ELECTRIC INFRASTRUCTURE MANAGEMENT

INTERGRAPH®
Asset-intensive businesses, such as electric utilities, have large capital investments in their extensive and complex transmission and distribution systems. To maximize the return on this investment, electric utilities have begun to geospatially enable their information systems for infrastructure management. Electric utility businesses are finding manual and partially automated systems obsolete: laborious, error-prone, and prohibitively slow. Utilities require a geospatially powered network asset database that eliminates redundant or duplicate asset management processes – one that refines workflows spanning the entire electric utility infrastructure. This new paradigm for dealing with expansive infrastructures also includes the need for automating field work processes, as the majority of the electric utility workforce is field-based and involved in the planning, design, construction, maintenance, or operation of these geographically dispersed transmission and distribution assets.

CHALLENGES TO THE INDUSTRY
Faced with an increasingly dynamic operating environment, electric utilities of all sizes must now view change as the only constant. In the coming age of intelligent or “smart” grids, distribution infrastructures
will shift rapidly toward self-operation and auto-
healing. Utilities will also face the accelerating
challenge of being good stewards of the environ-
ment, while meeting the energy needs of their
customers. They must do more with less. In
the next 10 to 15 years, consumers around the
world will see major changes in the way electric-
ity is transmitted, distributed, and metered. To
effectively harness and manage this change,
extric utilities need sophisticated software
solutions and visionary partners who are up to the
challenge – partners who provide cost-effective,
enterprise-scalable solutions based on proven
best practices.

**The Big Picture for Integrated Solutions**

Enterprise integration requires that a superior infra-
structure management solution integrate well with
other systems within the corporation that require
location-based asset information, including:

- Customer information systems
- Work management systems
- Enterprise resource management systems
- Financial systems
- Outage management systems

Intergraph’s open data architecture and
standards-based infrastructure management
solutions represent the industry’s best practices
based on hundreds of systems in production.
Intergraph’s infrastructure management solutions
enable the sharing of location-based asset infor-
mation among corporate information systems,
which helps you reduce labor and operating
costs. A geospatially enabled infrastructure
management system can easily result in signifi-
cant work design and record management labor
savings of up to 50 percent when integrated

with work management processes and systems.

By improving internal communication and
simplifying data management processes, you
can greatly improve your operating efficiency
and enhance customer service.

**Geospatial Versus GIS**

Intergraph’s infrastructure management solu-
tions are built on our geospatial network asset
data base, designed to meet the performance,
 scale, and data integrity needs of utilities of all
sizes. With Intergraph’s G/Technology software,
al network asset data is stored in a standard,
open Oracle database. Asset data are directly
accessible in a non-proprietary format, making
it easier to exchange location-based informa-
tion with other corporate systems. Intergraph
systems manage the long transaction needs of
work orders, and the performance and scal-
ability needs of the largest utility enterprise.

Unlike general purpose geographic information
systems (GIS), Intergraph’s geospatially powered
infrastructure management solutions are specifi-
cally designed to meet your interactive graphic
performance needs and unique network asset
management requirements.

Infrastructure management for utilities involves
the management of linear networks consisting of
sometimes hundreds of thousands of explicitly
connected pieces of equipment. These asset
data are geographically dispersed, managed,
and located using various geospatial views into
the system. A robust, accurate model of the
network and absolute data integrity is crucial
to allow downstream or across-stream integra-
tion. Many other general-purpose GIS systems
model the complex network of a utility and circuit
connectivity using simple graphic coincidence to
Integral Energy serves more than two million people in New South Wales, Australia. The utility chose a multiphase implementation for an integrated asset management system based on Intergraph’s electric infrastructure management solutions. The system shares asset information with corporate users to optimize the network, gain efficiency, and improve customer service. It also meets additional challenges, such as the rapid growth of electricity demand per year and the requirement to manage supply interruptions from storms and other unplanned events.
infer connectivity. This is inadequate for the data integrity and network modeling needs of utilities.

An enterprise-capable infrastructure management solution is required to interact seamlessly with both peer and corporate systems, especially those for operations and financial reporting. Intergraph systems are based on Oracle database management technology to support integration at all levels. Through strategic technology partnerships, Intergraph provides standard integration tools and interfaces for key enterprise resource planning (ERP) vendors, such as SAP®, Oracle, and Oracle-based partner solutions.

KEY APPLICATIONS

Intergraph’s Electric Infrastructure Management solution is specifically designed to manage the long-term transactions typical of the planning, design, construction, and maintenance processes, while preserving data integrity and overall system performance. System applications support the workflow of the entire utility infrastructure, including asset management, design, and engineering analysis for distribution and transmission, landbase management, and field automation. In addition, these applications coexist seamlessly with our Mobile Workforce Management (MWFM) solution and operating solutions designed for the smart grid. This gives electric utility businesses of all sizes an enterprise-wide, flexible, and reliable set of integrated tools to meet the industry’s increasing infrastructure management and operating challenges.

Distribution Asset Management

Distribution Asset Management represents your continuous property record of electric distribution and sub-transmission facilities as they are installed, modified, abandoned, or removed through various work-order processes. Facilities may be overhead, underground, or subway and duct construction. All are represented as components of a geospatial network. Maps of facilities typically include primary, secondary, and service conductors, as well as customer-to-meter locations. Superior to a general-purpose GIS, this infrastructure management application maintains an explicitly connected database model of distribution assets you can integrate with other corporate systems for true enterprise data sharing.

This application integrates accurate and timely asset information across business units to improve asset utilization and information sharing. Distribution Asset Management improves the productivity of mapping technicians, engineers, field personnel – anyone who needs to create, use, manage, or maintain accurate distribution asset information.

Distribution Design

Distribution Design enables the computer-aided design (CAD) of new electrical distribution facilities and the extension or replacement of existing facilities. This application provides the long transaction processing necessary to generate a work order and manage the status of projects through partial and final posting of all facility changes to the asset database. Work orders may be simple designs for a minor extension or repair, or complex plans for new service with multiple construction interdependencies. Distribution Design includes the integration and automation of routine design calculations. When integrated as part of the design process, these calculations and enforced standards improve
productivity and quality, and they produce optimized designs that improve cost effectiveness of the planned additions or services. Calculations supported include pole loading, voltage drop, cable-pull tension, and streetlight design. Distribution Design typically includes integration with a corporate work management system (WMS). Intergraph offers a variety of standard interface solutions to popular ERP systems, including SAP and Oracle.

Distribution Engineering Analysis
Distribution Engineering Analysis helps you conduct various engineering studies, analyzing individual primary circuits or primary and secondary networks. Using a third-party engineering application of choice, load flow or power flow studies can determine voltage drop and current flow, and identify overloaded or underloaded conductors based on estimated loads. The Distribution Engineering Analysis application enables you to extract circuit data from the electrical network for use within a number of third-party analysis packages. You can configure the system to format the data as required by most popular analysis packages.

Transmission Asset Management
Our Transmission Asset Management application enables the installation, modification, abandonment, or removal of electrical transmission facilities in the electric data model. These facilities are usually aerial towers, but, in some large utilities, can also be underground units with cooling systems. This interactive graphic and database application also produces maps of the electrical transmission network, providing clear and accurate details of such facilities as utility towers, poles, wires and cables, substations, transformers, switches, right-of-ways, and easements.

Transmission Design
This interactive graphic application enables the design of new electrical transmission facilities or the extension or replacement of existing ones. Work orders may be simple designs for a minor extension or repair, or complex plans with multiple construction interdependencies. This application offers the long-term transaction processing necessary to design a work order and manage the status of work through partial and final posting of all facility changes.

Landbase Management
Landbase Management supports the background landbase used for various utility infrastructure mapping and design applications. This application typically includes geospatial data such as edge of roadways, street center lines, and street names; however, it can also include company easements and right-of-ways as maintained by a utility. Landbase Management also manages aerial photography or commercial landbases when used for background land information.

Enterprise Imaging Distribution and Management
Utility personnel use imagery to help them understand the location and characteristics of the physical network and facilitate a variety of activities. Using Intergraph technology, you can have direct access to all imagery available throughout the enterprise through a modular client-server system that enables users to store, manage, and access multiple types of imagery and terrain data – no matter where they are in the workflow. Imagery needed for planning, design,
HAWAIIAN ELECTRIC COMPANY (HECO), HAWAII, USA

HECo serves more than 260,000 customers in Oahu, Hawaii. The utility is now in production with Intergraph’s electric infrastructure management solution. The solution incorporates select changes that accommodate HECo’s standard operating procedures. Under a data-sharing agreement, HECo imports extensive landbase features from the city and county of Honolulu. This data, coupled with the electric network intelligence and customer information system, provides a wealth of geospatial information used in planning, engineering, and operations.
Kelag supplies electric power, gas, and district heating within Austria’s federal state of Carinthia. The company also maintains a communications network used internally and sublet to telecommunications providers. Kelag serves 240,000 customers and manages a network of 17,000 kilometers. Intergraph’s multi-utility infrastructure management solutions for managing electric, gas, district heating, and communications facilities meets the company’s information needs through integrated, seamless workflows and helps Kelag maximize resources by integrating geospatial and other data.
construction, and maintenance is available in seconds, not hours or days.

**Field Automation**
Our Field Automation application uniquely integrates mobile mapping and IT systems on one platform to support a variety of mobile field applications. It includes an optional 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 works 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. 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 the dispatcher. Field personnel can accomplish more work through immediate and efficient communication, data update, and use of the most current enterprise data. The Field Automation application supports additional activities such as field design, field inspection, vegetation management, and damage assessment.

**EXTENDED APPLICATIONS**

**Smart Grid Operations Command-and-Control Center**
Intergraph uniquely provides solutions for operations that integrate outage management, distribution management, and MWFM into a consolidated user environment. Our solutions create a common operating picture, consolidating multiple systems in the control room into one user environment so you can improve situational awareness. This reduces the potential for human error and optimizes productivity and grid reliability. Intergraph provides a comprehensive set of integrated tools to manage operations and field crew dispatch and reporting. The application offers real-time monitoring and control of the distribution network from one console, which optimizes deployment of field resources and improves restoration resiliency. Superior functionality supports automated trouble analysis, develops and analyzes effective switching plans, and manages field crews. This builds upon our electric infrastructure management solution and extends the value to benefit overall operations. Intergraph’s Smart Grid Operations Command-and-Control Center can help you reduce outage restoration time, improve operational efficiency, and enhance safety.

**Mobile Workforce Management (MWFM)**
Because a large portion of utility employees are mobile workers deployed in the field, MWFM solutions offer significant productivity benefits. Intergraph’s MWFM solution supports dispatch, scheduling, and mobile computing for all types of field work – planned and unplanned, short-term and long-term. Productized interfaces, intranet access, and decision-support tools for reporting are integral components. Intergraph’s geospatially powered mobile workforce applications provide full dispatching and crew management capabilities, including appointment and workload scheduling. You can make assignments that match skills and job requirements, helping you put the right person in the right place at the right time.
MWFM supports mobile devices for field personnel and in vehicles. Technicians receive work automatically and update the status of work on mobile data terminals. The solutions provide capabilities such as street-level routing, street and facility queries, and even in-vehicle navigation. The system is highly configurable, eliminating the need for most custom programming.

**Critical Infrastructure Protection and Emergency Response**

World events have focused our attention and concern on security. Governments, public safety agencies, utilities, and others work tirelessly to assess the vulnerabilities of critical infrastructure, evaluate these vulnerabilities, and coordinate information 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 responsiveness and resiliency in the face of such threats by integrating information from a variety of real-time data sources, including intelligent video and access control systems, to provide a common operating picture for operations. Intergraph solutions can integrate physical security systems within the command-and-control environment of the operational center to help you respond more effectively and coordinate emergency response with other agencies. This is all possible within one incident management environment, further extending the value of the solutions built upon the infrastructure management framework.

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

Utilities need access to geospatially powered infrastructure information and must integrate this information with a variety of other data types to support decision making and reporting requirements. Intergraph’s Enterprise Web Portal and 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 become 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 in a user-friendly format. It provides real-time access to multiple data stores, both on the Internet and on internal servers, and access to the infrastructure management solution. Your employees or customers can access current information on inspections, service interruptions, and any number of reports.

You can use our Enterprise Web Portal to create an executive dashboard tailored for management reporting, spatial analysis, and decision support functions, with information access controlled 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 CAD packages
• Data in OGIS (openGIS) format, Web services, and more

The idea behind our business intelligence solutions 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 others. Any user equipped with a standard Web browser can accomplish these tasks and more with no GIS training.

THE INTERGRAPH DIFFERENCE

Intergraph is a recognized leader, specializing in infrastructure management solutions for utilities and integration of engineering and operations with asset management. Our infrastructure solutions can deliver productivity savings of up to 50 percent and are scalable to any enterprise, allowing integration of asset data with other corporate systems to further improve productivity and streamline workflows. Intergraph solutions are compatible with Oracle, providing a lower total cost of ownership. With more than 400 utility customers worldwide and more than 40 years of information system innovation, Intergraph is the single source for infrastructure management solutions, including products, services, and support.
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.