The Critical Need for Smart Meter Standards:

A Global Perspective
Smart meters and standards

Smart meters provide real benefits for utilities and consumers — but challenges remain.

A Smart Grid without standards is not a smart idea.

Smart meter rollout

Smart meter rollouts: Enel’s smart meters in Italy.

Why standards?

Standards ensure reliability.

Standards ensure effective communication while lowering risk.

Standards promote healthy markets — keeping short and long-term costs down.

Standards and the longevity question.

The right steps

How to take the right steps in a pre-standards smart meter deployment.

The right steps.
Smart meters are considered to be the backbone of Smart Grid deployment — the first move into two-way communication between power providers and their customers. Smart meters provide better real-time information to utilities about the quality of power supply and the customer demand for electricity and gas at any given moment. Based on actual deployments of smart meters globally, those benefits translate into more reliable service, streamlined billing, and reduced power loss. For consumers, use of smart meters makes understanding their consumption information easier, can help them better manage their costs, and removes the inconveniences associated with switching suppliers. More importantly, smart meters promote energy conservation. Finally, if meters for electricity, gas, and water leverage common communications methods, there can be significant benefits to each of the serving utilities by providing a platform that supports the metering requirements along with other critical monitoring functions. However, those benefits will hinge upon the reliability, interoperability, life span and ultimately the long-term cost-savings of the meters and the associated communication infrastructure.

**The Prius Effect.** Research studies have shown that the dashboard of the Toyota Prius, which makes it easy to see the amount of gas being saved, changes consumer behavior and further adds to fuel efficiency. Smart meters may lead to the same Prius effect in the home, saving up to 15% on energy bills.

“The many consumer benefits of smart meters will only be realized once international standards have been put in place”

— Fred Koenis, Senior Consultant, KEMA
A Smart Grid without standards is not a smart idea

There are those who consider standards to be a “nice to have,” while in fact, standards are essential to the long-term viability of the Smart Grid. If smart meters can’t operate in tandem with the rest of a network, or if products from different vendors do not successfully and fully interoperate in the future, those components may have to be replaced — resulting in significant additional costs.

Although the European Commission advocates transparency, to date there is no set of integrated open standards that governs the design, manufacture, and distribution of smart meters. The European OPEN Meter and OPEN Node projects have been set up to promote open standard development. One of the challenges, however, is that each layer of communication needs its own set of standards, from the physical layer to the data link layer to the application layer.

Steps have been made to develop standard communication protocols for different segments, but as of yet there is no integrated standard protocols. With smart meter vendors popping up by the dozens, and without a set of international standards for all vendors to adhere to, the potential benefits of the Smart Grid hang in the balance.
The European Union has drawn up a directive requiring that 80% of consumers must have remotely readable meters by 2020, as long as it makes economic sense. Energy companies globally are launching smart meter rollout plans or pilot projects. In 2001, in response to a high level of costly energy theft in Italy, Italian energy company Enel replaced electromechanical electricity meters with remotely readable ones. This changeover has had a variety of benefits above and beyond preventing energy theft for Enel for consumers and the country at large.

**Benefits for Customers**
- Invoices on consumption
- Multi-tariff choices
- Contract management
- No more home intrusions by meter readers
- A cost-effective gateway into the home to access new value-added services

**Benefits for the Country**
- Demand-side management
- Lower power consumption
- Easier switch of supplier
- Monitoring of network availability and efficiency

**Benefits for Enel**
- Savings of €500 million annually with a 5-year payback
- First mover advantage
- Industry leadership and prestige
- New services matching real-time customer needs

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**Leaders in European smart meter installations**

Source: http://www.eia.doe.gov/oiaf/eio/aeo/overview.html#fuel

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**Smart meter rollout: Enel’s smart meters in Italy**
First and foremost, meter readings have to be reliable. In order to gain confidence in the benefits of smart meters, consumers must understand that these devices provide valuable tools that enable them to more effectively manage their consumption. Proper management will result in lower bills. At the same time, utilities need to know that each kilowatt is accounted for. To date, there are many standards that are used to measure the accuracy of the metrology portion of the meter; however, as smart meters become integral parts of an ecosystem that gathers remote telemetric information on network conditions such as voltage, power factor and line anomalies, many of these standards are still emerging. Since many meters also have the ability to report sensed outage conditions, basic metrics for establishing a common set of criteria for reporting of these still remains undefined.

“Whether you are dealing with a traditional meter or a smart meter, you need to be sure that what it says is accurate.”
— Bartjan Kaptein, Manager, KEMA Calibration & Metering Lab

“For a multi-vendor solution, open (international) standards are preferable—it’s the only way to ensure interoperability.”
— Maurice Adriaensen, KEMA
A meter is only 'smart' if it can communicate effectively with other equipment. Because multi-vendor solutions are inevitable, clear communication criteria need to be defined in advance, specifically how meters, data concentrators, and central systems will work together. In Italy and Sweden, proprietary standards are used for communication between meters and central computer systems. However, as increasing layers of technology are added, a network of meters built on proprietary standards alone poses risks for effective, system-wide communication. As new technologies and vendors come into the market, there is no way to guarantee that they will communicate with older technologies or each other, making their integration into the grid a longer, more expensive process.

“An energy company that’s got hundreds of thousands – or even millions – of meters clearly doesn’t want to replace the whole lot.”
— Maurice Adriaensen, KEMA
Standards promote healthy markets — keeping short and long-term costs down

Competition among meter manufacturers makes for a healthy market, but only when open standards are in play. For example, without a set of standards that all manufacturers can follow, a single smart meter manufacturer could establish a virtual monopoly, with their proprietary standards adopted by the majority of utilities. This would make it very difficult for new companies and technologies to enter the market, stifling innovation at a time when it is most needed. Allowing and encouraging competition between vendors based on technology rather than conflicting sets of standards is critical to driving innovation and lowering costs, both of which are absolutely mandatory in order for the Smart Grid to be successful around the world.

### Why Standards?

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Mechanical meters have proved themselves very robust: most still meet the relevant IEC standards even after decades of use. Because smart meters are far more complex and robust devices than traditional meters there has not been a long history of field test results, creating a level of uncertainty about how long they will last. Testing to date implies that their longevity will be shorter than traditional meters, but there is not yet enough hard data to know for sure. The way a meter’s life expectancy should be assessed is covered by a special international standard, but that standard doesn’t go far enough. The problems that reduce the lifespan of a smart meter are difficult to pinpoint because they are far more complex than older meters, and because they contain components from multiple suppliers. Right now, there is no standard that requires that all of the various components of a smart meter be traced and cataloged. There is no way of telling where those internal components came from, who made them, or how long they might be expected to last. New meters have to undergo a variety of pre-deployment tests to check resistance to environmental factors and EMC performance, but that is only one source of potential failure. A set of unifying standards would go a long way toward helping utilities and other grid operators determine the expected longevity of their smart meters.

“There’s a lot to be said for paying close attention to the longevity question and making the standard mandatory. Our testing of digital meters leads us to suspect that these devices may lack the longevity of traditional meters, but there hasn’t been enough experience with them yet.”

— Bartjan Kaptein, Manager, KEMA Calibration & Metering Lab
How to take the right steps in a pre-standards smart meter deployment

The absence of standards does not mean that leading utilities should stop the push forward to smart meter rollout, but it does make it all the more important for utilities to take the right steps to mitigate risk. High-level functional specifications for smart metering systems provide an alternative to open standards. By working with detailed, specific functional requirements, utilities and regulators can achieve a quick rollout and increase competition among vendors that offer different types of solutions.

Leading Spanish energy company, Iberdrola, a founding member of the PRIME (PoweRline Intelligent Metering Evolution) Alliance, is currently working on determining compliance tests, to be applied to various manufacturers’ products ahead of its rollout of 100,000 smart meters. Scheduled to start this year, the rollout will ultimately lead to the replacement of all the company’s meters — more than 10 million units — in the next few years.

Because several manufacturers are contracted to supply the meters, Iberdrola has developed testing procedures and has requested that all of the meter manufacturers test their communication interfaces for compliance with the profile.

Taking place at KEMA’s Smart Meter Lab in Madrid, Iberdola’s rigorous testing requirements are laying the foundation for the development of standards; regulators and Spanish energy companies regularly visit, transforming the lab into a demonstration project of possible smart meter deployment scenarios. The findings will certainly push regulators and other energy providers to discover possible challenges and solutions raised by the current lack of standards.
The right steps

In the absence of standards, there are a number of steps that utilities and energy providers around the world can take to minimize the risks associated with Smart Grid upgrades, and ensure that their investments are sustainable and cost-effective in the long term.

1. Develop an in-depth plan for your Smart Grid rollout, understanding what the goals, business case, and potential challenges are for your company and region

2. Create a highly detailed set of functional specifications that all vendors and suppliers have to meet with their products

3. Follow and understand the regulatory environment in your region so that you can anticipate future changes

4. Only work with vendors whose products have been thoroughly vetted and tested by independent industry experts
Visit www.SmartGridSherpa.com

A free knowledge base and blog providing expert guidance on your path to the Smart Grid.

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