MAKING THE
CONNECTION

Electricity: How location information is improving operational intelligence
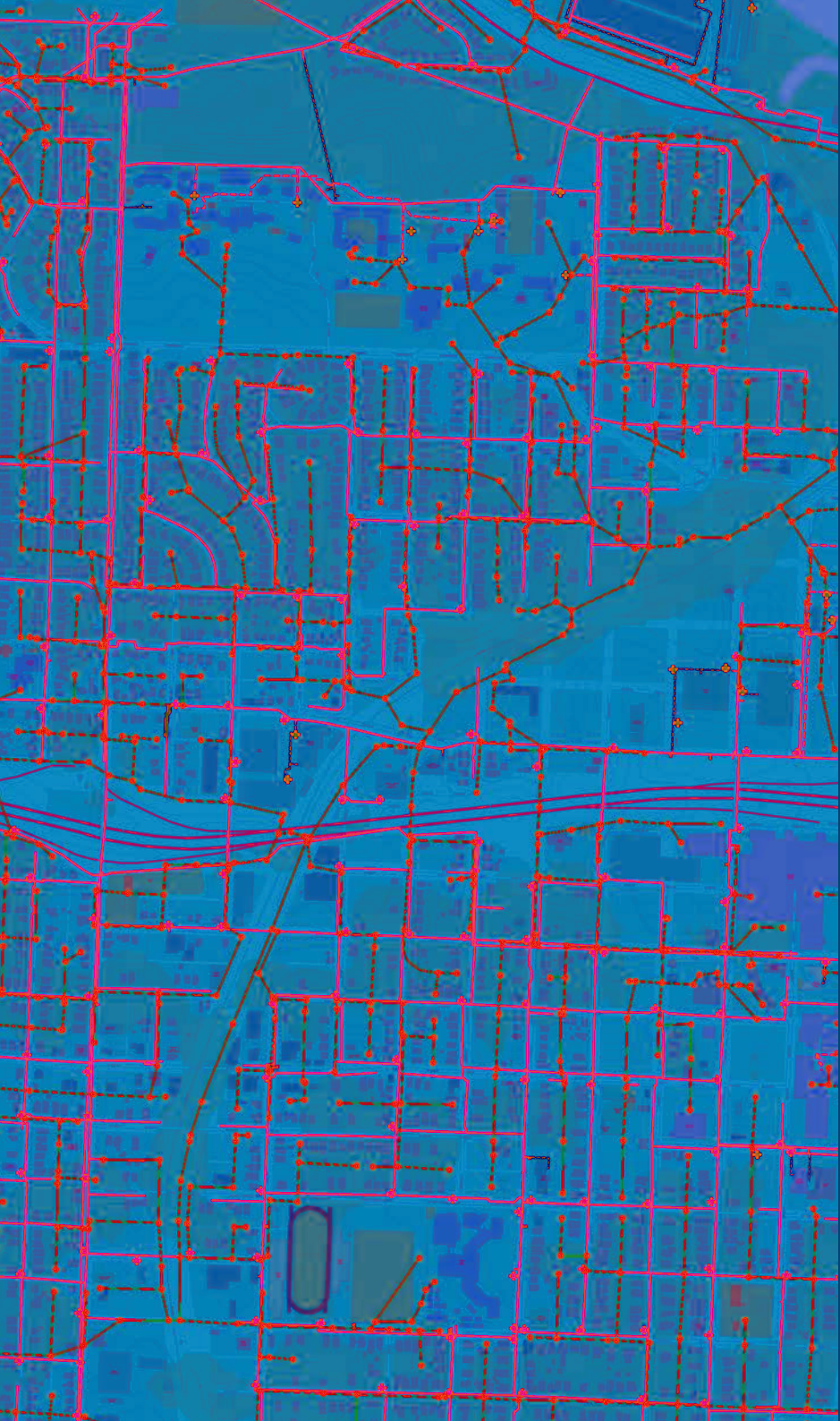
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THE SCIENCE OF WHERE™

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Dramatic Changes in Electricity Distribution

Until a few years ago, the electricity industry was operating on 100-year-old principles. While the industry is a reliable backbone of the national infrastructure, it is slow to change. Industry restructuring in 1990 radically altered the retail model, but it had little impact on the electricity supply chain. But now, a collision of multiple, fundamental forces is overturning the old ways of running an electricity business:

- Environmental regulation is driving the introduction of renewable energy and the phasing out of coal fired power stations, causing much tighter capacity margins.

- Renewable sources generate power in more dynamic, unpredictable ways, leading to a need for a more flexible grid and a new emphasis on storage.

- Distributed generation from solar, wind, biomass, and other sources is reversing power flows and fundamentally changing the way the grid operates.

- Electric vehicles are creating a new type of demand—one that moves to different places and peaks at different times of the day.

- The smart meter rollout is providing new insight into electricity demand and driving consumer awareness of consumption and pricing.

This is the beginning of a journey from a relatively static asset management operation to a more dynamic and flexible business. It leaves utilities with a tough challenge. How can they meet the future challenges brought by radical industry transformation?

Organizations are facing an avalanche of information, in forms and formats and via devices that weren't even on the radar screen five years ago.

Geoffrey Moore, Systems of Engagement and the Future of Enterprise IT, AIIM, 2011.

Enterprise IT Is Becoming a System of Engagement

To deliver the change needed, electricity networks will rely heavily on their large-scale information systems. But enterprise information systems across all sectors are also being transformed by the wave of digital disruption spreading across the economy.

Enterprise IT has historically been a system of record, designed to provide a single source of truth so that managers and staff have the information they need to effectively operate their organizations. But current trends are leading businesses to deploy a different breed of tools based on communications and collaboration capabilities. The consumerization of enterprise IT is changing employee expectations about usability and accessibility.

The drive toward outsourcing and partnership is creating new needs for business collaboration.

Many of these new tools look more like services than software and are built around new content formats (video, wikis, chat, maps, and conferencing tools), which can be either consumed in the moment or saved for later. These social business systems are now being deployed, enabling organizations to become more effective, more flexible, and more customer focused.

Geospatial IT Is Central to the Transformation

As the utility is a geography-based business with a widespread asset base serving customers and stakeholders over a distributed area, spatial information has a critical role to play. This is true both for information that is slow to change and live operational data. For many years, geospatial IT has provided a system of record for network assets, customer premises, and the environment in which all those things are placed. Geospatial specialists who could not do their jobs without this technology gain huge value. But in a more open, collaborative multistakeholder world, that geospatial information needs to be accessible to customers, partners, citizens, employees, and others, in a form that is of use to them. In short, a system of engagement is needed.

Geographic information system (GIS) technology is now a system of engagement as well. By including ready-to-use apps, content,

capabilities, and GIS infrastructure, the ArcGIS platform enables anyone to visualize, analyze, and collaborate using maps—anytime, anywhere, and on any device. Critical data still requires GIS professionals who build, maintain, and analyze geospatial information, but they are no longer the only ones who can make, use, and share maps. Now, all stakeholders can collaborate using maps hosted on web browsers and apps on whichever device they prefer. By empowering a whole organization (and its community), business performance can be improved across the board.

This e-book shows, by example, how geospatial technology is enabling the transformation of electricity distribution and transmission through better stakeholder engagement, complementing its more traditional role of records management.

People have the right information to make smarter decisions, communicate ore effectively, and work in ways that are healthier for the planet. the planet.

Jack Dangermond,
President, Esri ,2016.

Keeping Customers Up-to-Date

Helping customers help themselves is an established way to increase customer satisfaction. Empowering customers to get answers quickly when it suits them puts them in control. The benefit to business is a reduction in contact volumes in the customer contact center, which helps lower the cost to serve.

For electrical distributors, a major driver of customer contacts is network status information, including planned and unplanned maintenance and service interruptions. To make the information presented relevant, utilities can use location to show customers what is happening in their local area and at their premises, while filtering out areas that are not of interest. An online web map that shows maintenance activities and outages and provides expected restoration time scales can answer many customers' questions without their needing to get in touch with service providers.

Give customers better access to the information that they need and your customers will be both more informed and less likely to pick up the phone.

It is important that network licensees engage with stakeholders and help address consumer needs.

Ofgem, Stakeholder Engagement and Consumer Vulnerability Incentive Guidance for RIIO-ED1, 2016.

Empowering Customer Service Teams

When customers call customer care, they expect to speak to someone with answers right away.

All too often, call center agents spend too much time searching for information among multiple systems, increasing call handling time and reducing customer satisfaction. Whether the issue is a network outage, a construction development, or a query about charging electric vehicles, customer service teams need the right information at their fingertips. Again, location information can be used to improve engagement. A map-based view of the critical information in a customer's area will allow customer service agents to answer questions with authority and confidence, reducing callbacks and average handling time.

Getting Personal by Using Mobile Technology

People want to engage with businesses on their terms, at a time and place that suits them.

The mobile device is becoming the major channel for communication because it is personal and always at hand. This makes it particularly useful for reporting faults, outages, or street light issues.

By making it easier and more convenient for people to provide information and feedback to the business, utilities can increase their knowledge and insight. By providing an app that allows customers to easily report issues directly from their mobile device and submit a photo, your team can hear about issues faster and also have an accurate location of the incident[?] or problem. With instant information and a map showing where to go, your responders will get there faster, reducing lost minutes and improving customer satisfaction.
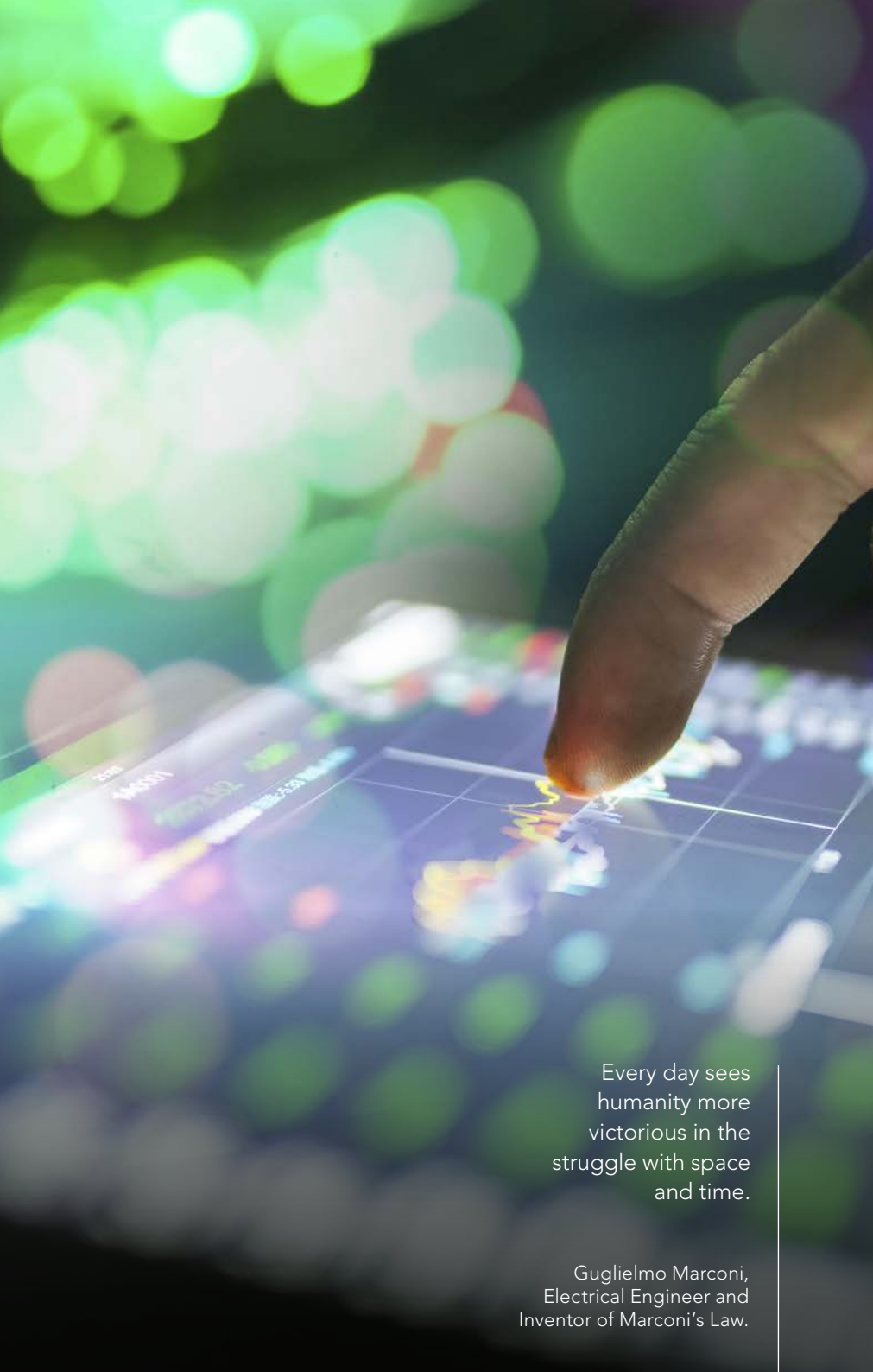
Painting a Common Operational Picture

Managers, employees, and customers have a common need—to know what is happening and where, at the moment it is happening.

Historically, map-based tools have provided relatively static views of networks and the environment they operate in. But advances in geospatial processing power have created the opportunity to bring together live operational data and multilayer geospatial data into a single view for enhanced situational awareness.

Streamed data feeds from a wide range of sensors (GPS devices, mobile devices, and even social media) can now be incorporated into GIS applications, transforming them into frontline decision-making tools. Live filtering and processing enables the detection of critical events and their locations as they happen. By setting appropriate thresholds, operations can be monitored by exception and without interruption. Dynamic assets (such as vehicles, people, or aircraft) and stationary assets (such as weather monitors and substations) can be viewed in the same picture. When locations change or specified criteria are met, multiple activities can be triggered. Alerts to key personnel, map updates, event recording, and interactions with other enterprise systems can all be initiated. Alerts can be sent across multiple channels, such as emails, texts, and instant messages.

For stakeholders, the result is a major step forward in operational intelligence. Whether planning for the future or providing timely emergency coordination, live, embedded operational data in geographic context enables faster response times, saves money, and possibly saves lives.

Every day sees humanity more victorious in the struggle with space and time.

Guglielmo Marconi,
Electrical Engineer and
Inventor of Marconi's Law.

STRIKE NOISE   Bng 86°   267mi

Strikes/min	Close/min	Noises/min
0	0	0

Total Strikes	Total Close	Total Noises
3	0	8

Lightning type distribution

Cloud-ground	+ 67%	– 33%
Count	2	1
Intracloud	+ 0%	– 0%
Count	0	0

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Squelch	11	Upload	Enabled
Persistence	110 min	Capture	Active
Range	750 mi	Receiver	Enabled

During storms, ScottishPower monitors, in near real time, which transformers have gone down and which customers have lost supply.

Lorna Nightingale, Head of Marketing, Esri UK, Esri UK Annual Conference 2015.

Robust Data for Regulatory Reporting and Engagement

Keeping customers' lights on is the ultimate measure of reliability and availability.

Utilities face significant challenges in the management of supply while ensuring that environmental and social responsibilities are met. And regulatory fines add further incentive to maintain supply. Extreme weather conditions can cause outages to even the most robust network, and in such situations, the regulatory fines do not apply. But this exemption creates a new challenge. To avoid fines, electrical distributors need to provide evidence that outages were caused by exceptional conditions.

Geospatial technology has enabled a system that monitors power outages during storms and provides the regulator with auditable reports that identify where storm-induced outages have occurred. This provides them with the confidence it needs. In addition, the system shows the location and number of customers without power in near real time. This helps operational management allocate emergency response units to priority areas, ensuring that the maximum number of customers have power restored in the shortest possible time.

We estimate that we have improved the overall efficiency of our vegetation management process by around 20 percent.

Nathan Caley, IT manager, ENGIE (formerly West Coast Energy).

Empowering Fieldworkers

Electricity cables and vegetation don't go well together. Transmission utilities have a statutory duty to ensure that trees and other vegetation do not come into contact with overhead power lines. Unstable trees can pull cables down, causing outages and risking public safety.

The traditional approach to vegetation management was labor intensive. Network planners, surveyors, and vegetation management teams would pass around marked-up paper maps as they identified and scheduled work and tracked progress. The process was time-consuming and error prone, with data replication and rework. Furthermore, fieldworkers had to spend a significant percentage of their time in the office performing administrative tasks when they could have been focusing on the job in the field.

Today's process can simultaneously be streamlined and made more flexible through automation and integration

of desktop and mobile geospatial solutions. Office-based planners electronically mark up sections of the network for surveying. Field-based surveyors capture the location of trees that are close to power lines, together with distances, images, and requirements for road closures or circuit outages. The increasing use of Lidar data is further streamlining processes.

Current technology enables workers to produce more accurate and consistent surveys faster. Surveyors are able to spend more time in the field, and administrators save time on data entry and job scheduling.

Moving Forward into a Transformed World

This e-book has shown how the emergence of increasingly powerful geospatial technology as a system of engagement is helping utilities tackle the many new challenges they face on the journey to a smarter, more agile world with fewer carbon emissions.

By making location information a key part of stakeholder communication and collaboration, these systems become more accessible, flexible, and powerful. Geospatial technology will also allow improved operational management of the network. As transmission and distribution evolve from one-way flow to a two-way smart grid, supply and demand become increasingly distributed and dynamic. Managers will require more precise and granular location information for key processes such as demand-side response and active network management.

A paradigm shift in the way electricity will be produced.

Professor Roger Kemp, IET Expert Group: Power Network Joint Vision.

Bringing the Field and the Office Closer Together

Whether online or offline, field staff can access maps and view real-time information, making it easy to report problems, complete work orders, and update maintenance records.

Increased Insight into Assets

Workers can have an up-to-date picture of asset performance, maintenance history, improvement projects, and inspection plans. Integration with business systems enables tracking of the financial performance of assets.

Better Community Engagement

A map is a powerful way to communicate an idea, a plan, or what is currently happening. The public can actively collaborate using maps that are quickly and easily created and shared.

Operational Intelligence

A picture can be built up of services, deliveries, people, vehicles, weather events, and social media and then shared with a chosen group of people, inside or outside the organization.

By applying innovative thinking and leveraging the power of location, utilities can rest assured that location technology is evolving with them and supporting them on their radical transformation.

To discuss how this way of thinking can be applied in your business, please contact Esri.

About Esri

Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them. Esri has cultivated collaborative relationships with partners who share our commitment to solving Earth's most pressing challenges with geographic expertise and rational resolve. Esri pursues mapping and spatial analysis for understanding our world with visionary products and services that define the science of GIS. ArcGIS is a complete system for designing and managing solutions through the application of geographic knowledge. Esri helps you build and manage great information products by providing the ultimate platform for geospatial integration and application.

Esri supports utilities with skills, knowledge, and resources in the following:

- Mapping data
- Geoprocessing
- Data visualization
- Spatial analytics
- Data content services
- Big data aggregation

With these capabilities, Esri can help you improve stakeholder engagement by building geospatial knowledge into the core information infrastructure of your business.

For more information, please visit www.esri.com/industries/electric.