



TRANSFORMING INDUSTRIES:

ENERGY AND UTILITIES

How the Internet of Things will
transform the utilities industry

GET THE
WHOLE
PICTURE

GETTING TO KNOW UTILITIES

Utility companies are responsible for managing the infrastructure that provides vital services to communities, including electricity, gas and water.

If we look at the energy market in most countries, the utility sector is usually split between different types of activity. These include:

Upstream activities

Actions relating to the production or generation of the resource. These are sometimes performed in a competitive environment, in other words deregulated. This can be the case even if subject to authorization or concession from the public authority.

Resource trading on wholesale markets

Activities that are by definition performed in a competitive way, even if there are rules and regulations in place to ensure physical delivery and to facilitate financial transactions.

Delivery is then carried out in two stages. The first is the transportation from production site to local area transmission network. It then moves from the transmission network to the consumer through a distribution network. These activities, forming a natural monopoly, are often strongly regulated – even if not performed by a public entity.

Data-supported services may be present in more developed energy markets. They are typically unregulated, with the aim of providing stakeholders with services related to the provision or exchange of common data – such as metering and customer information – or new business services.

The sale of energy resources is performed by energy retailers, who interact directly with customers. In countries where the market is highly regulated, the sale of energy and provision of retail services is undertaken by distribution network operators.

An industry in transformation

The following key drivers are bringing about a significant, disruptive transformation in the utilities industry:

Sustainability and decarbonization

One political and social driver is the end-to-end decarbonization of the energy system, in order to achieve sustainability targets. This is particularly relevant to European markets that are working towards

a 20 percent renewables target for 2020, and also to certain suppliers in North America and China. This is driving the introduction of distributed, intermittent and renewable energy generation. It also adds focus to system energy efficiency, consumer involvement, peak demand reduction and the electrification of transport systems, such as electric cars. Achieving these goals requires solutions for measurement, such as metering and monitoring, as well as dynamic grid operations and consumer involvement.

Availability and security of supply

The industrialized electricity markets in Europe, North America, Australia and New Zealand are characterized by aging grids and workforce assets. This creates a need to manage assets more efficiently using remote monitoring and management and data analysis tools. This is primarily a technical issue, which can lead to losses. However, non-technical losses such as theft are also impacting revenues in many markets, and reducing utility companies' abilities to invest in their infrastructure and avoid technical losses.

Furthermore, the introduction of intermittent renewable energy generation is creating instability in the electricity grid, putting more pressure on assets. This could represent a threat to the availability of supply if not managed accordingly.

Market liberalization and competition

The European Commission, as well as some areas of North America and Asia Pacific, are enforcing market liberalization as a political driver to achieve reduced energy prices and improved customer services. Ultimately this creates new challenges for utility providers, such as increased customer churn and the need for new revenue streams. It also puts pressure on operational efficiency and service innovation, triggering ICT investments.

The digitalization of the energy industry will be crucial to addressing these trends.

The role of ICT

Looking exclusively at electricity and gas distribution and supply, there are two areas in which ICT will play a major role:

Electricity grid operations will evolve from purely static to highly dynamic, with automated operations-based field



sensors and actuators, M2M platforms, and operational data analysis. As a consequence, intelligence for managing the electricity grids will move from operations centers to the edge of the grid, in the distribution network. This will enable distribution network automation and self-healing networks, among other things.

Energy retailers will become consumer service companies rather than point-of-load administrators. At the same time, consumers will increasingly become active market participants as micro-generators, adding value to electricity systems by shifting consumption. This will require the deployment of ICT platforms enabling enhanced, innovative consumer services and consumer participation in electricity markets.



Smart Grid: the intelligent network

The Smart Grid technology concept was introduced to enable market transformation. Smart Grids can intelligently integrate the actions of all users connected to it – both generators and consumers – in order to efficiently deliver sustainable, economic and secure electricity supplies.

THE RISE OF THE INTERNET OF THINGS

The Internet of Things (IoT) describes the design and implementation of internet-based systems and solutions that interact with the physical environment. As a concept it builds upon machine-to-machine (M2M) applications and technologies, which have been around since the advent of computer networking automation. The IoT will continue to rely on M2M solutions to bridge the gap between the digital and the physical.

With the advent of the IoT, devices are capable of sharing data by connecting to the internet, rather than communicating by wire or wirelessly through a specific application to a wide or local area network.

The difference between M2M and the IoT

The IoT resembles M2M in that it connects devices to networks. But while M2M is associated with specific solutions, primarily in closed systems, the IoT instead refers to the design and implementation of internet-based systems and solutions that interact with the physical environment. It is about extending the internet to provide a means of communication between two things that could benefit from a connection.

The shift from M2M to the IoT is not merely a result of ongoing technology development, but more a shift in perspective. M2M solutions have historically been specific and problem-driven, concerned primarily with maximizing efficiency using the information provided by connected devices. Solutions based on the IoT frequently utilize the existing communication infrastructure, and aspire to create business value and answer complex innovation problems across whole supply chains. It feeds off the open information paradigm, mobile networks and cloud solutions, creating entirely new areas to explore.

IoT requirements for utilities

Utility companies have used M2M solutions for a long time, primarily for control of power grid communications between different devices, and remote reading of commercial, industrial and residential customers.

There is now a growing need to monitor the distribution grid, in order to guarantee reliability. The cost of sensors has also gone down drastically. As a result, the number of connections and the volume of grid data will increase rapidly.

In addition, as smart meters are deployed in mass volume, the number of connections to the Meter Management Platform and the volume of data to be collected will multiply at least 100 times over. This surfeit of data will trigger new applications that could benefit grid operators, for instance:

- > Use of smart meter data and/or network data for improving grid fault location, identification and restoration in real time.
- > Use of grid and meter data for implementing efficient local energy efficiency measures, for example local energy loop optimization via monitoring, or control of local energy generation and load.
- > Use of grid and meter data to create more efficient market mechanisms – both wholesale and local.

Meter data may also allow retailers and energy service providers to design new services around energy efficiency. These could apply either to residential or industrial customers.



How does the IoT apply to utilities?

The global number of devices being managed by utility companies is projected to grow from 485 million in 2013 to 1.53 billion in 2020. The industry is the second largest source of M2M service provider revenue, behind the automotive and transport industries. These devices can range from meters, grid sensors and actuators to energy boxes and electrical appliances. They are used for applications such as grid monitoring and control, metering, asset management and tracking, and field force communication.

Impacting the energy value chain

Grid operators are usually organized in silos, meaning separate divisions for grid asset management, telecommunications network management and metering system management. The ability to use different data, including external data, will undoubtedly have an impact on their business processes and organization.

Retailers will also face competition from new energy service providers – companies such as Apple and Google – who will try to secure as much customer value as possible.

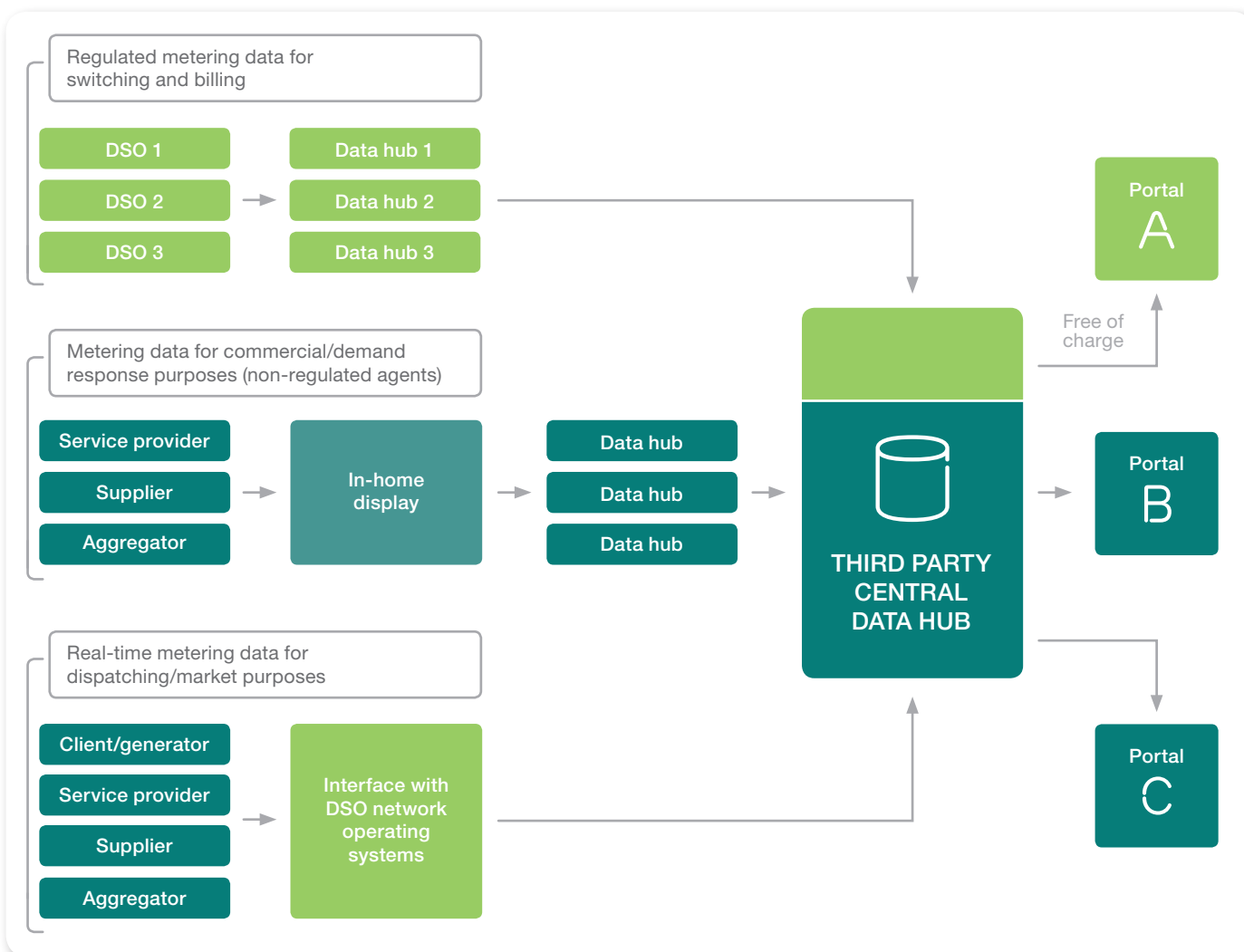
Connected objects in the home are creating a new and previously unavailable flow of energy data. Electrical vehicles, appliances and home automation devices

such as thermostats will soon form a completely new body of data. This will quickly become much larger than the grid operators’ traditional flow of data, and will be transmitted through a customer box connected to public internet – with no utility-specific solutions.

With new players like telecom and energy companies able to enter the energy data market and create new services, utility retailers and operators are eager to monetize it.

New data platforms, operated by current grid operators or by third party companies, may be put in place in order to bring new services to the end customer.

Example of implementation with a central data hub operated by a third party market facilitator



PUTTING IT ALL TOGETHER

The industry has always relied on utility-specific protocols for its operational data exchange. But for the past 15 years, it has been moving towards the digital world. Let us take, for example, the IEC 61850: a protocol and object model used for communication between Intelligent Electronic Devices (IEDs) within a substation, or between IEDs and a control center. This data model is now mapped on RESTful web services, and transmitted over TCP/IP and 3GPP networks. So we can infer that internet standards have already largely impacted utility connectivity solutions.

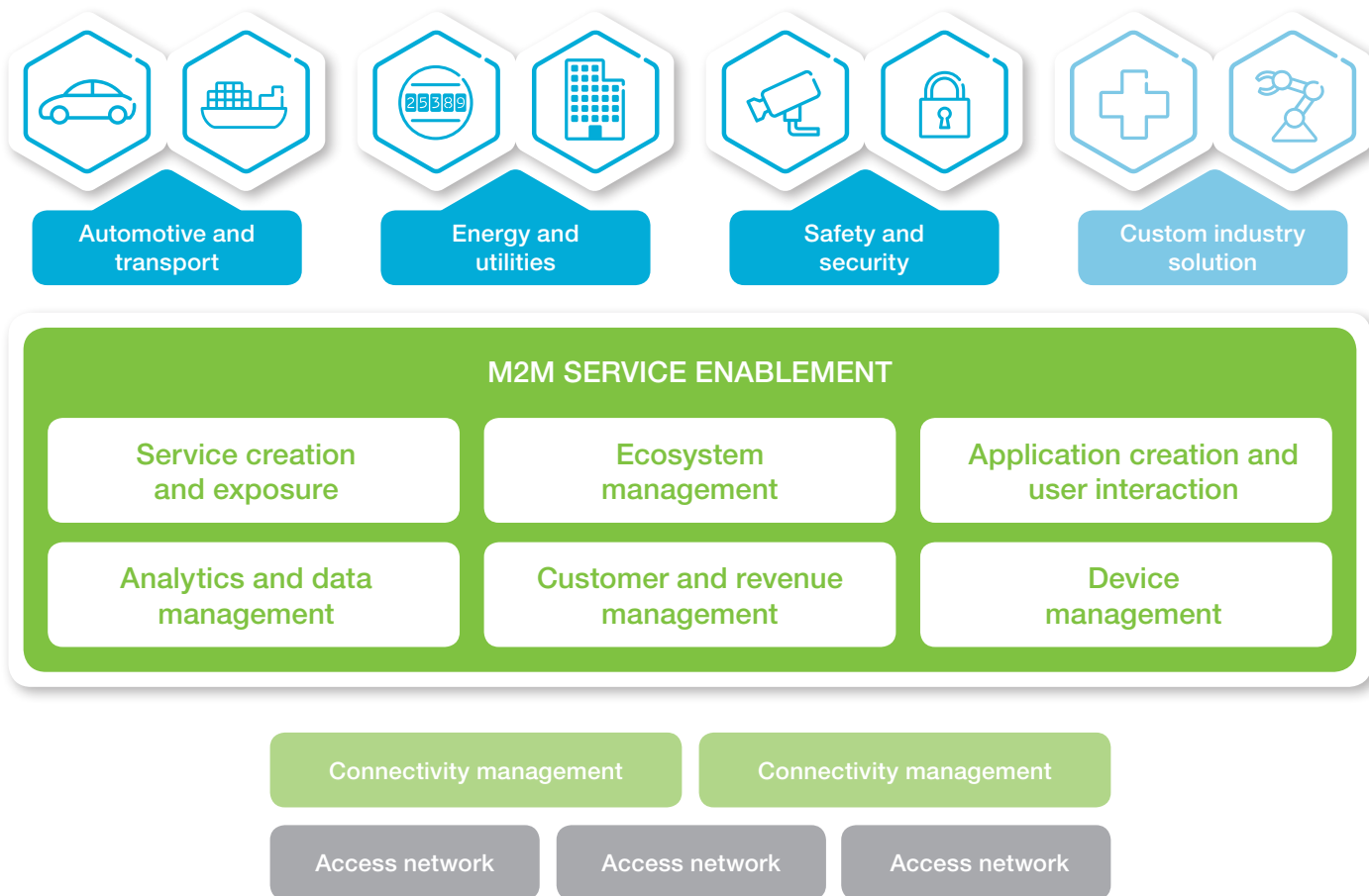
Beyond connectivity, Network Management Systems (NMS) will become a key component of the IoT. Utility providers will have to manage heterogeneous communications systems – multi-vendor, multi-protocol

networks with varying quality of service constraints. The NMS for utilities will benefit from the telecommunications industry, which has already dealt with issues of scalability, the need to support legacy protocol and devices, security, integration with back office and information presentation.

The IoT will rely on platforms that can process a large volume of data and enable the building of applications and services. Here again, the platforms developed for the telecom industry will offer the required functionalities at the lowest cost, using the latest internet technologies for cloud and service offerings.

An advantage of using this type of platform is that energy service providers may, where regulation allows, offer a bundle of services in a similar way.

The Ericsson M2M platform



Customer use cases

Utility companies have started building basic Smart Grid communications and metering infrastructures, and are now looking at further ways to maximize possible uses for the new data.



AUSGRID, AUSTRALIA | Implementing LTE for Smart Grid communications

Customer objective

- > Unified Smart Grid communication system to ensure stable operations and optimize energy utilization
- > Predictable Smart Grid applications
- > Security architecture with cyber security controls
- > M2M wireless device optimization

Solution

- > 4G network design and deployment
- > Design and integration of multivendor wireless access network
- > Telecommunications network able to transmit data between 12,000 smart monitoring devices
- > WiMAX installation for Smart Village
- > LTE pilot carried out in 2011

Benefits

- > Economies of scale for modules, devices and equipment
- > Sensor deployment anytime, anywhere
- > Quality-of-service enabled network with short latencies
- > A future-proof communication network that can evolve



ELEKTRILEVI, ESTONIA | Deploying Advanced Metering Infrastructure (AMI)

Customer situation

- > Was undergoing meter management legislation
- > Undertook a national smart meter deployment with very limited resources

Solution

- > Experience in technology and innovation, working with key suppliers such as L&G
- > New managed services contract to operate during the build phase
- > Platform for automatic meter reading and control

Benefits

- > Savings through increased operational knowledge and elimination of manual meter reading
- > Revenue protection due to fraud detection
- > Enhanced customer satisfaction



E.ON, SWEDEN | AMI as-a-Service

Customer objective

- > Reduce the number of long-term partners attached to smart metering solution
- > Optimize company workforce

Solution

- > Ericsson Smart Metering as-a-Service (SMaaS) for meter reading and control, management and monitoring – as just one part of the offering

Benefits

- > Improved efficiency



STOCKHOLM ROYAL SEAPORT, SWEDEN | Smart home services

Customer objective

- > Smart city communication infrastructure, with a primary focus on energy use cases within the Stockholm Royal Seaport microgrid
- > Energy use cases, including distribution automation for a self-healing microgrid and active house for energy efficiency

Solution

- > Unified Smart Grid communication system supporting the Service Enablement Platform for M2M applications
- > Design and deployment of a distribution automation solution via the public 4G network
- > Smart home architecture

Benefits

- > Economies of scale for modules, devices and equipment via the use of mainstream technologies
- > Future-proof communications network and IT architecture that can evolve

Share the value

In all, these findings represent the importance of utilizing IoT for new business, as well as using field-proven methods. In order for utility players to transform along with the industry, they must deploy solutions with the ability to evolve. It's all about building an ecosystem where many different players can share in the overall value created.

Ericsson is the driving force behind the Networked Society – a world leader in communications technology and services. Our long-term relationships with every major telecom operator in the world allow people, businesses and societies to fulfill their potential and create a more sustainable future.

Our services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

With more than 110,000 professionals and customers in 180 countries, we combine global scale with technology and services leadership. We support networks that connect more than 2.5 billion subscribers. Forty percent of the world's mobile traffic is carried over Ericsson networks. And our investments in research and development ensure that our solutions – and our customers – stay in front.

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