

Geospatial Technology Is Emerging as the Platform to Support Intelligent Electric Networks

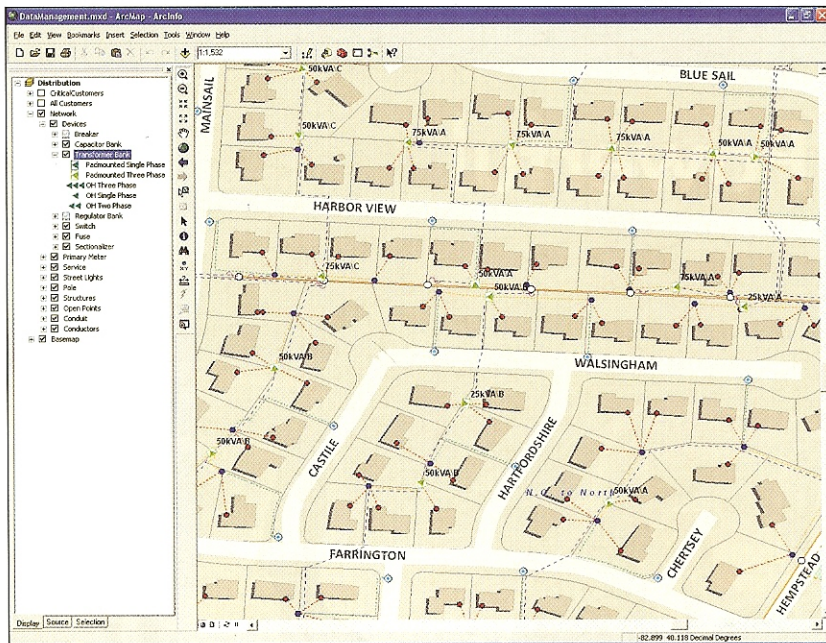
GIS

Makes Smart Grid Smart

We have heard the smart grid buzz. Smart grid will modernize utilities around the world by connecting communication and computer technology to electric networks. With smart grid comes the promise of energy that is cleaner, more reliable, more efficient, and more affordable.

By Bill Meehan

We are, of course, excited for smart grid to arrive. And when it gets here, smart grid will need the sturdy foundation of a sound enterprise geographic information system (GIS) that provides strong data management, planning and analysis, field collection, and situational awareness. Utility operators will need a GIS-based view of their utility in order to make the best decisions about key issues such as managing meters and customers, and incorporating renewable energy. Field crews will depend even more heavily on GIS for implementing an advanced metering infrastructure (AMI) and keeping current with data collection. In short, enterprise GIS will make it possible for utilities to build and operate a smart grid.



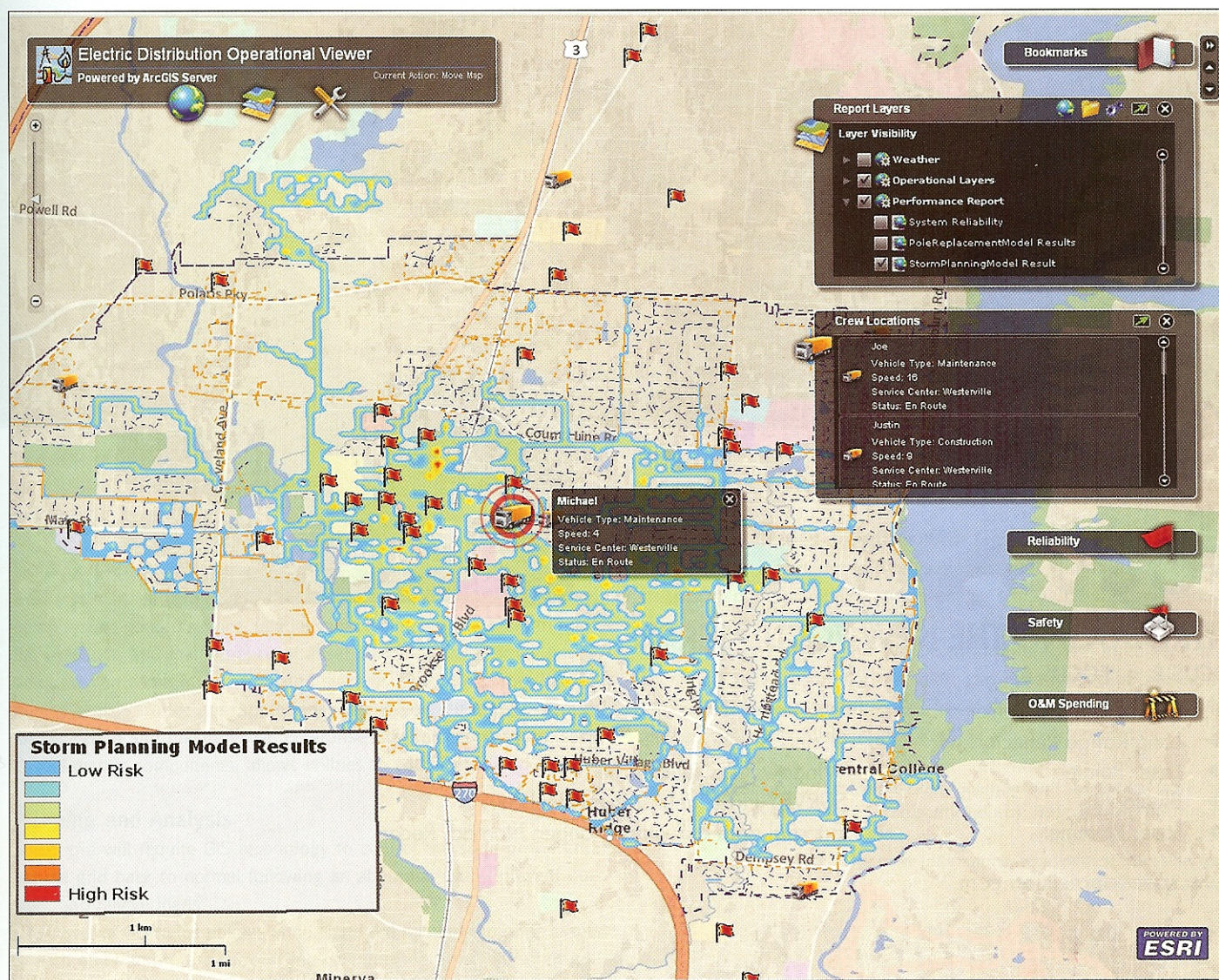
The electric distribution network

Utilities already depend on GIS to meet common operational needs including asset and field force management. Enterprise GIS allows everyone on staff to view and share up-to-date information on infrastructure, operations, and activities. Existing and additional GIS capabilities will prove crucial once smart grid implantation becomes widespread.

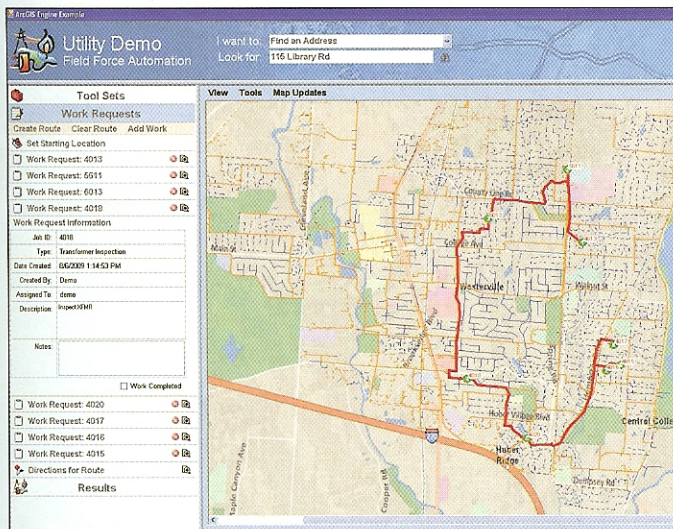
The Critical Role of Enterprise GIS in Smart Grid

An enterprise GIS exhibits four strong patterns of behavior: data management of assets such as

sensors, poles, conduit, smart meters, trucks, and people; situational awareness for visualizing the business spatially in cases such as a small house with high electric consumption; field collection to provide timely



Situational Awareness application showing the location of crews overlay with a risk model showing areas that are most susceptible to failure due to weather related events.



Mobile application showing the location of field inspections along with the optimize route to minimize drive time.

and up to date information to determine the optimal placement of fault indicators or locate places in the system most susceptible to lighting strokes.

Data Management

For smart grid to work, utilities will need to know the health of their systems. GIS is widely recognized for its strong role in managing traditional electric transmission and distribution, and telecommunications networks. GIS provides the most comprehensive inventory of the electrical distribution network components and their spatial locations. With smart grid's sophisticated communication network superimposed on the electric network, data management with GIS becomes utterly critical.

Situational Awareness

When smart grid goes into effect, operators will rely on a real-time view set up within their GIS. Utilities already use GIS to visualize the electric and communications systems and the relationships that exist between them. It goes well beyond the traditional "stare and compare" method commonly used by utilities to a notion of seeing relationships. GIS provides a means to monitor and express the health of the system in an obvious way with commands such as, "show me all the sensors that have failed to report results in the last hour." GIS can show the real-time view of the grid and note where things are changing. In effect, GIS (as compared with a SCADA system) shows the complete state of the grid, represented by a realistic model in a way that people understand.

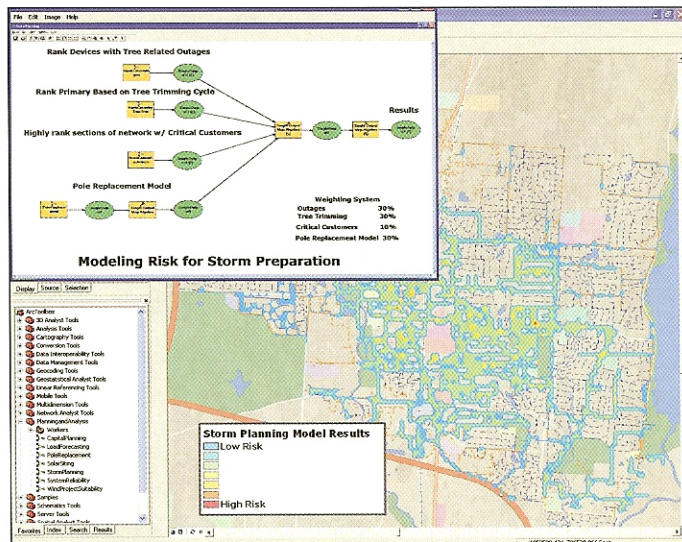
Field Collection

GIS helps manage data about the condition of utility assets. After parts of the system go into service, utilities must maintain the system through the collection and maintenance of asset condition data. Some condition data can come from automated systems and others from inspection systems. Utilities are rapidly adopting GIS-based mobile devices for inspection and maintenance. Enterprise GIS, with its desktop, server, and mobile components, allows utilities to gather condition data.

Planning and Analysis

Smart grid will require GIS technology to control the state of the grid, get the grid back to normal following an abnormal event, prevent outages, and relieve loads.

The power of GIS helps utilities understand the relationship of its assets to each other and to the surrounding environment. Since the smart grid is composed of two networks—electric and communications—utilities



Geoprocessing model showing the inputs and results of the storm vulnerability model.

must understand physical and spatial relationships among all network components. These relationships will form the basis for some of the advanced decision making the smart grid makes. Smart grid must have a solid understanding of the connectivity of both networks. GIS provides the tools and workflows for network modeling and advanced tracing.

GIS is used to determine optimal locations for smart grid components. During the rollout of smart grid, utilities will need significant analysis to determine the right location for sensors, communication marshalling cabinets, and a host of other devices such as fiber optics in conduit and on poles. GIS provides the proper means to perform these design services, since the optimal locations depend so heavily on the existing infrastructure. Existing telecommunications technology is another important piece of smart grid infrastructure. The industry itself already relies heavily on GIS and will readily step up to the smart grid challenge. The use of telecommunications will increase the reliability and efficiency of smart grid; improve security; enable decentralized power generation; and facilitate demand management.

GIS can provide a spatial context to the analytics and metrics of smart grid. With GIS, utilities can track the metrics over time and provide a convenient means of visualizing trends. Since smart grid is supposed to be smart, it must be able to provide advanced grid performance analytics, track trends in equipment performance and customer behavior, and record key performance metrics.

Smart Grid Comes Together with GIS

GIS will work with smart grid technologies such as advanced sensors, smart meters, telecommunications, energy storage devices, and renewable energy systems. With the platform of GIS, the grid will move from a largely passive and blind system to an interactive, intelligent, and energy efficient system. For the smart grid initiatives to be successful, utilities must make sure their GIS is enterprise ready, integrated with all their back office systems, and kept meticulously up to date.

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