OUTAGE AND DISTRIBUTION MANAGEMENT
THE SMART GRID

SERVICE RELIABILITY IS A MUST

Electric utility services are often taken for granted – until a service outage occurs. Increasing or maintaining power reliability is the fundamental charter for utility companies, but it is made all the more difficult by multiple challenges facing utilities today, including an aging infrastructure, a retiring workforce, rising costs, and mandated carbon reduction. To continue to meet service requirements and regulations – even as they endeavor to meet these pressing challenges and deploy grid modernization technologies – electric utilities require an efficient way to restore power as quickly as possible when service interruptions do inevitably occur.

Intergraph® solutions for outage management systems (OMS) and distribution management systems (DMS) provide the foundation for improving outage response and restoration times, quickly analyzing and diagnosing trouble, and efficiently dispatching and mobilizing field crews. These benefits directly improve overall operational efficiency, increase reliability and resiliency, and provide better information for accurate and timely customer communications.

During the next 10 to 15 years, consumers around the world will see major changes in the way electricity is transmitted, distributed, and metered to businesses and households. The relationship between the utility and its customers will forever be changed. To effectively harness and manage this change, utilities need sophisticated software solutions and visionary partners who can provide cost-effective, enterprise solutions.
**Smart Grid Operations Command-and-Control**

During the past several years, reoccurring outages have affected consumers and economies all across the globe, including:

- The Northeast Blackout in North America
- A devastating hurricane season in Florida
- A one-hour power outage at the Chicago Board of Trade that prohibited nearly $20 trillion worth of trade

These outages include non-preventable incidents such as storm damage, but are often the result of aged equipment, overload problems, and human error. Following these events, electric utility companies faced serious questions from both regulators and their constituents:

Why did the outage happen? Why did it take so long to restore power? How can you become more proactive and prevent such outages and service disruptions?

Automation and the smart grid will play a key role in improving electric service reliability in the future, and Intergraph’s Smart Grid Operations Command-and-Control Center integrates OMS with DMS functionality within a consolidated user environment to put you in control of your operations center. InService allows operators to more quickly analyze and respond to a wide range of situations and helps them act more quickly to restore service when outages do occur. The implementation of a smart grid enables your distribution infrastructure to monitor itself through sensors, alarms, and automatic communications to become increasingly self-operating and self-healing. The smart grid brings with it extensive automation and additional complexity for the operations center. Intergraph helps reduce the chance of human error in the operations center by making real-time information more accessible and easy to comprehend in a single integrated console.

Focusing on smart grid control room operations, Intergraph has created a new class of information system to help operations personnel visualize, analyze, and comprehend a voluminous array of data that often changes rapidly. The problem with today’s automated systems is not a lack of information, but rather the ability to quickly locate and understand what is needed at the right time. More data does not equal more or useful information. The amount of data, and the rapid availability of data delivered by future automated smart grid systems, will only exacerbate the problem for the operator unless he or she is prepared with the right system in the control room to quickly facilitate analysis and action.

**Smart Grid Operations Command-and-Control Center**

Intergraph’s integrated OMS and DMS solution offers a single user interface for both OMS and DMS functionality. This common user interface integrates other real-time data necessary for system operations. Intergraph provides a single integrated console for the smart grid to improve overall situational awareness and help achieve significant cost savings and increased efficiency in grid operations. Our solution consolidates and integrates disparate applications, traditionally in different locations, into a common operating picture in a single operations control center.

You can receive immediate input from SCADA devices, smart meters, and other remotely monitored infrastructure. Using an advanced system
display, network operators can monitor alarms that indicate overloads and other network problems. You can manage device control and network operations directly through the command center to reroute power, manage voltage levels, and reconfigure the network, as well as make adjustments to the grid during normal operations. You can extend this common operating picture to the field with Intergraph’s dispatch and mobile workforce management. The operation control center and your field crews can share information, which enhances the efficiency of grid management.

**Outage Management**

Outage management systems use the infrastructure model of the electric facilities, usually a geospatial or geographic information system (GIS) with links to customer information systems (CIS), automated voice response (AVR) units, supervisory control and data acquisition (SCADA) systems, and an automated metering infrastructure (AMI). When these applications are integrated, the OMS can more accurately predict the probable cause and location of an outage and quickly dispatch the most efficient repair crews to restore the network.

Intergraph’s OMS improves and optimizes network reliability with a comprehensive set of integrated tools that seamlessly manage operational and customer data across the enterprise. The system functionality provides you with real-time analysis of the distribution network, optimization of field resources, and management of fault situations, resulting in reduced restoration time, improved operational efficiency, and enhanced safety.

Progress Energy, headquartered in Raleigh, North Carolina, is a Fortune 250 energy company with more than 21,000 megawatts of generation capacity and nine billion dollars in annual revenues. The company includes two major utilities that serve more than 3.1 million customers in the Carolinas and Florida. Following the 2004 hurricane season that battered Florida, Progress Energy was challenged with a way to better assess outages during and after major storms. The four major hurricanes that hit Florida cost Progress Energy more than $360 million.

With more than 70 percent of Progress Energy’s total restoration cost being related to labor, the sooner people start working means big savings. Progress knows the fastest way to save money is by putting people to work where they are needed. With help from Intergraph’s outage management solutions, Progress tested pinging meters with helicopter flyovers. Using the helicopter in test runs, the company was able to read more than 100,000 meters in one hour – determining what meters were working and where outages were located.
**Trouble Analysis**

An integral part of the electric OMS, Intergraph’s Trouble Analysis module is based on calls received by customers or by AMI. It automatically performs an advanced analysis of the network in real time and predicts the extent of an outage, as well as identifies the most likely point of failure. The application uses the network of the operational model – along with the number, location, and time of trouble calls – to automatically group related calls into an outage event at the probable device. Trouble calls and predicted outages are displayed in the geospatial view.

**Computer-Aided Dispatch**

Intergraph’s Computer-Aided Dispatch (CAD) system provides your call center and command-and-control room operators with the tools they need to field trouble calls, create and update incidents, and manage your critical resources by providing real-time interaction of crucial data. A critical component of the CAD system is crew/vehicle monitoring and wireless communication. These two technologies aid dispatchers in identifying the closest crew to dispatch and issue a wireless trouble order. Advanced system dispatching tools also aid in order assignments including locating closest crew, recommending crews using skills and equipment, and monitoring shift times.

**Switching Plans**

Intergraph’s OMS tools enable you to prepare and execute switching plans. These tools, which are tightly integrated with geographic and schematic views of the operational network, handle emergency and planned switching for maintenance or construction. The switch plans aid in quicker restoration by providing the information to be dispatched to the right crews at the appropriate time. This tool also has a switch plan generator.
that works directly with the network map to automatically create a switching plan using criteria input by the user. Once a plan is built, you can save the template and use it for future switching plans. This will help you save time as transfer load procedures often have limited options. The switch planning tools allow users to place tags, pre-assign steps to crews, capture detailed activity logs, and use study modes to develop plans offline.

**Damage Assessment**

Intergraph’s Damage Assessment tools empower you to capture accurate damage reports quickly and efficiently using mobile computing and wireless communication technology, leveraging your AMI.

Automating damage assessment activities can significantly improve your response in an emergency because field reports can quickly supply larger amounts of data into the OMS for a more accurate network view. The OMS can track restoration progress and continue to manage remaining efforts. Intergraph solutions focus on damage assessment workflow and the enabling technology to make it successful.

**MOBILE WORKFORCE MANAGEMENT**

Complementary to Intergraph’s CAD, our Mobile Workforce Management (MWFM) solution supports dispatch, scheduling, and mobile computing solutions for all types of field work – planned and unplanned, short-term, and long-term. This enterprise-scalable platform eliminates the need for multiple dispatch systems and, combined with OMS, allows field crews and dispatchers to view identical network maps and work information. Intergraph’s MWFM solution provides multiple benefits:

- Reduces or eliminates manual paperwork and trouble ticket sorting
- Reduces data entry errors through validation of mobile forms
- Enables accurate and timely communication to customers
- Ensures crews with the appropriate resources are dispatched to resolve problems on-site
- Allows monitoring of crew productivity and safety through wireless work updates and GPS tracking

**Scheduling and Resource Allocation**

MWFM supports customer appointment and crew workload scheduling, optimizing assignments to crews based on availability and skill sets to minimize service costs. Intergraph’s Scheduling and Resource Allocation application also ensures resources will be available to meet appointments by displaying available appointment times back to the dispatcher. The auto dispatch tool delivers more efficiency by dispatching work to crews automatically, following a user-defined set of rules allowing it to match the skill set and attributes of the crews to the right jobs. Our application also allows field crews to reassign work to other crews during times of conflict or unexpected delays.

**Field Automation**

Intergraph’s Field Automation application uniquely integrates mobile mapping and back office IT systems on one platform and can integrate the MWFM application for short-cycle work scheduling and management to improve productivity of field personnel. Intergraph’s rich functionality includes navigation, analysis, vehicle tracking and routing, job creation and management, and access to real-time status of crews and jobs. The application is designed to work in a connected or a disconnected mode – with the ability to store and
forward information – allowing crews the flexibility to work inside and outside of wireless coverage. Via a mobile data terminal (MDT), field service personnel can accept multiple types of work orders, view up-to-date facility maps, turn redlines into almost immediate database updates, and communicate instantly with dispatch. Field personnel can accomplish more work through immediate and efficient communication, data update, and use of the most current enterprise data.

**EXTENDED APPLICATIONS**

**Critical Infrastructure Protection**

Utilities are also challenged by operating and protecting their critical infrastructure while being good stewards of the environment and meeting the energy needs of their customers.

World events have focused our attention and concern on security. Governments, public safety agencies, utilities, and others work tirelessly to assess the vulnerabilities of our national critical infrastructure, evaluate these vulnerabilities, and coordinate with other government and private entities to ensure the most effective response. Successfully managing and securing critical infrastructure and responding to large-scale natural or manmade incidents presents enormous challenges, whether an organization is a government agency, a large corporation, or a private entity. Each demands similar results – efficient operations, good business practices, and improved visibility and management of all resources. Intergraph’s geospatially powered incident management solutions improve utility responsivness and resiliency in the face of such threats. We integrate information from a variety of sources in real time to improve situational awareness within a utility’s command-and-control environment.

**Business Intelligence and Intergraph’s Enterprise Web Portal**

Utilities need to not only access the infrastructure information, but also be able to integrate geospatial information with a variety of other data types to support decision making and reporting requirements, both internally and externally. Today this is defined as business intelligence. Intergraph’s Business Intelligence solutions provide your employees, customers, and the public with fast and easy access to the integrated data within a geospatial context.

Because Web technology has evolved from a means of posting static company information to a powerful business platform, Intergraph’s Enterprise Web Portal has emerged as the principal interface for delivering business intelligence and other customized content to executives, employees, and customers through a user-friendly format. It provides real-time access to multiple data stores, both on the Internet and on internal servers; direct access to the communications infrastructure data and landbase information; and can include current information on inspections, service interruptions, and any number of reports. It’s also an executive dashboard you can use for reporting, spatial analysis, and decision support functions. You can also control access according to the intended audience. The solution is a truly vendor-independent analysis tool, as it works with data from a variety of sources, including:

- Intergraph’s infrastructure management systems
- Data formats from traditional GIS vendors
- Commercial database formats from Oracle, Microsoft®, and others
- Design files from computer-aided design packages
• Data in OGIS (openGIS) format, Web Services, and more

For OMS, key performance indicators (KPI) can be monitored and reported in the business intelligence application. These KPIs, typically required for various state public utility commission reporting (U.S. only), include system average interruption duration index (SAIDI), system average interruption frequency index (SAIFI), and customer average interruption duration index (CAIDI).

The idea behind Intergraph’s Business Intelligence solution is straightforward – provide real-time access to disparate data sources online and equip you with geospatial query, analysis, and visualization tools. With these tools, you can interrogate, analyze, assess, and formulate decisions in support of core business objectives, such as emergency management, critical infrastructure protection, economic development, and more. Any user equipped with a standard Web browser can accomplish these tasks and more without specialized training.

THE INTERGRAPH DIFFERENCE

Intergraph solutions are scalable to any enterprise, allowing integration of asset data with other corporate systems to further improve productivity and streamline workflows. Intergraph solutions are “open” on Oracle, providing a lower total cost of ownership. Our infrastructure solutions can deliver productivity savings of up to 50 percent. With more than 400 utility customers worldwide and more than 35 years of experience in the utilities industry, Intergraph is your single source for infrastructure management solutions.

ONCOR ELECTRIC DELIVERY

Oncor Electric Delivery is a regulated electric distribution and transmission business that uses superior asset management skills to provide reliable electricity delivery to consumers. It operates the largest distribution and transmission system in Texas, providing power to three million electric delivery points over more than 102,000 miles of distribution and 14,000 miles of transmission lines.

With systems from Intergraph, Oncor is advancing its outage management system to support smart grid operations, integrating power systems analysis and service restoration with a single graphic user interface.
ABOUT INTERGRAPH

Intergraph is the leading global provider of engineering and geospatial software that enables customers to visualize complex data. Businesses and governments in more than 60 countries rely on Intergraph's industry-specific software to organize vast amounts of data into understandable visual representations and actionable intelligence. Intergraph's software and services empower customers to build and operate more efficient plants and ships, create intelligent maps, and protect critical infrastructure and millions of people around the world.

Intergraph operates through two divisions: Process, Power & Marine (PP&M) and Security, Government & Infrastructure (SG&I). Intergraph PP&M provides enterprise engineering software for the design, construction, and operation of plants, ships, and offshore facilities. Intergraph SG&I provides geospatially powered solutions to the defense and intelligence, public safety and security, government, transportation, photogrammetry, utilities, and communications industries.

For more information, visit www.intergraph.com.