Esri News
for Electric & Gas Utilities
Fall 2012

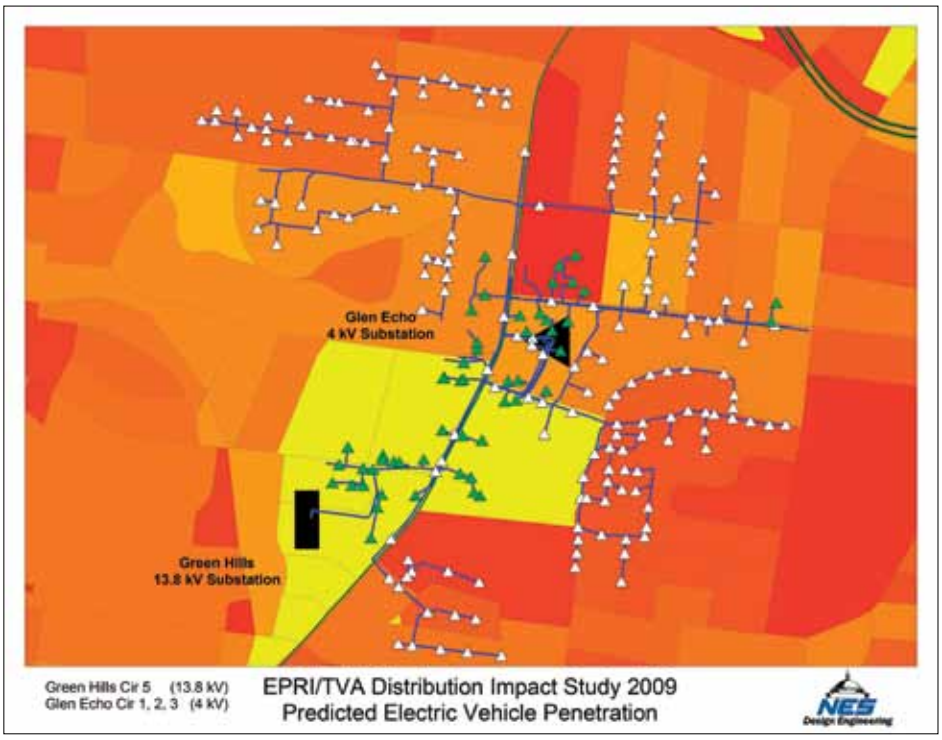
Keeping the Electric Vehicle Alive

How Nashville Electric Service Prepared for Spikes in Demand

By Jessica Wyland, Esri Writer

In the 2006 cult-classic documentary film *Who Killed the Electric Car?,* consumers, yearning for a petroleum alternative, mourn the loss of the General Motors EV1. The plug-in vehicle lived a brief and controversial life during the 1990s in the United States. Upon the demise of EV1, electric vehicle (EV) proponents wanted someone to blame. EV1's final post-mortem diagnosis in the film was determined to be "death by a thousand cuts." The alleged perpetrators included the government, the automaker, and oil companies. Inadequate batteries, lack of consumer interest, and insufficient electric utility infrastructure were cited as contributing factors.

Fast-forward to 2012 as Nissan deploys 300 of its fully electric, no-emission cars, the Leaf, to a launch market in Nashville, Tennessee. In an act of foresight, and perhaps to help ward off another electric vehicle death, Nashville Electric Service (NES) in central Tennessee steadied itself for an anticipated rise in consumer demand for electricity as more people bought the Leaf and took it home to charge.



↑ A circuit of the NES system shows both residential and commercial loads in an area considered to be regions with high affinity for electric vehicles and impact to the network. The yellow census blocks make up the Green Hills mall area.

↑ Keith Brown charges one of the NES electric vehicles in a parking lot near Vanderbilt University.

If the utility infrastructure is not ready to meet increased electricity use, customers could experience power outages. Keith Brown, principal associate engineer for the NES Design Engineering, Distribution Planning Group, and NES senior engineer Carla Nelson compiled and analyzed a complex collection of data; they then used Esri ArcGIS technology to create predicted electric vehicle adoption maps. These maps show clusters where Leaf drivers are predicted to live within the utility service area.

"Electric vehicle deployment is brand-new, and like a lot of other utilities, we are still figuring out how this will impact our infrastructure

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Esri UC Wrap-up

By Jessica Wyland, Esri Writer

Utility professionals attending the 2012 Esri International User Conference (Esri UC) held July 23–27 in San Diego, California, were treated to sessions on innovative uses of GIS, operational awareness, alternative energy, and more. They had a custom Plenary Session where Bill Meehan, Esri's director of utility solutions, shared a vision: utilities maximize geospatial resources to predict problems, perform location analytics, manage workflows, and understand customer needs.

"GIS helps your utility go from 'We hope so' to 'We know so,'" Meehan told a crowd of nearly 200 at the electric and gas Plenary Session. The audience was then treated to real-world demonstrations of Esri's latest technology, including ArcGIS Online, which enables utilities to share data and collaborate and to provide access to ArcGIS from any device.

The week held other highlights for utility professionals: an Electric and Gas User Group (EGUG) meeting, an EGUG Social, and a Smart Grid Modeling Workshop.

The edification and fun continue this fall with the Esri Electric and Gas GIS Conference, October 7–10, 2012, in Salt Lake City, Utah. Visit esri.com/electric-gas.

And the Winner Is . . .

Esri recognized more than 170 organizations during the Special Achievement in GIS (SAG) Awards ceremony at the annual Esri UC. The SAG Awards acknowledge innovative and intelligent applications of GIS technology.

"Each year, the SAG Awards highlight extraordinary achievements and efforts to improve our world," said Esri president Jack Dangermond. "At Esri, we are always deeply impressed with the work of our users. This recognition is well deserved for how they've applied geospatial technology to address the needs of their industries and communities. They are defining GIS best practices."

Organizations from around the world honored at the Esri UC span industries including agriculture, cartography, climate change, defense and intelligence, economic development, education, government, health and human services, telecommunications, and utilities.

The SAG Awards ceremony was held at the San Diego Convention Center on July 25, 2012. For more information about the 2012 Special Achievement in GIS Award winners, including project information and photos, visit esri.com/sag.

SAG Award Winners from the Utility Industry

ENEL Green Power, Italy
National Grid Gas Distribution Transformation, United Kingdom
Provincial Electricity Authority, Thailand
Union Power Cooperative, North Carolina, USA
Grupo Neoenergia, Brazil
Wien Energie Gasnetz GmbH, Austria

Save the Date

The next Esri UC will be July 8–12, 2013.

Shine On

Utility Saves Money by Mapping Street and Security Lights

By Josh Snoddy, GIS Coordinator, Holy Cross Energy

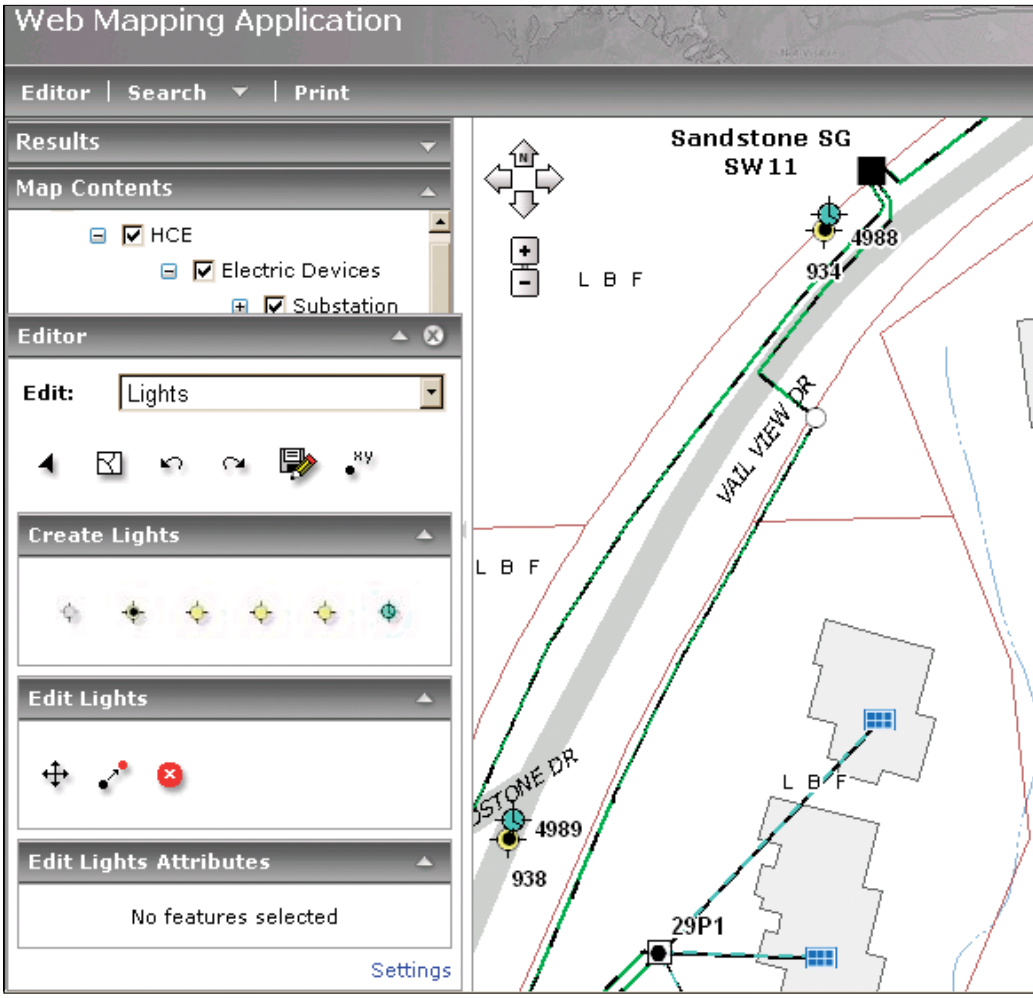
Holy Cross Energy, an electric cooperative in western Colorado, recently updated and corrected its billing system for the cost of street and security lighting—a move that is saving the utility and some of its customers hundreds of dollars per month. Holy Cross Energy staff digitally mapped security lights and streetlights within its service area using GPS, aerial photographs, and a custom web mapping application powered by Esri's ArcGIS technology.

A member-owned cooperative founded in 1939, Holy Cross Energy serves more than 55,000 meters in communities such as Vail, Aspen, and Beaver Creek.

The security and streetlight project got under way in May 2010 after Holy Cross Energy staff determined that the utility's maps needed to be updated with the exact locations of street and security lights. Staff started with various levels of information in its billing system and incorrect or missing map information.

First, the utility sent crews into the field to collect the exact GPS location for each streetlight. In the past, the locations of street and security lights were created without GPS points. Some streetlight locations were created in previous CAD programs. In other cases, the location of a streetlight was entered into the GIS based on proximity to the billing address on file. Some security lights in rural areas, such as county roads, were not shown at all.

Meter supervisor Tonya Warmenhoven started the security and streetlight project by going into the field with a laptop that was loaded with software, including a custom map, from Esri and Esri partner Futura. During her on-site evaluation, she was able to find lights according to GPS location and mark the locations on paper maps. Later in the project, the utility's GIS team created a web application that made paper maps unnecessary. Some regions of the project area did not rely on GPS points because the aerial images provided enough detail. In those cases, Warmenhoven e-mailed the GIS analyst marked-up screen shots of areas. The GIS analyst, in turn, placed points into ArcGIS according to the sketch.



↑ Holy Cross Energy's mapping application shows where lights were added in an area.

As the project progressed, Holy Cross graduated to using ArcGIS for Server with a custom web editing application. Warmenhoven could then enter all the data herself, eliminating the steps of marking paper maps and e-mailing updates to the GIS analyst. Using the web editing application, Warmenhoven could only edit the light features, ensuring that she did not inadvertently update other features. She was pleased to have editing control with a next-day turnaround of the data for everyone in the company.

Meter supervisors can now update the GIS and complete their work faster, as the updates do not have to be made by the GIS analyst. In an upgrade to the initial project process, Holy Cross has eliminated the process of marking up paper maps and sending them to the GIS analyst. All edits can be made through the web application hosted at the company's main office in Glenwood Springs. This only requires access to a web browser at the satellite office where Warmenhoven works. The new process saves Holy Cross four labor hours each week.

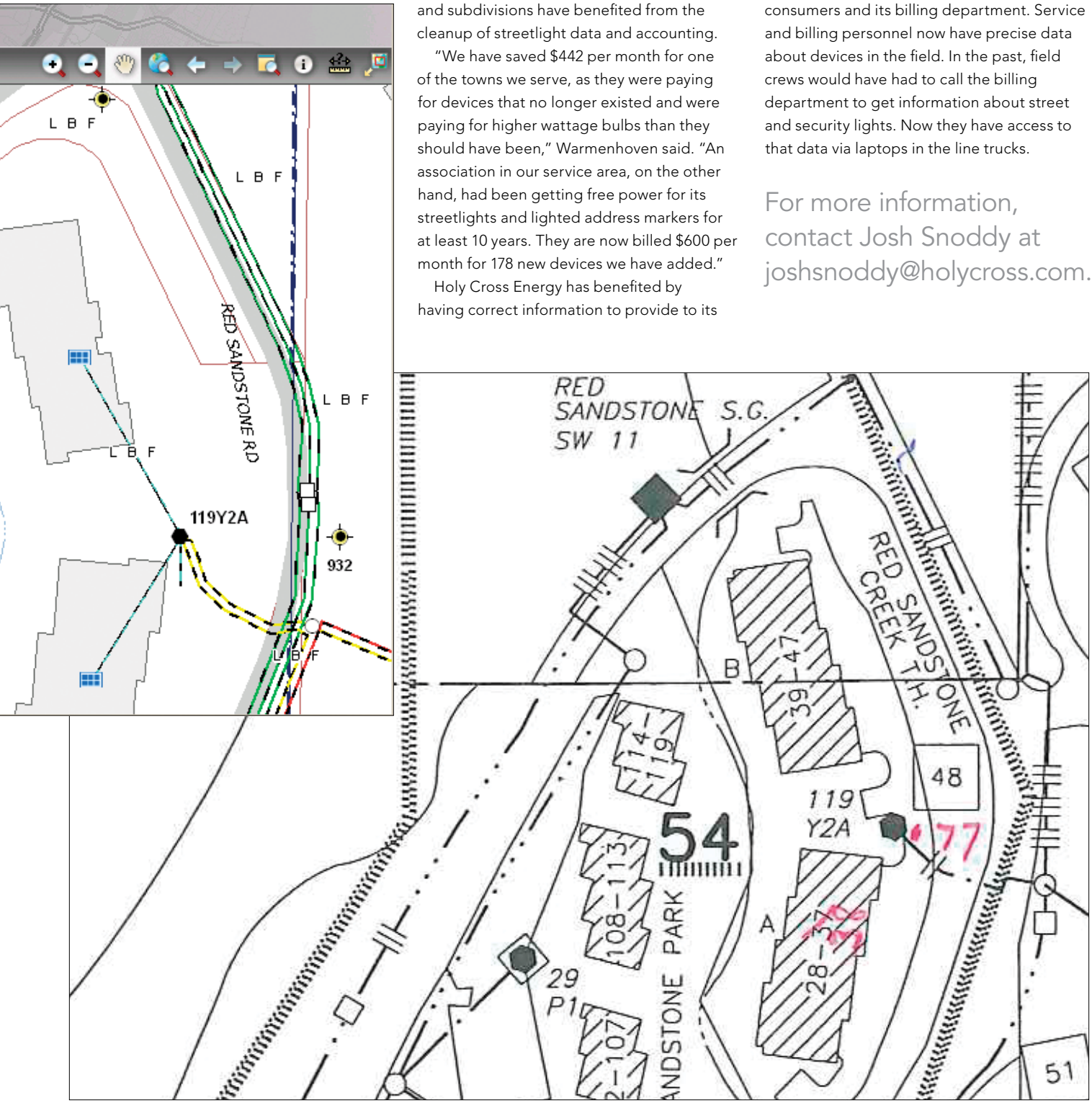
The updated information has helped improve accuracy in the utility's billing system by ensuring that all street and security lights are properly accounted for and billed. Throughout the utility's service area, towns

and subdivisions have benefited from the cleanup of streetlight data and accounting.

"We have saved $442 per month for one of the towns we serve, as they were paying for devices that no longer existed and were paying for higher wattage bulbs than they should have been," Warmenhoven said. "An association in our service area, on the other hand, had been getting free power for its streetlights and lighted address markers for at least 10 years. They are now billed $600 per month for 178 new devices we have added."

Holy Cross Energy has benefited by having correct information to provide to its consumers and its billing department. Service and billing personnel now have precise data about devices in the field. In the past, field crews would have had to call the billing department to get information about street and security lights. Now they have access to that data via laptops in the line trucks.

For more information, contact Josh Snoddy at joshsnoddy@holycross.com.



↑ One of the utility's old paper maps shows the same area, with streetlights noticeably missing.

iPhone Application Integrates SCADA and GIS for German Utility

Known for medieval castles, snowcapped mountains, and world-famous beer gardens, the southeastern German state of Bavaria aims to blend traditional with modern. Home to Munich, Bavaria is the largest German state by area and its second most populous, with more than 12 million inhabitants and a steady stream of tourists.

Electric power is provided to part of this popular and well-populated region by Lechwerke, a Germany-based electric utility company. Lechwerke distributes electricity through low-, medium-, and high-voltage grids; generates electricity through 35 hydroelectric power stations; and is engaged in electricity trading, electricity and gas sales, and energy efficiency services.

Management at Lechwerke ensures reliable service by using an iPhone application to check out-of-service stations and the number of affected customers. The application is made possible by excellent data quality, a well-defined and stable data model, and a tight integration of GIS and the company's supervisory control and data acquisition (SCADA) information system.

The GIS department of Lechwerke has ambitious visions and a focused long-term plan that emphasizes data quality and system integration. Lechwerke's overhead lines are more vulnerable to natural hazards, such as strong storms or freezing rain, that have the potential to result in blackouts for customers. In these types of crisis situations, Lechwerke management works to curtail the impact on customers by minimizing the outage duration and the number of customers affected through technology innovation.

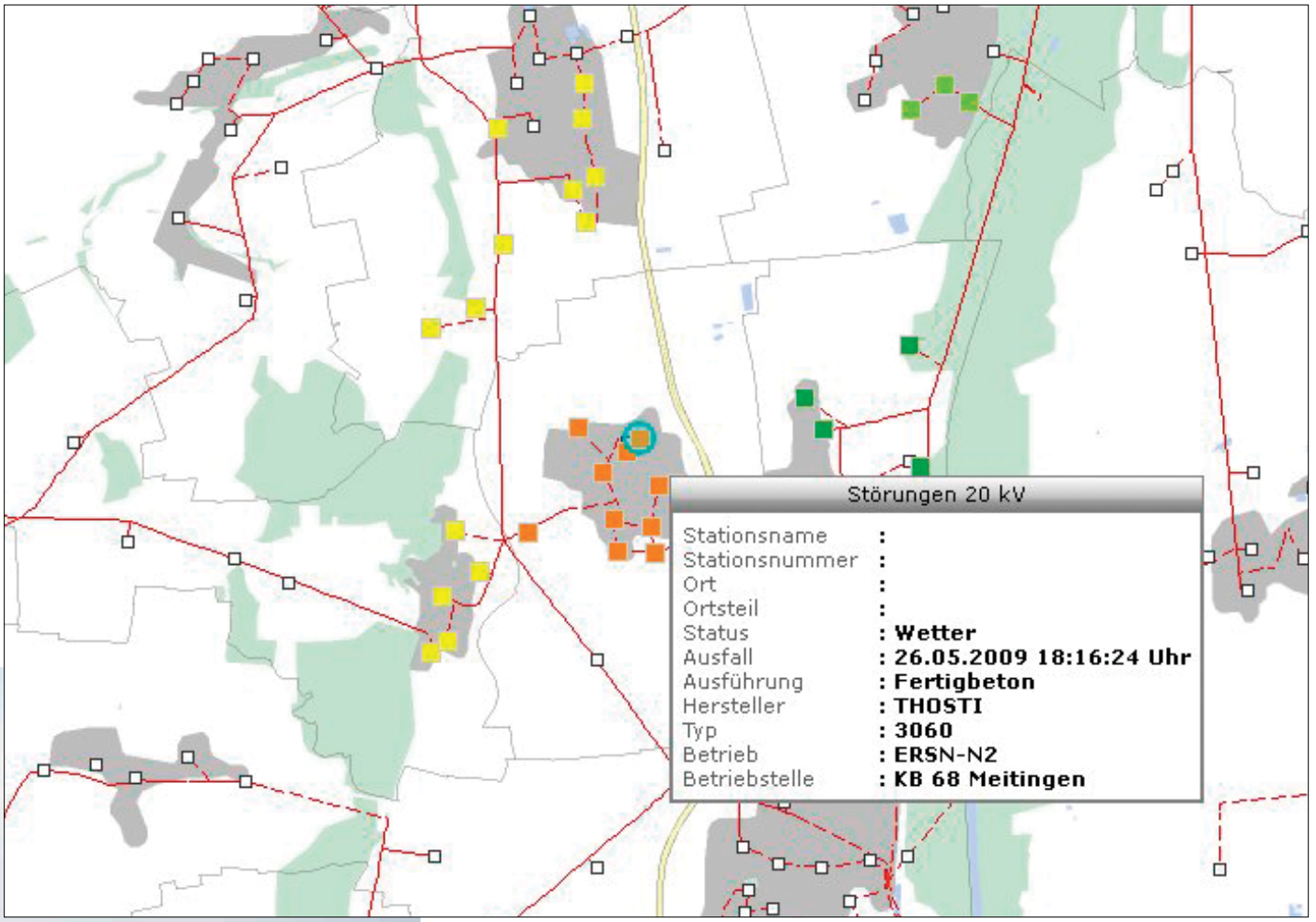
Traditionally, management would request information about the degree of the crisis in the SCADA control center—the only place where all information came together. But control center staff in a crisis situation are extremely busy attending to calls from the field and working to restore electricity to customers.

Staff in the GIS department decided it would be prudent to take the information provided by SCADA and display it directly on a map based on ArcGIS and accessible via the iPhone application. For its documentation, the company uses the ArcFM UT product line, a solution developed by Esri partner AED-SICAD (Bonn, Germany) using ArcGIS technology. Whenever there is a change in the network, the change is propagated from the GIS to the SCADA as a full update. Updates take roughly 40 minutes. A visual control is done before the change goes live.

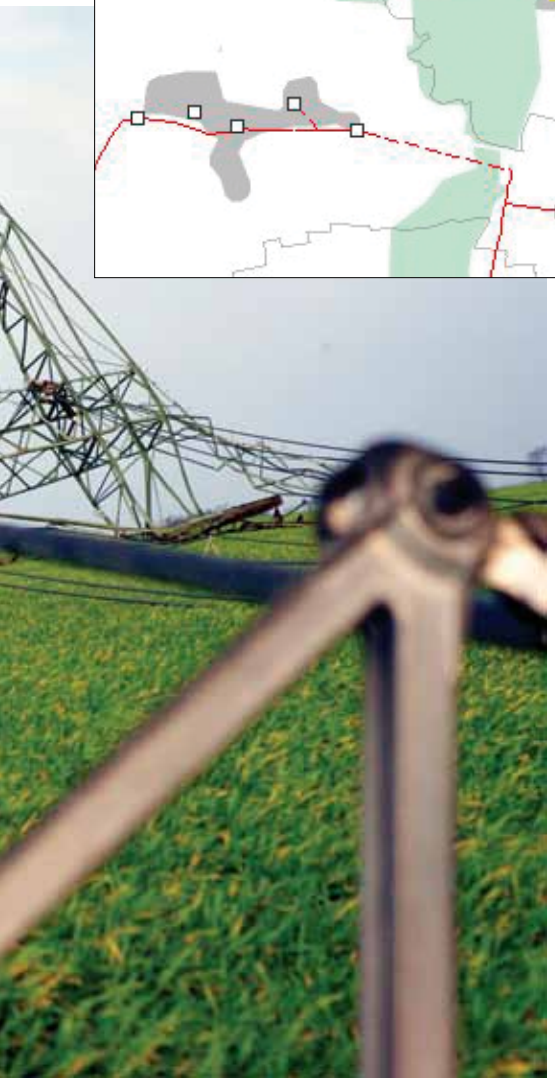
This process brought several key advantages. Data need be entered in only one system. Errors in the old schema plan of the control center were detected. And all assets have the same unique ID in the GIS and the SCADA.

Since the stations in the SCADA and the GIS "know" each other, it was not a big step to use the SCADA's robust ASCII interface to send an ASCII file containing status messages from the SCADA to the GIS every three minutes. Via SQL, this list was filtered and aggregated to obtain one SQL record containing only key information per outage. This record is then written to an Esri feature class and displayed in a small application.

Through a visual web interface, the end user (in a crisis situation, this would be the company CEO) can select a certain theme, such as outages, and receive an overview of the distribution area. All out-of-service stations are displayed in colors ranging from green to red, depending on the percentage of the affected district or city. Key attribute information is also



↑ This network map includes station details.



available from the map view.

This web solution was implemented by an AED-SICAD subsidiary and Esri partner BARAL Geohaus-Consulting AG (Reutlingen, Germany). It used ArcGIS for Server together with the brand-new ArcFM UT Server V10 JavaScript client, caching all basemap data and only providing out-of-service stations and the geoschematic layer as dynamic layers. Basemap data is displayed instantaneously, and the dynamic layers are visible after an approximate five-second delay.

"If you want to bring new apps to your end users, they must be better than the old ones," says Martin Thoma, GIS manager at Lechwerke. "Here, we have brought completely new information content paired with greatly improved performance through the latest ArcGIS technology. Thus, we could achieve end-user acceptance of this new technology."

Thoma is convinced that SCADA and GIS will continue to grow together in the near future. He sees this type of integration as the productive basis for implementing lightweight and rapidly developed web interfaces, which bring users exactly the content and functionality they need for a certain task. But Thoma stresses the fact that the fundamentals must be there: the good, stable, and well-known UT data model; excellent data quality; and the combined know-how of IT and utility business processes.

For more information, contact Martin Thoma, Lechwerke (e-mail: martin.thoma@lew.de), or Peter Grüninger, BARAL Geohaus-Consulting AG (e-mail: peter.grueninger@baral-geohaus.de).

Dakota Electric: One Visionary Rural Electric Utility

By Len Jewell, Senior Consultant, POWER Engineers (formerly technical systems manager, Dakota Electric Association)

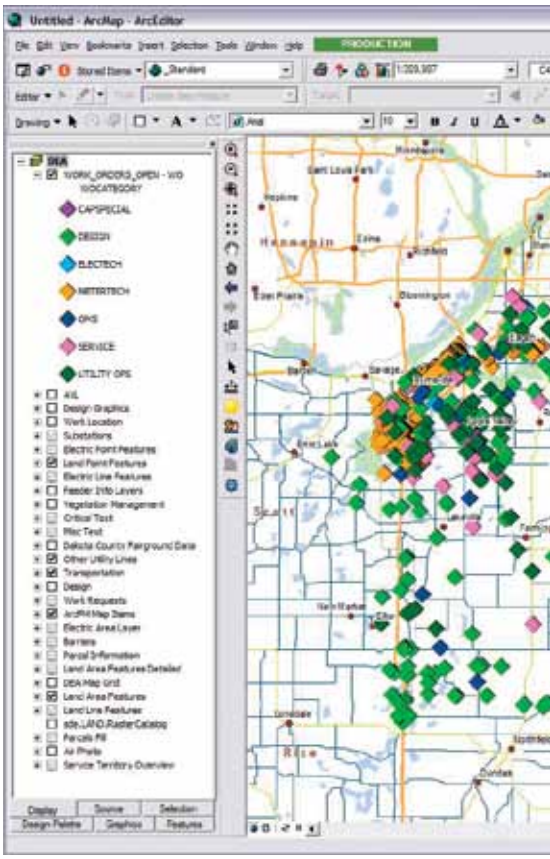
Like most utilities, Dakota Electric Association has made a significant investment in its GIS and needed to determine whether the utility was getting all it could from the system. To assist in this determination, utility operators formulated the following yes-or-no questions:

- Can the users who are responsible for a particular piece of GIS data maintain it themselves? Can non-GIS users edit the data stored in the GIS?
- Is information exchanged automatically between systems? Is information only entered once and shared with the other systems?
- Have the Dakota Electric systems captured and documented the company's workflows and procedures? If key personnel were to retire tomorrow, would the work continue in the same manner and with the same high quality?
- Can everyone within the organization see where all work is currently occurring on a map? Can users access all the details about the work (estimated costs, actual costs, material, etc.) from the map in just a couple of mouse clicks?
- Does every field crew have access to all its construction documents (design drawings, material lists, permits, etc.) on mobile devices? Does each crew have access to all construction standards and standard operating procedures?
-

Dakota Electric was able to build an enterprise GIS that enabled it to answer "yes" to all the questions above.

Founded by farmers with the help of the Rural Electrification Administration (REA) in 1937, Dakota Electric is a member-owned, not-for-profit electric utility based in Farmington, Minnesota, serving over 100,000 members. In 2006, Dakota Electric began a project to replace its current GIS and outage management

↑ With access on mobile devices, field crews can view all construction documents and make changes to GIS attribute data (i.e., asset size, type, manufacture information); the changes automatically update the GIS.



systems (OMS). The purpose of the project was to improve member service by increasing work force efficiency through the effective use and integration of new GIS technology. As a third-generation GIS user, Dakota Electric knew that maps were the most natural way for everyone to view, interact with, and manage distributed assets and that an enterprise-wide GIS was essential for future success.

Early in the planning stages of the project, Dakota Electric identified the following seven tenets that established the vision for the project:

- Those who know the most about the data should be able to maintain it directly.
- Everyone in the organization should have access to all data from the operations systems (only access to the most sensitive data would be restricted).
- The GIS should reflect the state of all

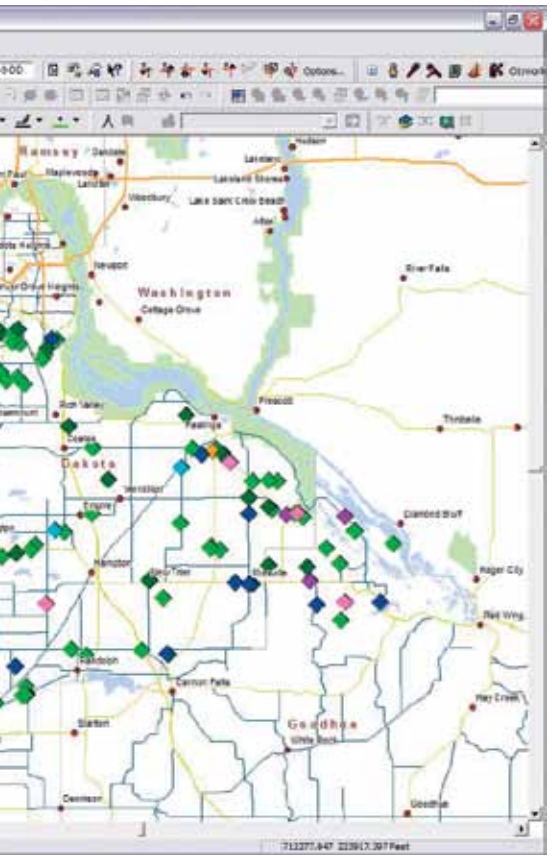
assets and the electric distribution network accurately in as near real time as possible (i.e., changes in the field should be reflected in the GIS within minutes).

- All work done outside the main office must be done via a single GIS-based work management system (WMS).
- Information should only be entered once into the system at a stage that makes the most sense given the workflow. Once entered, the information should automatically be shared instantaneously with the other systems.
- Work processes should be adapted to match the out-of-the-box functionality of the systems provided, which should be customized only when justified.
- Switching orders must be created and executed using the OMS, and the orders must reflect all steps necessary for safe operations.

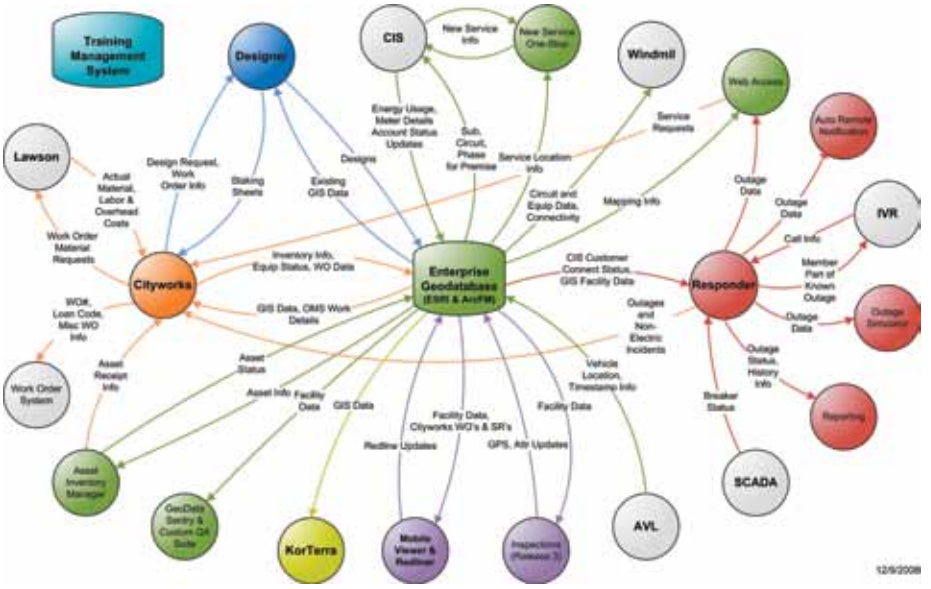
Moving Forward

With a vision in place, Dakota Electric began searching for software that could be used to make it a reality. Esri was quickly identified as the ideal enterprise GIS due to its wide acceptance in the utility industry, extensibility, and third-party support. Telvent's ArcFM was selected to augment the base Esri functionality. Telvent's Designer (capital improvement design software) and Responder OMS software were also selected to minimize integration costs among the systems. During the selection process, Dakota Electric realized that an overall WMS would be required to achieve its vision, so the GIS-centric Cityworks by Azteca Systems was chosen.

While having a vision and identifying key software systems represented a good start, these steps simply were not enough to get the backing of senior management. What was needed was a plan that was detailed enough so all involved would be confident the project could succeed, but not so detailed that the project would get stalled in planning. To help create this Go Forward plan, Dakota Electric partnered with POWER Engineers, and together they were able to complete the plan in a few weeks and present it for approval. Senior management and the board of directors shared the vision of the project, and the Go Forward plan helped them commit to the path outlined and the necessary funding. This commitment was critical for the ultimate success of the project.



← The information about any work order on a typical day is easily displayed on a map, showing everyone in the organization where all work is currently occurring.



↑ The system integration plan shown in this diagram was key to successful information exchange between Dakota Electric's systems.

Go-Live

After three years of hard work, all the major systems were ready for production, and the users were ready for the new systems. The tenth (and final) data migration occurred over a weekend, and finally, in November 2009, all the systems went live at the same time.

While there were minor issues during the first week, Dakota Electric never went back to the old systems—but that didn't mean all the work was done. On the contrary, many lower-priority customizations still needed to be completed. In addition, as users began working with the new system, they identified additional enhancements that could improve their productivity (and they also found that some of the customizations they thought they needed were no longer required because they did their work differently with the tools available in the new systems). Three years after Go-Live, the last of the customizations are being completed, and the remaining workgroups who were not using the system are now coming online.

Lessons Learned

Just as no two utilities are alike, no two software projects are alike. However, there are often similarities that allow the lessons

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Dakota Electric: One Visionary Rural Electric Utility continued from page 9

learned from one project to be applied to another. The following are a few of the lessons Dakota Electric learned about this type of project:

Start workflow discussions early. It takes time to introduce everyone to the new technology and even more time to agree on how the current workflows should be altered to take full advantage of the capabilities of the new systems. Time and again, work was transferred from one group to another because it was more efficient. Some workgroups gained work, and others had less work. What was important was that, overall, the work was being accomplished in the most efficient manner for the entire utility—not just one group or department.

↑ Reports are accessible via a web browser, allowing users to drill down quickly to the information they need.

Avoid analysis paralysis. Don't try to come up with the perfect all-encompassing plan. These projects and systems are very large and complex, with many user interactions. Dakota Electric found it was much better to release software that met many of its needs than to wait for the complete system. Once the users tried the software, they were able to adjust to its functionality or recommend improvements.

Was It Worth It?

The change created by the project was revolutionary. Many problems that existed for decades were brought to the surface and resolved. While there were many improvements (and a few steps back), some of the most important changes included a vast improvement in the ease and efficiency of finding work information. Everything about any of the more than 10,000 work orders completed each year is simply several mouse clicks away. Additionally, the work management system captured the key elements of each workflow. Training new staff became much easier, and the overall quality of the work improved.

On June 19, 2012, at approximately 4:00 a.m., a major storm passed through Dakota Electric's service territory, knocking out power to 20 percent of the utility's customers. System Control was able to use the systems to assess the situation and develop a plan for restoration. When the crews arrived, System Control was ready to execute the plan and direct the work in an orderly and efficient fashion. Every two hours throughout the day, System Control briefed senior management on the current situation using the information provided by the systems. By 10:00 a.m., all but a few hundred customers had their power restored, and by midnight, all power was restored. What is truly incredible was that all this was accomplished electronically, without any paper. Using all the systems together as they were designed was the key to success.

"We never could have gotten everyone back on as quickly as we did with the old system," said John Thurmes, System Control manager, Dakota Electric. "Everything worked just like it was planned."

GIS is no longer a system that should reside in only one portion of a utility. Integrating GIS with all major business systems delivers a huge return on investment. While these types of projects are often difficult, the rewards are well worth the effort. People like to do good work and do it efficiently. The systems are out there to improve utilities, so all that's needed is a good plan to start moving forward.

For more details, see the full article at www.powereng.com/dakota.

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- Follow Esri's utility industry writer Jessica Wyland: @EnergyGIS.
- Follow Esri's director of utility solutions Bill Meehan: @bill_meehan.
- Join the EGUG LinkedIn group.

Esri Maps for Office Released

Business professionals can use the new Esri Maps for Office to visualize and analyze data directly within Microsoft Office. "By bringing the power of location analytics to Microsoft Office, Esri Maps for Office extends mapping and geographic intelligence capabilities to new people and departments," said Jack Dangermond, Esri president. Visit esri.com/software/esri-maps-for-office.

Keeping the Electric Vehicle Alive continued from cover

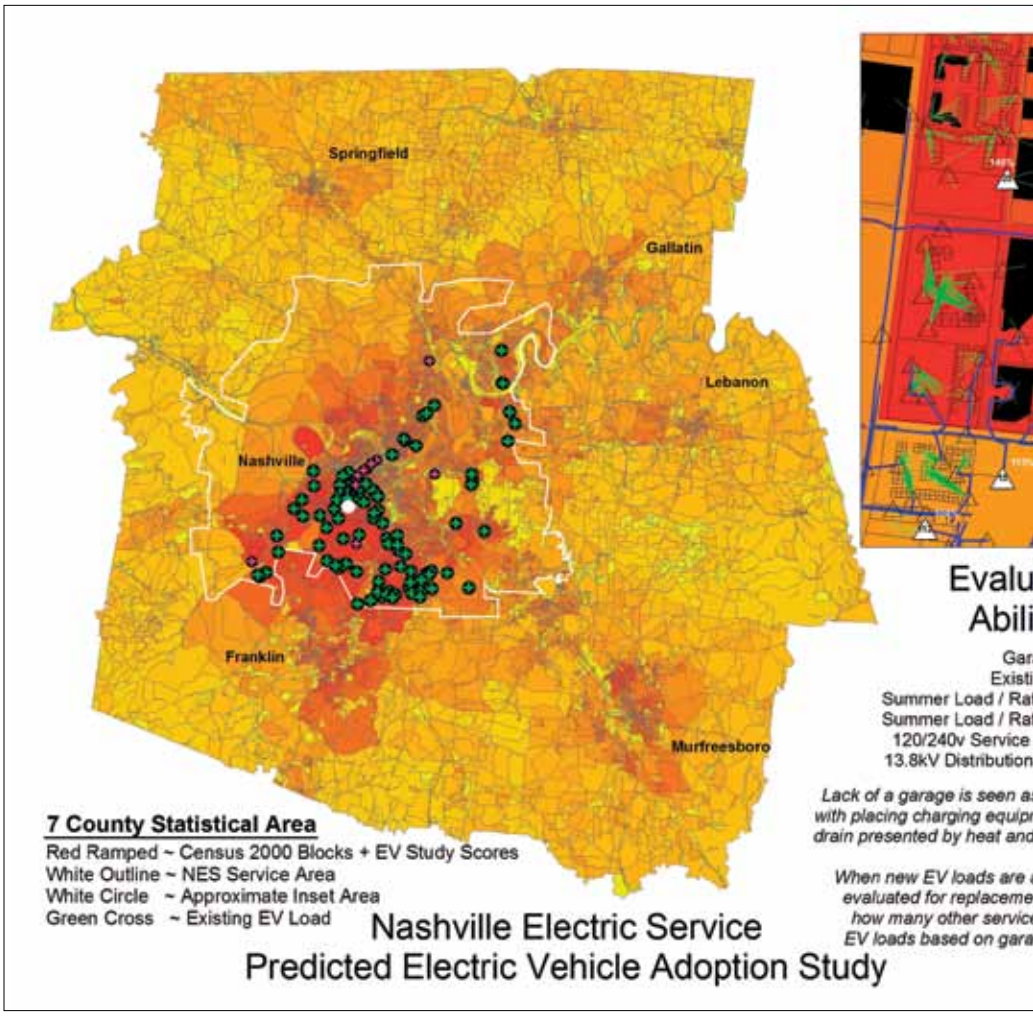
and the best way to prepare for it," said Brown.

Brown, Nelson, and the NES Distribution Planning Group work to ensure that the electric network has adequate capacity to meet customer demand.

"If people come home from work around four or five o'clock in the afternoon on a hot day, plug in their electric vehicles, and turn on their air conditioners, we have to build up the infrastructure to serve that load," Brown said.

Since it takes the Leaf eight hours to get a full charge, Brown figured most vehicle owners will plug in at home. NES needed to profile the people who would likely purchase an electric vehicle and then identify where they live. Brown and Nelson chose Esri ArcGIS technology to create the predicted electric vehicle adoption maps because NES has worked with Esri software for the past 15 years and has mapped all its electric facilities in ArcGIS. Naturally, the utility wanted to be able to relate the study data to the locations of its electric facilities.

The maps were designed and prepared in 2010, two years ahead of the Leaf's deployment, to help the utility prioritize maintenance projects, upgrade outdated equipment such as wires and transformers, and shore up facilities that would likely experience heightened demand.



↑ The map (left) shows the state of Tennessee with the NES service area outlined in white and existing electric vehicle load as green crosses on the predicted heat map. The inset (right) uses white triangles to indicate overloaded transformers.

Pinpointing EV Hot Spots

The NES team surmised that with a few small differences, EV buyers would closely resemble hybrid vehicle buyers.

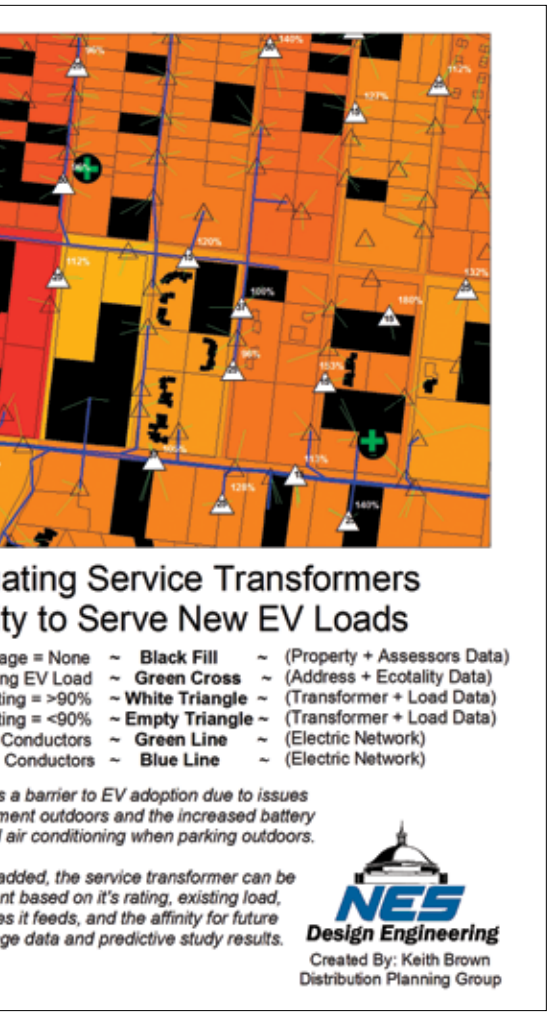
"We looked at existing marketing profiles for hybrid owners published by firms like J.D. Power and Associates and Scarborough Research," Brown said. "Among the many hard-to-measure characteristics, such as being twice as likely to ski, hike, or practice yoga, we found that owners who purchase hybrid vehicles tend to have attained higher levels of education and report higher household incomes."

According to a 2007 J.D. Power and Associates' survey, hybrid buyers are older than the average new vehicle buyer, with the most likely age group being 45 to 54. Hybrid buyers drive fewer miles on average and tend to be female. And, according to a 2007 Scarborough Research survey of 110,000 adults, hybrid buyers are more than twice as likely to report themselves as Democrats than Republicans.

Brown took this research information and compiled a list of factors. Most could be analyzed using raw US Census data that was not only free but also provided a fine-grained geography so that he could display the results in ArcGIS.

He then developed a set of formulas and custom functions using Microsoft Access and Excel to score the raw data in a way that showed which census blocks were more likely to be home to electric vehicle purchasers relative to other blocks. The factors Brown selected to support the study included age, gender, population density, education, household income, travel time to work, and political affiliation. Individual factors were scored separately from 1 to 100. The factors were then added to give a sum score that was also reduced to be between 1 and 100. The study's design allowed the various factors to be weighted. For example, if the age factor was considered more important than education, it could carry more weight in the sum score. To incorporate analysis of political party affiliation, Brown and his team obtained shapefiles of the voting precincts and downloaded freely available state and federal election results data for the last 10 years.

"I wanted to keep all maps and scoring on a census block level," Brown said. "I used the spatial analysis Identify tool in ArcGIS to overlay census blocks with voting precincts and



transferred the scoring for voting precincts to each of the area's 20,000 census blocks for the seven-county region that we serve."

Putting EVs on the Map

The finished scores were placed in a Microsoft Access database file, added to ArcGIS, and linked to the census block shapefile via a join, providing the shapefile with score values. Those values were used to symbolize the census blocks in 32 shades of red, displaying the scores in a heat map where deeper reds indicated census blocks most likely to have future EV buyers.

The raw census data was stored in a Microsoft Access file and broken down by county. Analysis was completed within Microsoft Access and Excel for all seven counties served by NES, including the regions outside its service area.

The ArcGIS spatial analysis tools and the shapefiles for the NES service area were then used to carve out a new shapefile containing only the census blocks that NES serves. Brown said he specifically chose to work with ArcGIS because it allowed him to perform a spatial join between shapefiles of voting precincts and census blocks.

The first batch of maps identified census blocks with people who have a strong affinity for electric vehicles. However, some were large rural areas containing only a few people. Since that would amount to very low impact on the electric system, Brown used ArcGIS to produce an impact map where each census block's summary score was multiplied by its population density score. The impact map more accurately predicts areas of actual electric network load growth due to clusters of electric vehicle adoption.

Brown reasoned that residents of homes without a garage would be less likely to adopt an EV because they would have a problem determining where to place an electric vehicle charger. So he added another map feature to specify whether homes had a garage. He joined data from the assessor of property to the property parcels shapefile and symbolized parcels without a garage as black and parcels with a garage as clear.

"It makes a pretty map," Brown said. "We'll see how predictive it really is."

Once the predicted electric vehicle adoption maps were ready, Brown and his team circulated PDFs and printed copies throughout NES to help all departments understand where demand would likely spike and which areas of the electric network might need to be more closely maintained and updated.

"Since two of the study's driving factors were education and household income, which, not too surprisingly, aligned pretty closely with each other, the more affluent areas like Brentwood and Green Hills showed higher predicted [EV adoption] rates," Brown said. "When we added the political component, based on the Scarborough Research survey, it strengthened the prediction for neighborhoods a little farther north into the Hillsboro Village area."

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What Are People Saying about Electric Vehicles?

"I think it's a gamble not to do."
William Ford, Jr., Executive Chairman, Ford Motor Company

"We would like people to get a $7,500 tax credit on the day they buy the Leaf."
Ray LaHood, Secretary, US Department of Transportation

"It is estimated that the automotive industry is responsible for roughly 15 percent of global carbon emissions."
Adopting Electric Vehicles: The Role of Technology and Investment, a Report from PriceWaterhouseCoopers

"If there is one thing an electric vehicle supporter and opponent can agree on, it's that battery-electric cars aren't the most versatile driving solutions."
Motor Trend Blog, May 2011

Keeping the Electric Vehicle Alive continued from page 13

Customer Needs

NES partnered with the Tennessee Valley Authority (TVA) and the Electric Power Research Institute (EPRI) on a separate study. The study determined which portions of the utility infrastructure are at greatest risk for early impacts, such as localized power outages and overloaded equipment, due to electric vehicle adoption. The results showed that the impact will likely hit the individual service and distribution transformer level. Particular strain will fall on smaller transformers, transformers serving many homes, and those that are already heavily loaded.

This is good news for NES, because transformers and service drops can be replaced more easily and at a lower cost than circuit conductors. The EPRI findings also illuminated the fact that utilities must identify potential problem areas beyond a system-wide view.

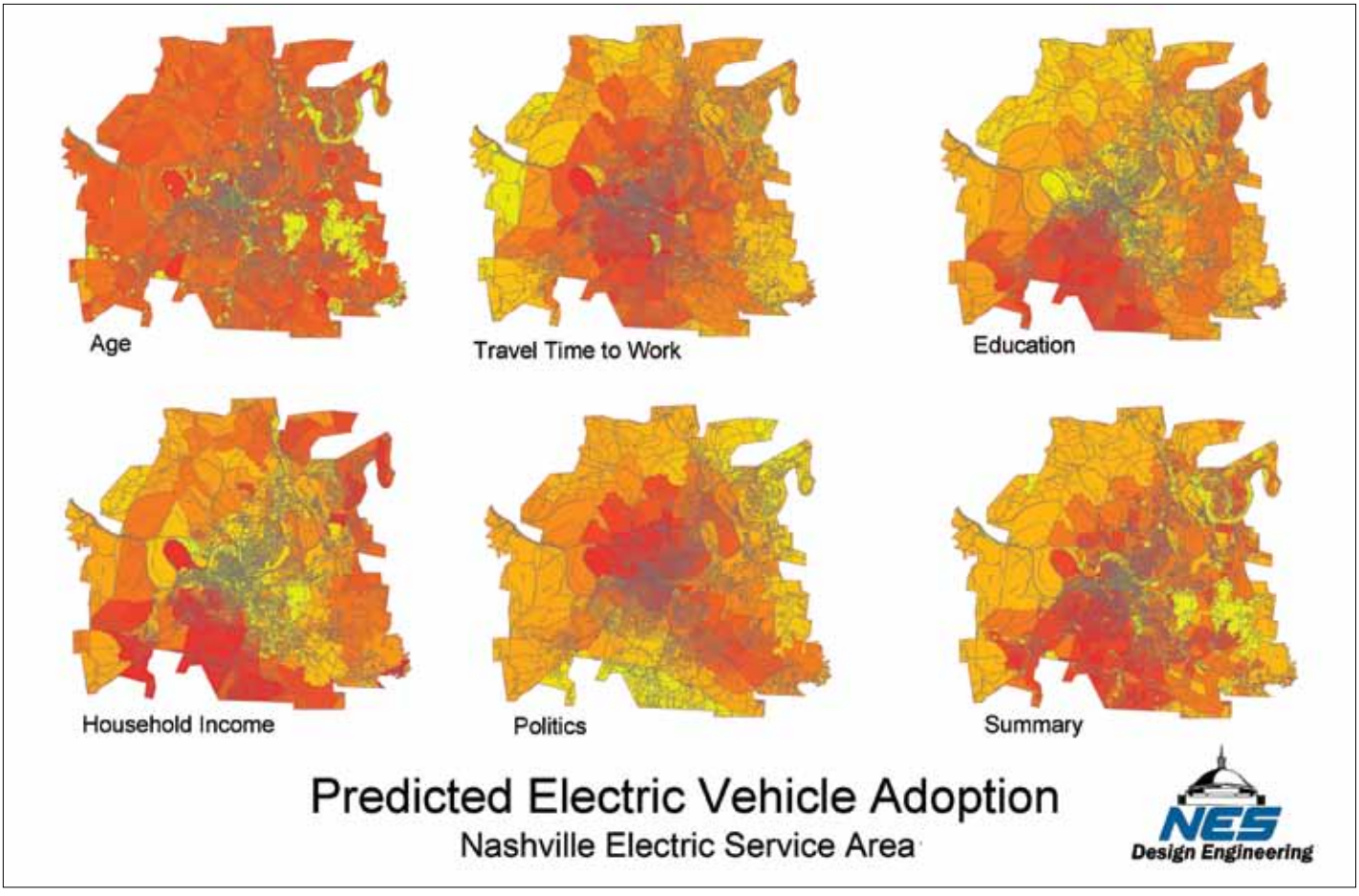
NES utilized the EPRI study, as well as the predicted electric vehicle adoption maps, when prioritizing capital improvement projects. A top item on the to-do list: convert low-voltage (4,100 volt) lines and transformers built before the 1960s to higher distribution voltages.

"Over time, air conditioning and other loads have been added to the system, usually without any changes to the transformers," Brown said. "So, many transformers are already at 100 percent or more of rated capacity."

A new Leaf comes with a 110-volt Level-1 slow charger, but NES suspects most people will opt to install the 220-volt Level-2 that has a higher current draw. Overloaded transformers would not bode well for a neighborhood with new electric vehicles parked in garages, nor would it reinforce the customer service or outage management goals set by NES.

"When I added the new charging stations to my predictive map, I was relieved to find those points falling in the red areas," said Brown. "We're working to get a regularly updated file from the state showing the addresses of new EV and plug-in hybrid vehicle registrations in our service area, which will allow us to be proactive in addressing transformer loading concerns."

For more information, contact Keith Brown at KBrown2@nespower.com.



↑ This series of heat maps shows in red the areas served by Nashville Electric Service that have the highest predicted electric vehicle adoption rates based on NES study criteria.

Esri Launches European Wind User Group

Wind energy professionals across Europe now have a local source for the exchange of ideas, success stories, and information about geospatial technology for on- and offshore wind farms: the Esri European Wind User Group. The group's mission is to discuss the best ways to meet daily challenges and learn how proven applications of GIS technology from Esri and its partners can support wind farm business processes.

"GIS technology allows us to develop, plan, and maintain wind farms," said Anders Røpke, president of the European Wind User Group and GIS and environmental engineer for DONG Energy A/S in Denmark. "Spatial overview and analysis adds direct value to the DONG Energy wind power organization. Applied GIS services and analysis contribute positively to the business case for offshore wind power production."

"Esri offers an integrated approach to GIS products, services, and support," said John Shaw, vice president of the European Wind User Group and CIO and head of information services for Mainstream Renewable Power in Ireland. "The formation of our Wind User Group gives us a great forum to share best practices with peers committed to GIS excellence."

The first European Wind User Group meeting was held this past May in Gentofte, Denmark. The event was hosted by DONG Energy along with Informi GIS A/S, Esri's distributor in Denmark.

Wind energy professionals, including operators and developers, are welcome to join the group via LinkedIn to stay apprised of upcoming events.

Esri on the Road

Esri Electric and Gas GIS Conference
October 7–10, 2012
Salt Lake City, UT, USA
esri.com/electric-gas

Gastech
October 8–11, 2012
London, UK
2012.gastech.co.uk

Itron Utility Week
October 20–26, 2012
San Antonio, TX, USA
www.itron.com

GITA Oil & Gas Pipeline Conference
October 22–24, 2012
Houston, TX, USA
www.gita.org/gis

Knowledge Summit
November 12–14, 2012
Houston, TX, USA
knowledgesummits.com

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