

How to Leverage Smart Meter Opportunities with Future-Proof Designs



The role of metering is changing—and advances in technology are driving that evolution. Early connected meters reported consumption once a month, but that model is fast becoming outdated. Relationships between energy providers and their customers are growing deeper and more complex. Regulatory bodies around the world are setting energy savings mandates that utilities must meet. Consumer-facing apps, demand response programs, software, and other services are becoming key elements in the smart metering market.

And the market is exploding. According to a 2018 IHS Markit Technology [report](#), “Annual shipments of smart electricity meters exceeded 100 million units for the first time in 2017, whilst total meter shipments reached 170 million.” The same report states that meter manufacturers generate nearly \$5 billion every year for hardware, software, and services. Similarly, the smart water meter market is predicted to reach \$5.5 billion by 2021 ([Markets and Markets Research](#)), and the global smart gas meter market will grow to \$1.62 billion by 2025 ([Frost & Sullivan](#)).

To compete in a changing market, utilities must look closely at existing technology and create a plan for the future that considers key issues such as customer engagement, cellular network evolution, and the increasing prevalence of consumer facing applications.

Adapting to the Market

The past decade has seen a tremendous shift in the energy landscape, marked by a rapidly expanding smart meter market. Automated Meter Reading (AMR) has given way to Advanced Metering Infrastructure (AMI) or smart metering, providing utilities with a constant connection to meters. Today’s smart meters also enable utilities to check grid status instantly and manage many problems remotely.

On the consumer side, Internet of Things (IoT)-based smart home technology is driving increased interest in energy usage, motivating consumers to monitor their consumption and assert more control over it. Utilities and other energy stakeholders are developing mobile apps that educate consumers about energy usage, allow them to control

Contents

Adapting to the Market	2
Choosing a Standard	3
NB-IoT	3
LoRaWAN	3
LTE-M	4
2G/3G	4
4G/5G	4
Choosing a Communications Module	5
Size and form factor	5
Power Usage	5
Longevity	5
Anticipating Future Changes	5
1. Is all hardware secure?	5
2. Can the solution handle high sampling rates?	5
3. Does the system allow for low latency communications?	5
4. Is software flexible and easy to upgrade?	5
5. What is the longevity of the module provider?	6
Telit: A Proven Leader in Cellular Modules for Smart Metering	6
Versatile Form Factors	6
Long-Term Availability	6
High-Speed IoT Solutions	6
Software-Based SIM Technology	7
Expert Support	7
Market Data	7

thermostats remotely, act as portals to request service calls or pay bills, and more. Some apps even tap into metering data to paint a picture of a consumer's energy usage.

For utilities, apps present an opportunity for increased customer engagement because they create a portal for two-way communication. Utilities can create apps to help consumers better understand (and participate in) demand response programs. Customer engagement apps can also optimize field service by providing a way for customers to report specific issues and send photos or other information to technicians prior to a service call.

In response to these fundamental shifts, utilities should ask the following questions:

- Which types of functionality do we need? (Remote meter programming, time-based rates, interface based on OpenHAN standards, etc.)
- How deeply do we want to engage consumers, and with what kinds of programs? (Energy education, demand response opportunities, service request portal, bill pay, etc.?)

Answering these questions enables utilities to determine the best connectivity standard for their specific needs.

Choosing a Standard

Utility companies looking to implement a smart metering solution must choose from a variety of connectivity standards. Low power wide area networks (LPWAN) are a popular choice because they provide inexpensive, low-power, long-lasting, wide-range connectivity based on mobile technology.

While coverage remains an issue in some areas, the climate is changing rapidly with the adoption of several global LPWAN options:

NB-IoT

Narrow Band IoT (NB-IoT) is a fast-growing connectivity option offered by several major cellular providers. According to GSMA, 2018 will see rapid global deployment of NB-IoT as mobile IoT operators work to create widely available, cost-effective solutions for IoT. Devices using NB-IoT often have long battery lives of up to 10 years, a great asset for utility applications, and are able to transmit data at peak rates of 250 kilobits per second. NB-IoT operates on licensed frequency bands, unlike other LPWANs that use ISM, an unlicensed radio spectrum. Because it's licensed, NB-IoT is able to ensure agreements between cellular providers and their customers (known as Service Level Agreements or SLAs).

LoRaWAN

Another LPWAN standard that is gaining a global foothold in IoT applications, LoRaWAN (Long Range Wide Area Network) operates on unlicensed frequencies. While it does guarantee a stability of 20 years or more, it is not a mainstream standard and carries the risk of substantial evolution over the next several years, necessitating product redesigns on deployed metering

systems. The open global standard prioritizes two-way communication, localization services, and end-to-end security, and it's becoming a popular choice for smart metering rollouts in Australia, Italy, India, and elsewhere. LoRaWAN has the ability to maintain connectivity across distances of up to ten miles and offers an open global standard with the flexibility to connect a broad range of IoT devices and systems. Its maximum data rate is 50 kilobits per second.

LTE-M

While it carries the LTE moniker, Cat-M1 is essentially a LPWAN that allows for medium data rates (about 375 kilobits per second) and for better range, especially indoors, compared with other LTE standards. Like other LPWAN options, LTE Cat-M1 allows for lower power consumption, enabling extended battery life. LTE Cat-M1 is growing in popularity within the U.S. because of its similarity to other LTE networks and because it offers latency and bandwidth much like the higher LTE categories, yet saves on power and offers better coverage.

Depending on specific use cases and needs, cellular standards are also viable choices for smart metering initiatives:

2G/3G

Over the past several years, 2G and 3G technologies have become common standards within the world of smart metering. Many utilities choose to deploy LPWAN technology to implement point-to-multipoint solutions, yet still use cellular connectivity to backhaul regional data to a central management system. While 2G and 3G are cost effective and provide ample data speeds of 0.1–42 megabits per second, they do not provide low power solutions for battery-operated gas and water meters, and their infrastructure is quickly being overtaken by 4G and 5G technology in many areas as networks evolve.

Europe is an exception, where 3G is diminishing but 2G is expected to keep growing. According to ABI research, 2G will peak in Europe at about 113 million devices by 2021 and decrease slowly, staying above 80 million until 2026.

In other world markets, including Asia and North America, longevity is a serious concern. 2G services are no longer available in many areas, and ultimately, all utilities must be prepared to adapt their solutions to 4G and 5G when the time comes.

4G/5G

The network landscape is changing rapidly as NB-IoT and LTE-M are embraced by 5G, pulling all cellular connectivity toward the newest standard. By upgrading to 4G or 5G now, utilities future-proof their solutions, delaying the need to restructure for as long as possible.

Choosing a Communications Module

When deciding on a communications standard, utilities must also determine the best module for their solution—an essential component for any smart metering initiative. To make the most informed choice, consider the following variables:

- **Size and form factor.** If possible, choose a module (or module family) with a form factor that can be used across the market you serve, irrespective of other technology.
- **Power usage.** Low power usage will lengthen the device's battery life and decrease the frequency of needed maintenance.
- **Longevity.** Look for a module with a life cycle that matches that of your meters, and a provider that will still be in the market when replacements are needed.

Anticipating Future Changes

Ultimately, utilities must anticipate a rapidly changing energy market and create a solution that's nimble enough to keep pace with it over the next several years. Here are five key questions utilities should ask when planning a future-proof smart metering initiative:

- 1. Is all hardware secure?** Cyber attacks represent an increasing threat for smart grids worldwide, and the more private consumer data is involved in the platform, the more important security becomes. Ensure that all hardware components include adequate security features, and that firmware is easily upgradeable to stay current with future developments in both security and functionality.
- 2. Can the solution handle high sampling rates?** The ability to measure power at high rates enables features such as load disaggregation in real time, providing consumers with a clear picture of which home appliances and devices are using the most energy, and when. The extensive detail provided by high sampling rates also generates data for grid analytics and fault diagnostics.
- 3. Does the system allow for low latency communications?** To provide consumer-facing apps with the real-time information they need to operate well, the network must allow low latency communications (less than 0.5 seconds) between devices. Low latency is also needed to implement automated demand response programs in real time.
- 4. Is software flexible and easy to upgrade?** Experts anticipate a growing ecosystem of energy related apps, increasing consumer engagement, and incorporation of distributed energy resources (DER) such as rooftop solar panels and home energy storage into the grid. To create future-proof solutions, utilities must choose software elements that are flexible and easy to upgrade from afar.

5. What is the longevity of the module provider? Most communications modules promise a long life cycle, but since the market itself is still developing—especially for LPWAN and other IoT-specific modules—many providers are new and untested. Look for a provider that is an established expert in IoT connectivity, maintains a reputation for reliable products, and can provide expert help through implementation and future upgrades. Also consider the advantages of software-based SIMs, which displace the need for traditional SIM cards. Choosing a module with a software-based SIM can increase product durability, simplify manufacturing, and reduce footprint, resulting in lower overall costs for production and maintenance.

Many utilities build and operate their own cellular networks, but that may change as major carriers introduce IoT-specific networks and expand their coverage. Whether building their own networks or not, utilities would be wise to choose standards and modules that can adapt to future innovations in cellular technology and accommodate the expanding world of commercial, consumer facing applications that will help customers gain more control over their energy usage.

Until now, 2G and 3G have been popular choices for smart electric metering because of their cost efficiency and wide range—but 2G shutdowns have already happened in the US and Australia, and the rest of the world will eventually follow suit. While 2G and 3G remain viable options for smart electric metering in some areas, such as Europe, utilities around the globe would be wise to ensure that any new smart meters have the ability to adapt readily to the growing wave of 5G.

Telit: A Proven Leader in Cellular Modules for Smart Metering

Telit offers a large portfolio of LPWA cellular communications modules – including LTE Cat 1 and NB-IoT – and non-cellular modules (LoRaWAN), perfectly suited for smart metering applications.

Telit module features:

Versatile Form Factors

A family form factor approach is available to support all cellular technologies—each with the same size and shape, pin-to-pin compatibility, and software interface. One design can address different geographic markets because the modules are interchangeable.

Long-Term Availability

Telit modules are designed with long-term availability in mind. They match product life cycles, reduce field support, and lower the total cost of ownership. If a replacement is needed years from now, rest assured that the module form factor or API will be available.

High-Speed IoT Solutions

Telit modules are designed to fully leverage modern, high-speed LTE networks. As the first company to produce a gigabit-LTE capable data card, we understand the importance of supporting the next generation of IoT applications with technology that can grow along with networks approaching 5G speeds.

Software-Based SIM Technology

Telit's software-based SIM technology, simWISE, eliminates the need for traditional SIM cards and trays. A secure application that is part of the module, simWISE is able to store and manage up to 10 MNO profiles, allowing utilities to minimize exposure to coverage outage for one to millions of devices. Quickly address connectivity issues on edge devices with LOCI and FPLMN reset options, and switch back and forth between the physical and virtual SIM locally or remotely through the control portal. This feature allows utilities to invoke the physical SIM baseline remotely when necessary for coverage issues or troubleshooting.

Expert Support

As you build your smart metering solution, we'll provide expert help along the way. Our team of experts provides design review services, schematics reviews, system architecture counseling, and more.

To learn more about our smart metering IoT solutions or to get in touch with our experts, visit <https://info.telit.com/smart-metering>

Market Data:

- **Annual shipments of smart electricity meters exceeded 100 million** units for the first time in 2017, while total meter shipments reached **170 million**. ([IHS Markit Technology](#))
- Over the next five years, emerging markets alone will deploy **nearly 250 million meters**, representing an investment of almost **\$35 billion**. ([Metering and Smart Energy International](#))
- The **electric meter market is growing steadily at the rate of 12-15% annually**. Smart metering adoption in the water and gas markets is just beginning, so growth rates in those markets are **even higher**. ([Mobile Experts](#))
- **97 percent of energy app downloads are consumer applications**, with the other 3% split between utility engagement and DER-related apps. (Navigant Research)
- Driven by regulatory and policy measures, the **global smart gas meter market is expected to reach \$1.62 billion by 2025**. ([Frost & Sullivan](#))

Cellular & LoRa Modules Designed for Smart Metering

Find the right module for your application >

Telit