabase. To collect distribution data for the geodatabase, T&TEC used Field Express Chameleon software from 3-GIS. This gave field technicians the ability to capture, edit, and update data; design line extensions; locate plants and customers; and perform vegetation management, corridor management, line tracing, and inspections.

Working with T&TEC's GIS team members, 3-GIS configured the technology for data collection activities. T&TEC began testing with a pilot group of 10 technicians using Trimble Juno ST handheld devices to inventory the distribution infrastructure. After five months of data collecting with the pilot group, T&TEC decided to move forward in production.

"We were able to input much more field data than we previously collected and thus reduced the overall cost of data collection—one of the highest costs in development of a GIS," said Curvis Francois, T&TEC GIS project manager.

Technicians also rely on GIS-based staking tools to plan new construction and to perform inspections on poles, transformers, lines, substations, and transmission structures. Eventually, T&TEC field crews will use GIS to perform damage assessments and vegetation management activities. The company is also looking at integrating GIS with its other enterprise solutions including automated metering infrastructure and outage and asset management systems.

For more information, visit www.3-GIS.com.



AES Sul Proves the GIS-SAP Integration Business Case

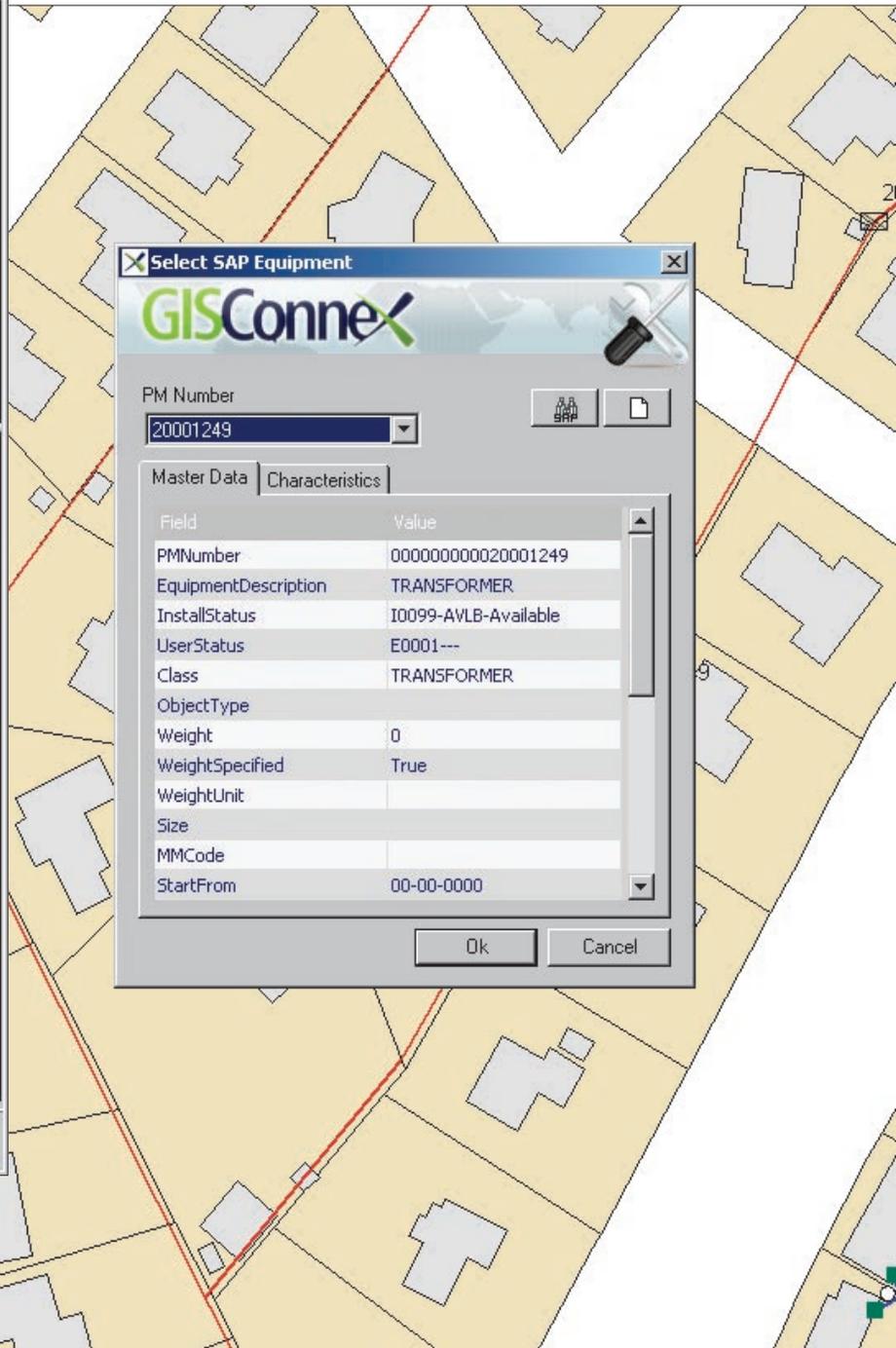
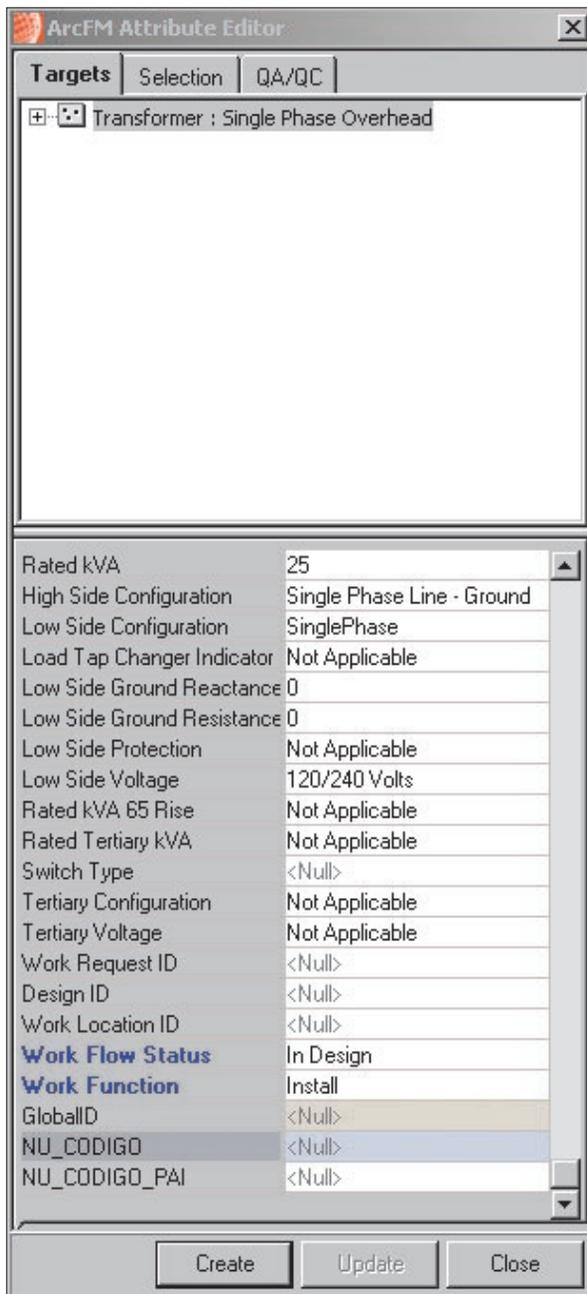
By Lucio Graça, GISConneX

Asset and work management are directly linked to a utility's core business. Assets that are not properly maintained have a direct impact on profitability and efficiency. Finding the right balance between maintenance costs and operational efficiency is one of the key challenges that utilities face today. However, maintaining

assets means not only ensuring that they are operational but also maintaining accurate asset information. One of the key elements for a successful asset management strategy is data integrity between enterprise resource planning (ERP) from SAP and GIS technology from ESRI. Data integrity between these two systems improves the accuracy of financial information and

prepares the utility for the scrutiny of improved compliance and governance.

AES Sul is an electric distribution company and a subsidiary of AES Brazil. The company operates an electric distribution network serving more than one million customers in the metropolitan, central, and western areas of Brazil. In 2005, AES Sul began to realize that it had serious problems related to asset



Users easily create SAP equipment inside ArcGIS technology with GISConneX.

management. Inventory data was inadequate from the point of view of accounting as well as network operation. Without geographic information, it was difficult to identify assets in the field. Field operations were annotated on paper forms, and a lot of people were involved in the time-consuming process of updating data. Finally, network data inventory was not compliant with current regulations that required

proper and accurate accounting of assets, very similar to International Financial Reporting Standards (IFRS).

This challenging scenario presented the right opportunity for AES Sul to promote the necessary investments in GIS and GIS-SAP integration. A significant investment was required: almost \$7.5 million had to be spent on PDA equipment, software licenses, development, training, field survey, mapping/satellite images, consulting, internal infrastructure, change management, and other internal costs.

To prove the business case, AES Sul had to be able to link the business benefits sought with GIS and GIS-SAP integration to the organization's strategic goals and objectives, proving how and when that investment would deliver tangible benefits. AES Sul needed a project that would jointly take all these aspects into account and maximize return on investment (ROI).

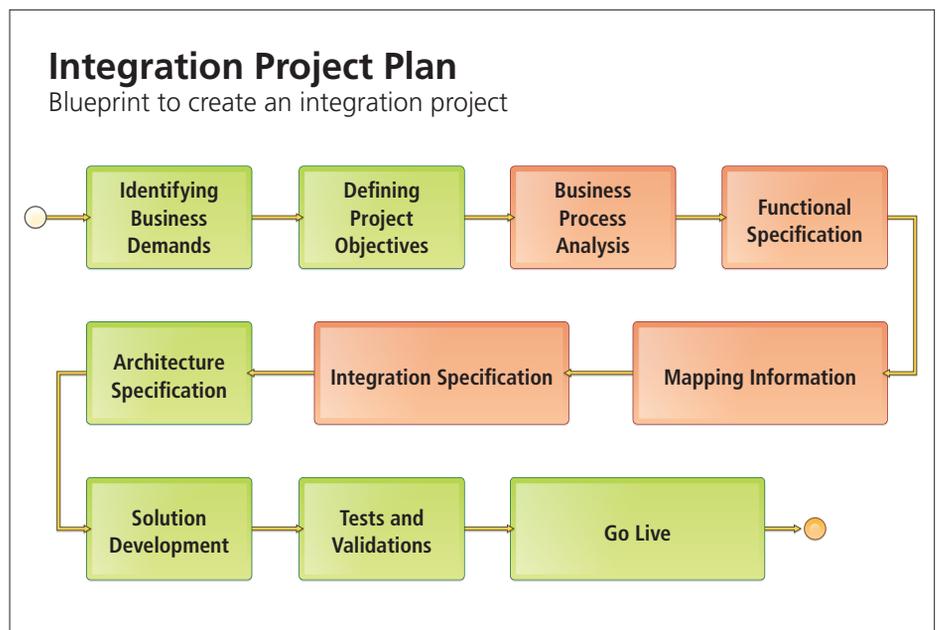
In April 2006, AES Sul decided to implement the CONTA COMIGO project, targeting improvements in the quality of network service, customer service, and compliance. The project included a significant investment in asset inventory, financial reconciliation, and IT technology infrastructure.

AES Sul began with a review of its asset registration and network maintenance processes. The next step was a review of the data model and the development of business rules that would be validated by GIS and SAP. Finally, ArcGIS and ArcFM Designer were integrated with SAP Product Lifecycle Management (PLM) based on a NetWeaver platform for project management and network maintenance.

By the end of 2008, after the second round of the rate revision process led by the regulatory agency, it was possible to account for ROI in CONTA COMIGO for the period of April 2006 to April 2008. Based on the ROI-IMG methodology, developed by Imagem Geosistemas e Comércio Ltda., ESRI's distributor in Brazil, under global financial analysis standards, the utility reached a 130 percent internal rate of return (IRR) and an ROI of 200 percent with a payback in three years.

Quantitative benefits could be measured in terms of compliance with regulations, thus helping AES Sul avoid fines. The company was also able to justify appropriate rate increases, achieve greater accuracy in the maintenance of network inventory data, and reduce

continued on page 18



Blueprint to Create an Integration Project

AES Sul Proves the GIS-SAP Integration Business Case

asset management work by an average of 75 percent. Since implementation, the utility has seen greater efficiencies in network project design and construction; a reduction of overlapping projects, thereby reducing redundancy in field crew deployment; an increased utilization of IT assets with increased efficiencies; and marked cost avoidance by eliminating the need to acquire or install metal ID plates for about 800,000 assets.

In the context of current governance and the global economic climate, there has been an increased demand to improve accountability, business efficiencies, competitive advantage, and resource utilization. As a result, executives are seeking more sophisticated approaches to prioritizing and targeting investment in GIS technology and proving how and when that investment will deliver tangible benefits to their organizations.

To substantiate the business case for GIS and GIS-SAP integration, organizations must be able to link the specific benefits of integration initiatives to the organization's strategic goals and objectives. The business case must illustrate a systematic delivery of benefits through a well-structured program that delivers value to the business core of the organizations.

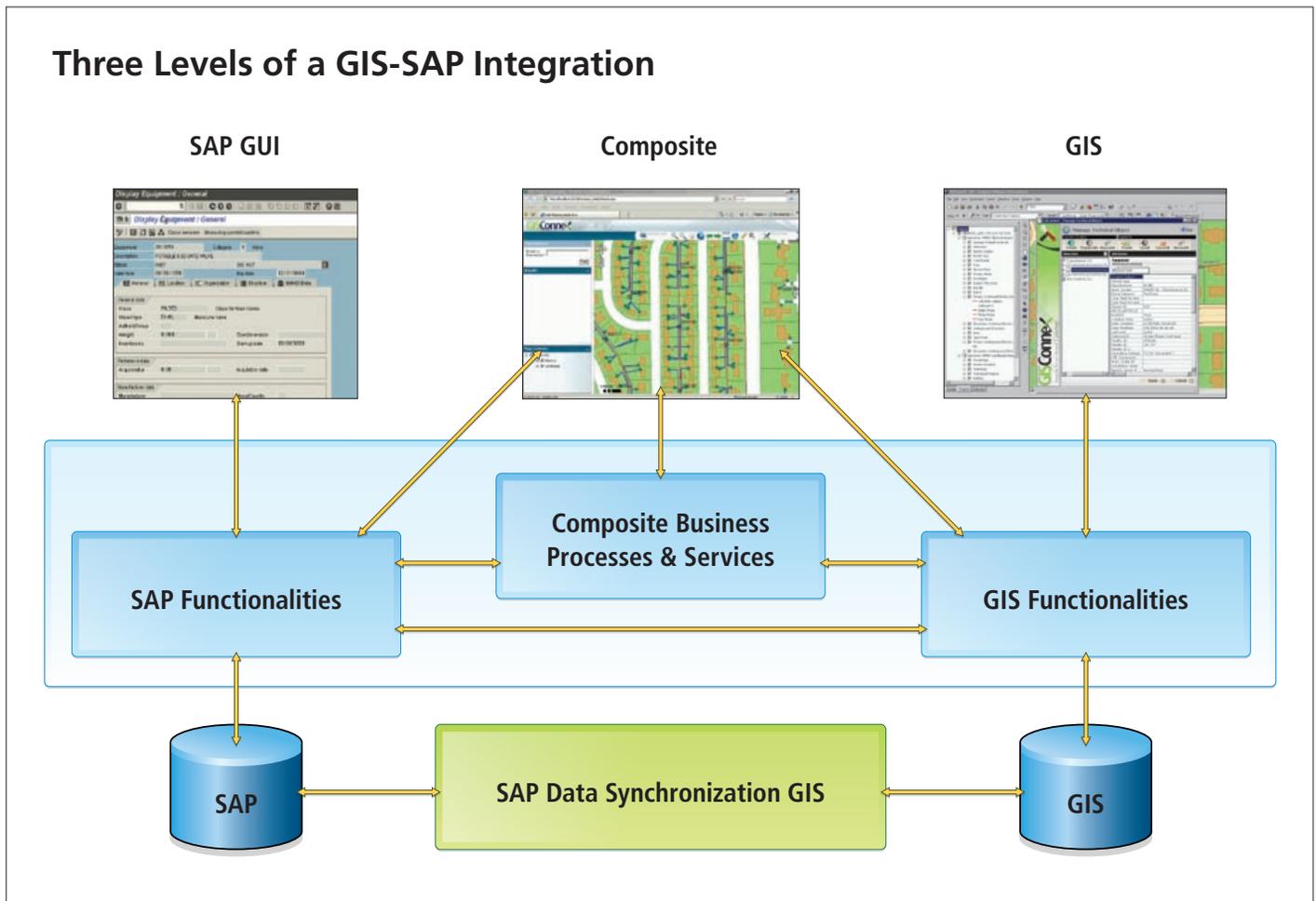
Emerging financial standards such as IFRS dictate more detailed asset accounting. These regulations will change depreciation models and the granularity of asset accounting, providing a very compelling business case to integrate GIS with SAP.

Generation of revenue is the most important item in a business case. The best lens on this topic focuses on justifying rate cases. Utilities must account for and justify proper management of their assets as a portion of their case to receive a rate increase. This was very much

the case with AES Sul. Moreover, the common perspective is that integration of GIS with both operational and business systems is critical to a successful smart grid implementation.

When thinking about GIS-SAP integration, it is necessary to define a suitable integration design for each utility. For achieving that integration design, one must thoroughly understand cross-business needs by reviewing functional requirements, identifying current gaps and issues, analyzing areas for process improvement, and designing optimal business processes. A secondary requirement is to define the most suitable technology for realizing the GIS-SAP integration.

For more information, visit GISConneX at www.gisconnex.com.



Three Levels of GIS-SAP Integration

Tianjin Power Improves Workflow, Database Accuracy

By Eric Li, ESRI China (Beijing) Limited

After researching a series of solutions, Tianjin Power in China decided to implement an ESRI platform for its GIS upgrade. The new system would serve more than 380 global users of the utility's water, electric, gas, and oil services. Tianjin wanted to maintain the power network data and create an accurate network model. The utility found that the new system, built on ESRI's ArcGIS software and Telvent Miner & Miner's ArcFM software, could meet its needs.

With GIS tools, Tianjin is now able to efficiently maintain the power network data and ensure data accuracy. For instance, the data quality checking module can identify insufficient data before it enters the database.

The new system also allowed the utility to create an accurate network model, thereby achieving advanced analysis. Tianjin

operators can switch between typical and object-oriented mapping for managing underground cables and pipelines.

The solution provides template collection so users can automatically enter a series of power equipment by clicking the map. Breakers, transformers, poles, and wires can be added with a click. A combine collection tool allows

users to add a group of equipment to the map. For example, Tianjin is able to combine the transformer substation and respective equipment as a whole, saving time.

Underground properties are now managed with pipeline tracking that includes materials, diameters, or other conditions. The feeder line management tool enables Tianjin to monitor and automatically maintain the power network connection status.

The application of this system provides

With GIS tools, Tianjin is now able to efficiently maintain the power network data and ensure data accuracy.



Tianjin is the sixth-largest city in China in terms of urban population.

Tianjin Power with better data management and a more accurate database, improves the management and maintenance of the power network, and reduces the expense and workload of many departments. Additionally, the system helps improve Tianjin Power's workflow. With GIS, the utility is able to satisfy its business needs and monitor the accuracy and timeliness of data entry.

A promotional banner for the ESRI International User Conference. The background features a stylized map of the world with a color gradient from blue to green. The text is arranged in a clean, modern layout.

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Monitoring a Virtual Hazard

Pipeline Crews Train for Work Environment in 3D GIS

By Matthew DeMeritt, ESRI writer

What does a business do when faced with a very short construction season in a remote, environmentally sensitive location? BP Exploration Alaska (BPXA) addressed this problem with what it calls a virtual hazard monitoring (VHM) tool. VHM uses GIS technology to accurately simulate the environmental and logistical constraints of remote projects. Being able to visualize and “walk through” a work environment before arriving on-site allows crews to gain situational awareness of a project and its constraints, thereby minimizing potential for accidents. The VHM tool also provides planning and construction capability to identify and mitigate potential problems in a virtual world before construction even begins.

The specific work environment that inspired the development of the tool is the Alaska North Slope. Pipeline construction activities occur on ice roads during the winter months to avoid impacts to the sensitive tundra ecosystem. Winter construction helps protect the fragile arctic habitat but results in other challenges such as working in subzero temperatures and perpetual dusk or darkness. Because improvements need to be completed during the compressed winter construction season, construction often occurs simultaneously with ongoing field operation activities. A simple mistake that shuts down operations for even a few hours can have significant operational consequences and potentially adverse environmental impacts.

The inherent risks of working above the Arctic Circle required a forward-thinking solution to maximize worker safety and minimize impacts to operations. In 2007, BPXA teamed with engineering consultant and ESRI business partner HDR to create a “business process rehearsal tool” to visualize potential simultaneous operations and construction-related risks. The goal of developing the VHM tool was to build an application that would depict existing North Slope facilities, along with planned project-specific design detail, in a 3D format. BPXA’s vision was to create a virtual 3D environment in which workers and managers could freely navigate through the planned construction site and identify hazards that might be



View of proposed pipeline shows vertical support members, construction equipment, ice road, and buildings in background. All features shown are true GIS features, either displayed with 3D symbols or multipatch shapes.

encountered during construction activities.

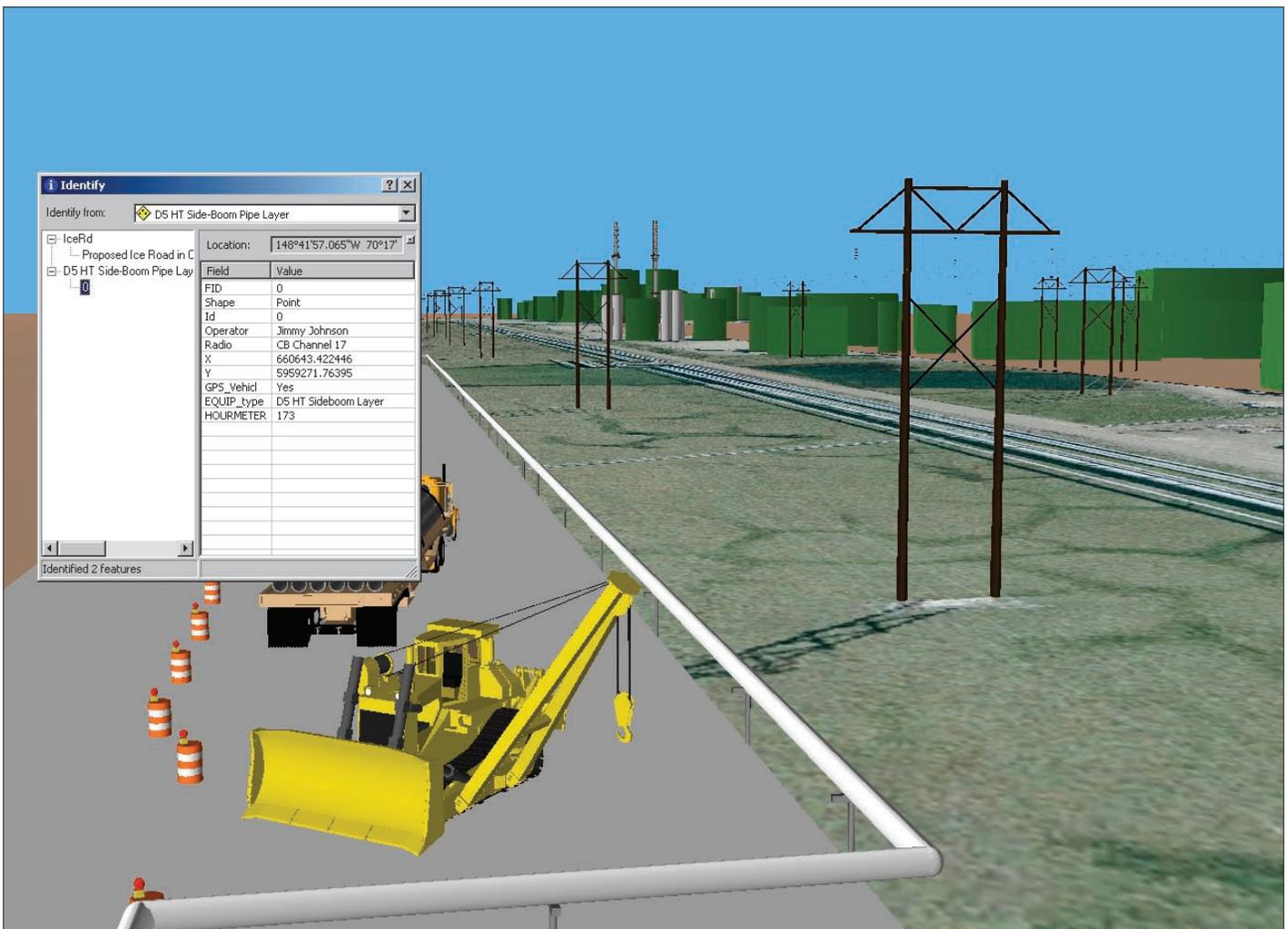
HDR built the first version of VHM in Google Earth. Although the prototype application convinced managers that they were on the right track, the lack of precision topography and metadata in Google Earth meant the tool didn't meet several significant goals that management had set for the tool. In particular, Google Earth lacked the ability to easily integrate much of BPXA's existing GIS data with the design information in CAD—one of the main advantages of a true GIS. Full GIS capability was deemed critical for the effort to be considered successful. The Google Earth prototype was invaluable in demonstrating the basic look and feel of a 3D tool, but to meet

project goals, the project team needed to create a second, more robust prototype with ArcGIS.

HDR used ArcGIS Server to deploy globe services, providing a 3D view of the environment that could then be used by ArcGIS Explorer. At the start of the project, the prototype was given a 50 percent chance of success by BPXA and HDR, considering the aggressive development schedule of two and a half months, data constraints, and untested state of the technology. To meet the project schedule, the team started data preparation while gathering business requirements and building functional specifications for the prototype. The data to support the project included high-resolution orthophotography; construction

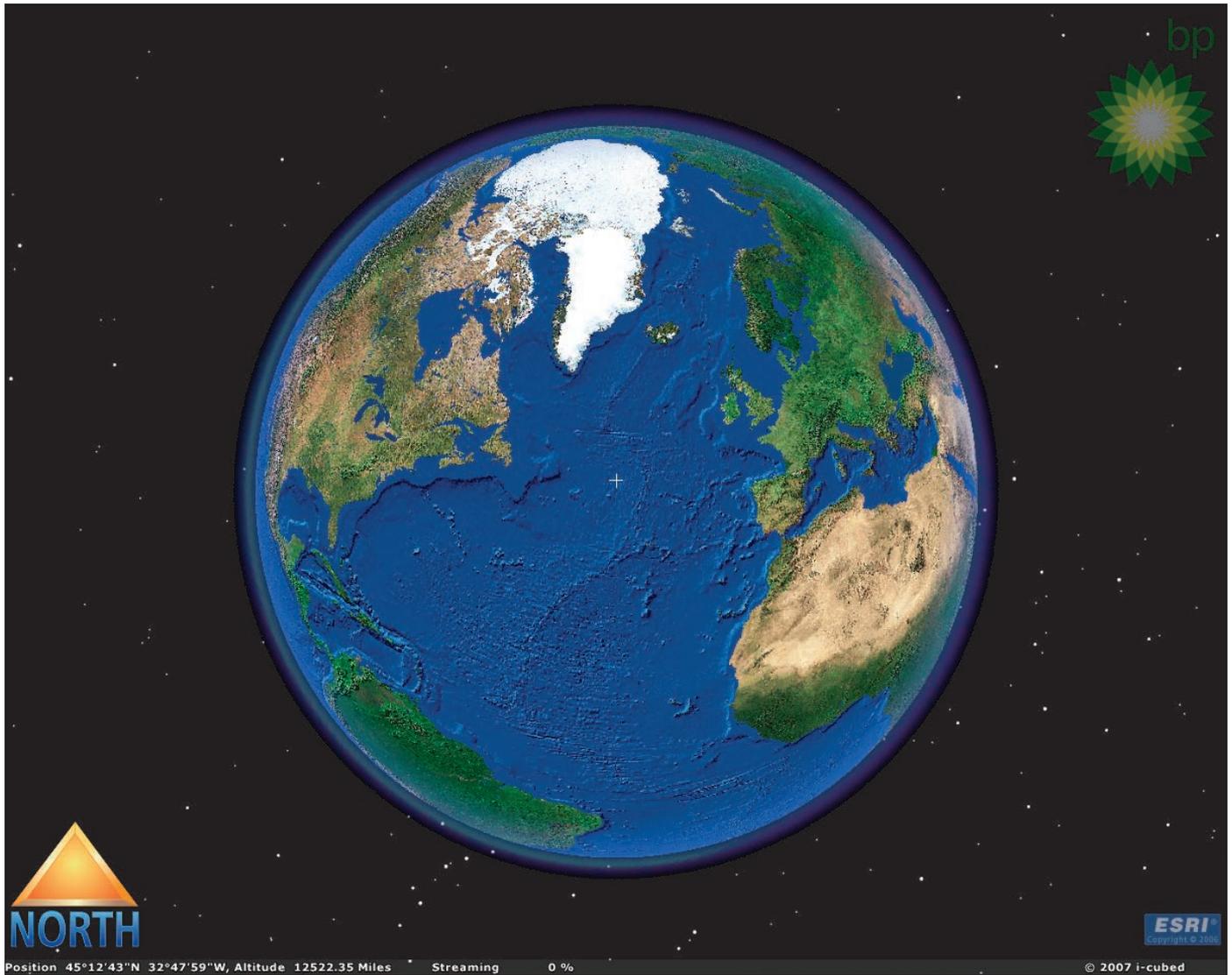
designs migrated from CAD to GIS; and existing GIS datasets for pipelines, electric power facilities, and buildings. BPXA also had recent lidar data, which provided elevations for structures (most of the existing footprints and GIS data were in 2D). Other known elevation data was embedded in the pipeline CAD designs, and in some cases, typical sections and design standards were used to generate the required elevations for the rest of the features. The resultant GIS data was an accurate depiction of BPXA's elevated pipeline infrastructure, its power transmission and distribution network, and the site-specific on-slope buildings, all of which were in 3D.

continued on page 22



Attributes displayed are associated with equipment to demonstrate GIS capabilities.

Monitoring a Virtual Hazard



The custom skin and home server were developed in ArcGIS Explorer.

Many of the decisions that were made as to how to depict 3D features were based on maximizing performance of the application. To meet functional specifications, custom tasks were built to enhance the ArcGIS Explorer out-of-the-box toolset. These custom tasks were able to be deployed from ArcGIS Server to ArcGIS Explorer without the need for customized installations of ArcGIS Explorer.

At project close, a findings document was produced. The key points addressed were as follows:

- The technology has advanced to a stage where ArcGIS Server is robust enough to serve real-time GIS 3D data in a Web environment.

- ArcGIS Explorer is a viable client for display and use of globe services.
- This technology is viable not only as a training tool but also for a variety of situations where an enhanced view of the environment (beyond standard 2D mapping or design) is required to support business processes.
- As BPXA goes forward with other parallel initiatives, such as enterprise GIS, the ability to build 3D GIS environments will be part of overall design considerations (i.e., GIS technology is being adopted as part of BPXA's overall corporate environment).

VHM was delivered on time to BPXA and

met all business and project objectives. Upon completion, Steve Gerlek, pipeline renewal program delivery manager for BPXA, commented, "I am convinced I just glimpsed the future, and it is closer than I had believed."

For more information, contact Steve Gerlek, BPXA pipeline renewal program delivery manager (e-mail: Steve.Gerlek@BPXA.com), or HDR VHM codeveloper Rick Lovel or Diane Holloran (e-mail: rick.lovel@hdrinc.com or diane.holloran@hdrinc.com).

New Mexico Gas Company Starts from Scratch

AMIGO. Information on things such as construction orders, asset data, leak reports, and repairs was pulled into the GIS by linking each piece to relevant points, lines, and polygons.

“We looked at what we had, and we knew we could tie in the AMIGO data with attributes in GIS to improve data accuracy in the database,” Winner said.

To enhance the geodatabase, New Mexico Gas Company brought in aerial photography, county street data, parcel data, and available environmental data. The utility built specific task assistant procedures for both mapping and design of distribution pipelines and other assets.

With GIS-based utility maps, the operations staff is able to view county assessor and parcel

data, along with topography, aerial images, and customer information, and can see how that data relates to the company’s transmission lines.

Field crews use Global Positioning System (GPS) data to track facilities and update asset information. Because all the data is geospatially enabled, the utility can quickly create work orders for new construction and maintenance. Using GIS-based spatial analysis, the company performs least-cost analysis to site potential pipeline corridors. These routes can also be imported into the utility’s hydraulic modeling software, ensuring accurate and timely model runs.

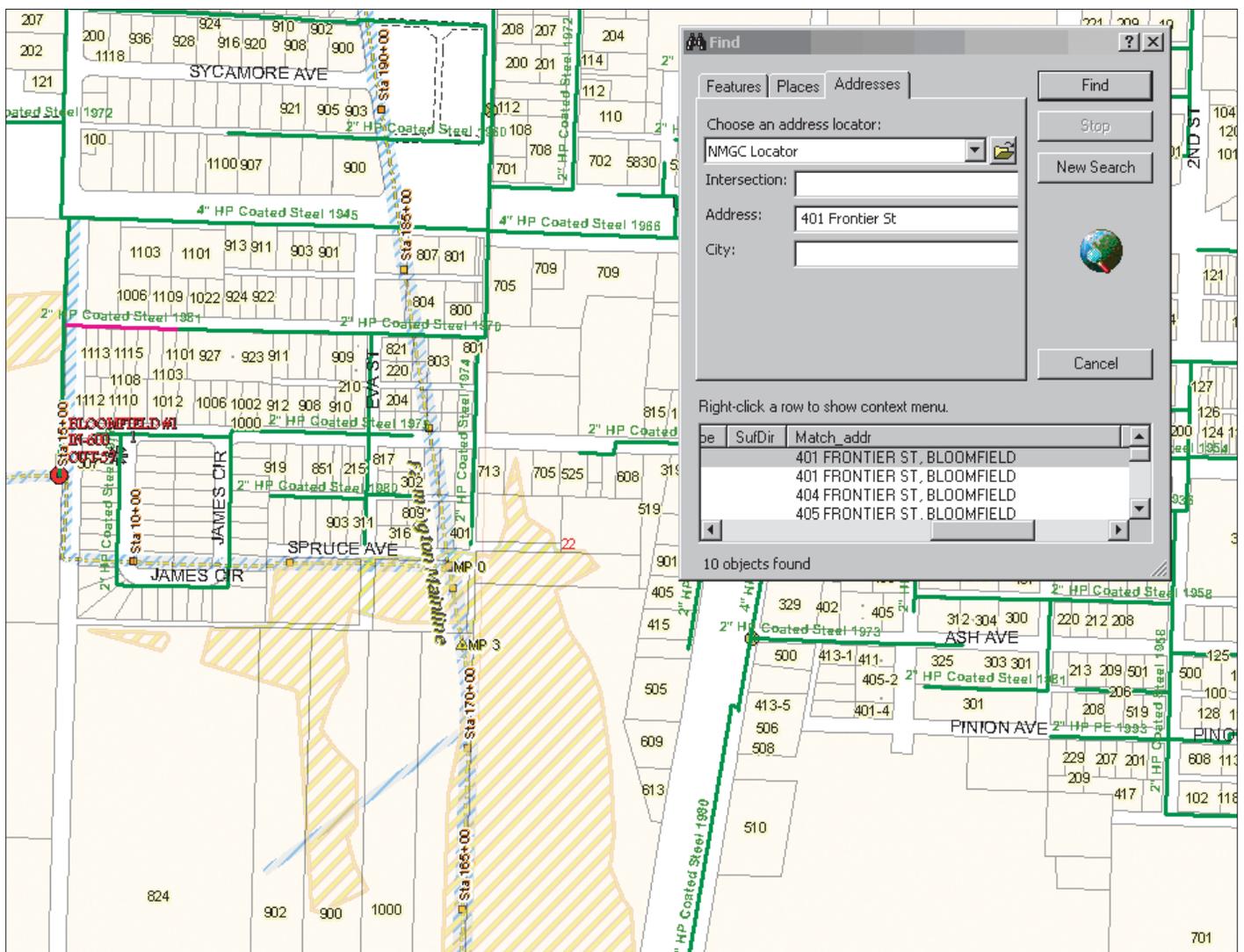
“Potential routes can be identified quickly, and we know the exact length for generating accurate cost estimates,” Winner said. “We

have taken a lot of the what-ifs out of the equation and can quantify our recommendations.”

New Mexico Gas Company also uses GIS for environmental planning and permitting. The staff can view assets relative to groundwater discharge zones and other environmentally sensitive areas such as cultural sites and threatened and endangered species habitats.

“The GIS system is running smoothly and being used company-wide. Without the support of ESRI’s staff to guide us through the process, this would not have been possible,” said Deborah McDonald, GIS administrator, New Mexico Gas Company.

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



By building a combined address locator of street data and parcels, New Mexico Gas Company is able to quickly locate areas of interest.



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