

THE POTENTIAL OF THE INTERNET OF THINGS FOR UTILITIES



Improve Operations and Overcome Challenges
UTILITIES WHITE PAPER



Today's utilities are striving to achieve digital transformation, just like organizations across every industry. One of the major technologies helping utilities find success—whether they deliver electricity, gas, water or telecoms to their customers—is the Internet of Things (IoT). Smart sensors, gateways and reliable communications networks are enabling utilities to increase efficiency and effectiveness in asset management. They also enable remote monitoring and control, increase physical and data security and the productivity of workers, reduce costs, and help address the serious issues of resource depletion faced by all regions of our planet.

Utilities dealing with mounting challenges

Gas, electric, water and other utilities carry a serious responsibility—to provide critical, life-sustaining resources to homes and businesses while protecting public health and the environment. Today, utilities face significant challenges that make it difficult to do their jobs efficiently and cost-effectively.

Aging infrastructure and budget shortfalls

Most of the power grid infrastructure in the U.S. was built in the 1950s and 1960s—and had an original life expectancy of about 50 years.¹ In the country's aging water infrastructure, the average pipe was built 45 years ago and has recently seen increased breakage.²

It's no secret that American utilities infrastructure is at a tipping point and urgently needs improvement. Local, state and federal government agencies are doing what they can to set aside funding for these improvements, but it's not happening fast enough to truly solve the problem for many utilities.

Sometimes, increasing spending isn't the issue.

The natural gas industry, for instance, tripled spending between 2009 and 2017, which allowed gas companies to increase the rate at which they replaced old pipes (as the average gas main was almost 35 years old). Between 2010 and 2020, gas companies replaced an average of 5,600 miles of gas mains per year. At that rate, however, it would take 230 years to replace every pipe in the system.³

Aging workforce and loss of institutional knowledge

The utilities industry is having a hard time recruiting younger employees to fill available jobs. The average age of workers in the industry is 50 years old, and the U.S. Department of Labor has estimated that as much as 50% of the current energy utility workforce will retire within the next 10 years.⁴

1. "The Future of Utilities Infrastructure," T&D World (November 9, 2020) ▶
2. "Washington, DC 2022: Future-proofing our water infrastructure," McKinsey (April 12, 2022) ▶
3. "A New Approach to America's Rapidly Aging Gas Infrastructure," RMI (January 6, 2020) ▶
4. "The ageing workforce's brain drain," Smart Energy International (September 2, 2019) ▶

Resilience and regulation



These retirees will include key personnel, such as engineers, plant operators and managers, technicians, and line workers. Along with these employees will go their depth and breadth of knowledge and experience. This could result in loss of efficiencies, longer downtimes for servicing, the need for more extensive training and increased worker fatigue, which leads to a bigger risk of accidents or mistakes.

Need for increased resilience to extreme weather

A recent Deloitte survey reported that the extraordinary unpredictability and intensity of climate and weather events in 2021 are driving the need for utilities to put a greater focus on building resiliency into their infrastructure and processes going forward. For example, the survey found that more than half (51%) of respondents said that extreme weather has affected the reliability of electricity delivery in their territory more than usual in the past year.⁵

With climate change affecting weather around the world, utilities will need to “harden” their infrastructure to keep energy delivery consistent while avoiding major cost increases.

Additional and increasingly stringent regulations

Local, state and federal government regulations—as well as mandates created by industry associations—are continually evolving and becoming more stringent to address energy-saving goals. For instance, the Biden Administration aims to slash the utilities sector’s carbon emissions 80% by 2030 and hopes to achieve full decarbonization by 2035. That’s a tall order. Deloitte experts estimate that more than 60% of U.S. electricity is still generated by carbon-rich sources.⁶

States are also increasing regulations to address sustainability issues, which puts pressure on utilities to offer greener solutions and increase output in some cases. For instance, a bill passed in August 2021 made California the first state to make electric heat pumps and appliances the default standard for new residences and businesses.⁷

As electric appliances are mandated, use of gas decreases—but electric grids must generate more energy than ever.



FORCE 5, INC.

Based in Miami, Force 5, Inc., provides unmanned self-service kiosks that scan badges or biometrics and automatically check every requirement a utility sets for each worker. To meet the demanding user, availability and environmental requirements, Force 5 kiosks require the most rugged and robust hardware and software—needs that remained unmet by embedded technology from other vendors.

Force 5 integrated Panasonic TOUGHBOOK® tablets, which delivered the durability, performance and touch features necessary to provide 24/7 availability at utility sites. Now Force 5’s kiosks and internal software controls effectively stop violations and threats in real time at the point of entry. These devices provide the reliability that Force 5 requires to provide customers with always-audit-ready compliance solutions. Read the **complete case study** for more details.

5. “2022 power and utilities industry outlook,” Deloitte (2021) ▶

6. Ibid.

7. Ibid.

Operational challenges



POWER & ELECTRIC

IoT can improve the efficiency and performance of the power grid in three primary ways: first, by gathering data from sensors to increase grid resilience; then through more effective management of resources; and finally, through optimization, where electric companies can make better-informed decisions about power usage and generation. The IoT also assists in more effective asset management through capabilities such as smart metering, physical location surveillance and monitoring, burglary detection, dynamic charging, and power rerouting and restoring when a system goes down.



The IoT can help utilities overcome their challenges

To address and resolve their many challenges, utilities are turning to technologies such as the Internet of Things to connect previously siloed data sources and aggregate and analyze data more effectively.

This allows them to optimize operations, improve efficiencies, better manage their systems and assets, and identify and fix problem areas before they escalate.

The IoT refers to the billions of physical internet-connected devices around the world—such as cameras and sensors—that collect and share data in real time.

27 billion
2025 It is expected that by 2025, there will be approximately 27 billion connected IoT devices.⁸



Utilities companies are adopting IoT technology rapidly. A report published by Allied Market Research reported that the global IoT in the energy market accounted for \$109.19 billion in 2021, and it's estimated that it will garner \$703.52 billion by 2031, growing at a CAGR of 20.6% from |2022 to 2031.⁹

Improving operations

Armed with a wide range of real-time data types from IoT devices and sensors, utilities gain a more informed view into their operations and workflows. Before the IoT, managers had to make decisions using experienced intuition or extremely subjective observation. Now utilities have access to much more intelligence through objective data analysis, which can lead to more sophisticated, accurate insights that people couldn't gain in the past.

8. "State of IoT 2022: Number of connected IoT devices growing 18% to 14.4 billion globally," IoT Business News (May 19, 2022) ▶

9. "Internet of Things (IoT) in Energy Market to Hit \$703.52 Billion by 2031: Allied Market Research," Globe Newswire (July 14, 2022) ▶

Benefits for utilities



The IoT can help utilities:

- Gain a more realistic and accurate view of asset health and condition.
- Make more meaningful investment and operational decisions.
- Discover how to best balance risk, compliance and reliability.
- Better track and manage assets and reduce energy waste and consumption.
- Ensure operations are working smoothly with mobile inspections, surveys and assessments.
- Work smarter and faster to diagnose and restore service during unexpected disruptions.
- Manage vegetation more effectively.
- Reduce downtime with access to predictive maintenance data.
- Capture and access data at the edge to streamline processes and quickly respond to updates about shortages, equipment disruptions and more.

IoT system components for utilities

The IoT is made up of components that vary depending on each utility's unique challenges and priorities. Often, these systems are built incrementally, so flexibility and scalability of IoT technology is important. While some utilities prefer a major technology overhaul, many prefer to start with "low hanging fruit" with a quick return on investment.

Most utilities have at least some of this basic infrastructure to integrate with IoT:

- **Supervisory Control and Data Acquisition (SCADA)**—An electronic monitoring and control system that sends instantaneous data on system operations; for water companies, for instance, these would include tank levels,

TELECOMS

The IoT is generally dependent on telecommunications networks because of the many and various devices and sensors that transmit their data via a network. Much of the value of the IoT for telecoms lies in enabling customers to profit from a wide range of use cases, from home automation systems to smart metering to industrial monitoring systems. Internally, however, telecoms are putting the IoT to work to gain critical insights into their own operations, monitor their assets (such as cell towers and telephone lines), maximize resource utilization, curb their own energy usage, and make fleet and supply chain operations more efficient.



equipment status, and monitoring parameters (temperature, pH, disinfectant levels, etc.). SCADA allows for off-site monitoring/control and emergency callout.

- **Geographic Information System (GIS)**—A combination of mapping and data, showing the location and detailed information of the utility's assets.

Integrating data



- **Computerized Maintenance Management System (CMMS)**—Tracks work orders for preventive, predictive and reactive maintenance for system equipment.
- **Utility asset management software**—Tracks inventory, age, condition and replacement of system assets.
- **Smart meters**—Replaces manual-read meters with automated meter reading (AMR) or advanced metering infrastructure (AMI). In addition to recording water or energy use, these smart systems can have additional sensors to help locate water or power leaks, identify system anomalies or malfunctions, and provide automated shut-off and turn-on capability.

Other IoT systems can also provide data to enrich utility enterprise software, hydraulic modeling software, customer information systems, billing and fleet tracking software. As the technology matures, new software, hardware and IoT solutions will emerge, such as systems that integrate with other “smart city” utility networks including electric, gas, lighting, weather monitoring and social media. As technologies become available, it will be increasingly important to integrate the data so that it is visual, understandable and easily usable.

IoT enhances the effectiveness and efficiency of mobile workers

Field workers serve as “boots on the ground” for utilities companies. Responsible for operating and maintaining equipment, pipelines, power lines, turbine farms, solar arrays, treatment facilities and pumping systems, these employees can work shifts covering 24 hours per day, 7 days per week in the field, often in remote locations. In addition to their scheduled duties, they must respond to emergencies and customer complaints.

Many utilities workers in the field are using mobile devices and applications to gather data from IoT and standard utilities systems to help guide their work and

WATER/WASTEWATER TREATMENT

IoT in water treatment relies heavily on smart sensors installed at various points in the water system. These sensors collect data, such as water quality, temperature changes, pressure changes, water leak detection and chemical leakage detection, and send it back to the monitoring systems. Using this data, water treatment managers can more efficiently forecast usage patterns, set peak pricing, and keep equipment and machinery in good working order—especially when they combine and analyze a wide range of IoT data, including information they get from process monitoring and control, flow measurement, utility billing, maintenance management, system modeling, and others.



make informed decisions in real time. These devices, data and applications empower them with:

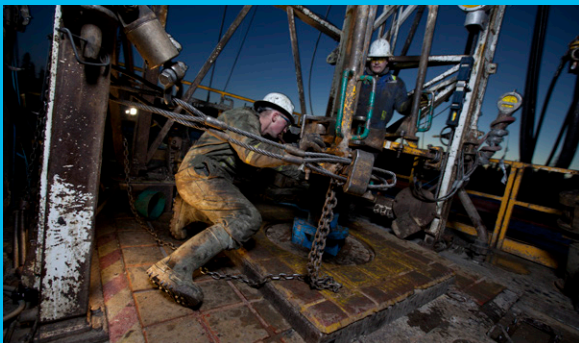
- Clear, quick and detailed communication
- Accurate locations of infrastructure
- Early problem identification and resolution
- Automated meter reading (AMR)
- Preventive maintenance schedules and work orders
- Effective response to natural or manmade disasters

Integrating technology



OIL & GAS

Managing assets is critical in oil and gas industries. They can be spread out over thousands of miles and include everything from expensive drilling equipment to pipelines, vehicle fleets and the oil itself. The job becomes even more challenging when you add in a distributed workforce, thousands of parts in scattered warehouses, and remote drill sites and refineries. Oil and gas companies are using IoT to track and monitor those assets, as well as identify potential problems or malfunctions in equipment that may be extremely remote or hard to reach. IoT monitoring combined with artificial intelligence (AI) can also enable preventive maintenance, saving immense time and money.



SeekOps

California-based SeekOps developed a drone-based gas-leak detection solution using sensor technology developed for the Mars Curiosity Rover—because those sensors, designed to accurately measure trace amounts of methane gas, could help identify methane leaks at production and storage facilities and cities. However, SeekOps needed a mobile device component that was reliable, versatile, rugged and easy to read in the field.

SeekOps paired their drone with a Panasonic TOUGHBOOK tablet due to its 10" form factor, daylight-readable screen, long battery life and rugged durability. Thanks to the tablet, purpose-built for energy professionals, SeekOps now offers a technology platform that makes detecting process emissions and gas leaks significantly faster and more accurate. Read [the complete case study](#) for more details.

Panasonic Connect provides IoT applications and devices that can improve operations, increase efficiency and simplify asset management

At Panasonic, we understand the importance of the IoT and how it can transform utilities operations. We offer a range of software, devices and services that can help you design the best mobile solution for your workforce.

Panasonic Connect has a robust ecosystem of partners and software for utilities-specific applications that include:

- **Rapid Application Development Platform**—A development platform to rapidly develop, test, deploy and manage your enterprise software on mobile devices.
- **First Responder solutions**—All TOUGHBOOK rugged devices are certified with major carriers and ready to activate, including FirstNet and Verizon.
- **TOUGHBOOK Smart Essentials (Smart Service Suite for Utilities)**—A cloud-based software tool providing real-time, actionable insights into the health and utilization of your mobile infrastructure, including devices, applications, batteries, cellular,

Integrating technology



Wi-Fi, SIM cards, disruptions, reboots, operating systems, patches, hotfixes and much more.

- **Vegetation management**—Save time and money with a complete vegetation management planning solution that can coordinate field workers with managers in the office.
- **Utilities workforce management**—A software suite for mobile workforce management, automated vehicle and worker location, mobile GIS, meter reading, and smart grid deployment operations.
- **Augmented reality (AR)**—AR capabilities for field workers such as utility technicians, with 3D, first-person equipment display, asset status, maintenance details, task assignments and other critical information.
- **Regulatory compliance**—Electronic logbook software for power, water and waste treatment, and oil and gas companies that aids regulatory compliance by consolidating data from automated instruments, maintenance management systems, and SCADA systems with digitized data such as shared documents, spreadsheets and logbook information.
- **Operations management**—Mobile, web and automation solutions seamlessly integrated for more efficient management of water treatment plants, power companies, oil and gas, and more.
- **Resources management**—A portfolio of smart networks, software, services, smart meters and sensors to help utilities better manage energy and water for the people they serve.
- **Unmanned aerial systems (UAS)**—Complete UAS solutions, including drones, operations software and accessories that can help utilities companies monitor remote assets and gain insight into equipment condition without requiring a human worker on-site.

Purpose-built for heavy-duty work

Mobile devices for utility workers have a tough life. They may be left in hot trucks, carried in freezing or rainy

weather, handled by wet or dirty hands, and used while wearing gloves. They may be bounced around in vehicles or accidentally dropped. To withstand these conditions and still work flawlessly, devices should be:

- Rugged enough to withstand dirt, grease, moisture, vibration, extreme temperature and weather, and accidental drops
- Compatible with the utility's software and IoT infrastructure
- Easy to configure and use
- Capable of accessing FirstNet for emergency response

Panasonic Connect has a robust lineup of TOUGHBOOK devices that are designed to perform in the harshest environments. Our rugged mobile devices for utilities workers include:

- **TOUGHBOOK 40**—A rugged laptop with eight modular areas, including innovative modular expansion packs (xPAKs)—such as an optical drive, authentication reader, IO ports and barcode reader—that are user upgradeable. Optional certification for hazardous environments and wireless options that include GPS, 4G and 5G.
- **TOUGHBOOK G2**—A rugged 2-in-1 modular laptop/tablet with an 18.5-hour battery. Options include a second hot-swappable battery, 4G LTE or 5G broadband, and hazloc certification for environments with flammable vapors, gases and liquids. Three expansion areas enable user-upgradeable capabilities such as a serial port and thermal camera.
- **TOUGHBOOK 33**—A rugged 12" 2-in-1 device with 3:2 display for easy handling and improved readability—plus a detachable tablet with infrared camera for Windows Hello® support, hot-swappable twin batteries, rubber keyboard, and CAC smartcard, barcode and fingerprint readers. Optional GPS or 4G LTE and optional certification for hazardous environments.

RENEWABLES (WIND, SOLAR)

IoT has enabled the creation of smart grids that allow utilities to manually switch between renewables and traditional power plants to deliver a consistent supply of power to consumers. This switching allows utilities to take advantage of renewable energy sources as they become more popular. IoT also enables remote monitoring of equipment—a valuable benefit considering wind and solar farms can be located in rural or desolate areas. Sensors can transmit positioning data as well as identify potential malfunctions, so operators can optimize resources and address issues before they escalate.



Value-added services

Our services for utilities can help you get the most out of your Panasonic investment. They include:

- **Kitting and deployment**—We can help you get your TOUGHBOOK mobile computers into the field quickly and ready to work. Our deployment services include kitting with third-party accessories such as network adaptors, barcode scanners, straps/holsters and expansion modules.
- **Vehicle mounting and installation**—We offer custom in-vehicle mounting solutions and installation services for a wide range of vehicles. This can help simplify installation planning and management, maximize worker productivity, and ensure easy serviceability.
- **Battery monitoring**—With this cloud-based service, we proactively manage your batteries to keep devices in continuous use.
- **Mobile device management**—We can help you monitor, manage and update devices in house or remotely with mobile device management software.
- **Security enhancements**—We can help you protect your TOUGHBOOK devices and data with security applications that implement layers of log-on authentication, remotely lock a stolen or lost device, remove partial or all data, and comply with industry regulations.

Learn how Panasonic Connect can help your workforce better access IoT data and improve operational efficiency. Visit **TOUGHBOOK mobile solutions for utilities** ▶

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