ISSUE 5: STANDARDS AND INTEROPERABILITY

Landis+Gyr
manage energy better

pathway 05



open standards and interoperability:

creating a new picture of the industry

from the editor



Dear readers,

The smart revolution in energy management is one of the largest in the history of the world. And all players of the energy industry have to ensure that future generations are able to enjoy a high standard of living in a livable world.

Interoperability of smart devices is a necessary precondition for the seamless functioning of the sophisticated networks our utility customers are building. Our customers have to make difficult and important decisions that will affect the long-term development of their businesses and the countries they serve. With the IDIS Association, Landis+Gyr has taken a decisive step towards ensuring that they are not locked in to the technology of just one provider. We are in the business of providing solutions for our utility customers all over the world, and our IDIS-certified meters are solutions our customers can rely on.

Here at Landis+Gyr, we are fully aware that our exposed position as the global leader in smart metering technology is a privilege while it is also a constant challenge to maintain our edge at the same time. We have embarked on a globalization project to make even better use of our truly global footprint. We will further improve knowledge sharing across all our regions and divisions and create reference designs and platforms harnessing the expertise gained in thousands of projects across the globe. At the same time, our local branches will make sure that our experts are in close contact with our customers. In this issue of “pathway” we have leveraged the knowledge and experience of our colleagues throughout the EMEA region to give you a unique insight into standards and interoperability.

Enjoy the read!

Oliver Iltisberger
Executive Vice President EMEA, Landis+Gyr

contents



STRATEGY

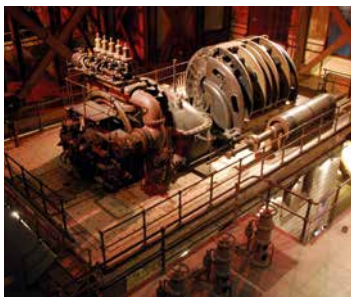
interoperability: the key to a smart future 6

protecting data flows 10

test of time 12

interoperability for a secure future 14

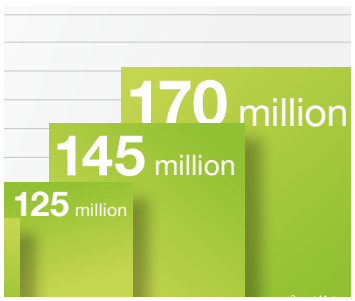
leaving room for innovation 18



REPORTS

TAURON: delivering on a promise 16

powerhouses for art 20



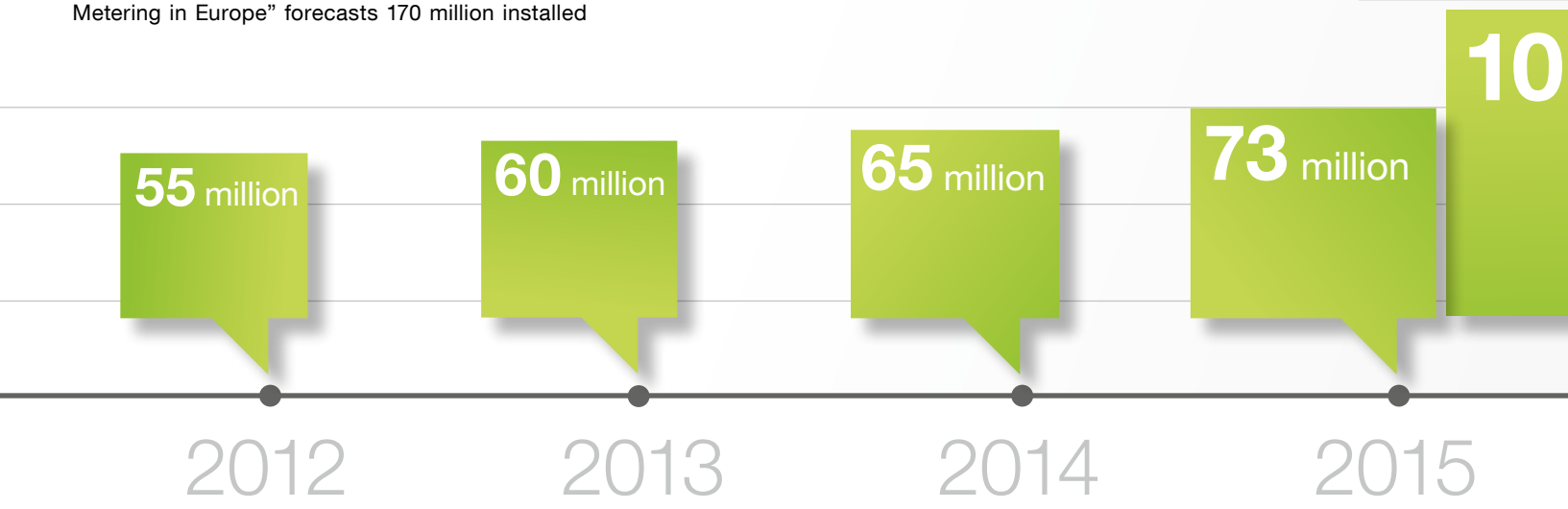
FACTS AND FIGURES

driving standards 4

protagonists of standardization 26

driving standards: the european road to smart metering

Exponential growth in smart metering installations is expected in the next few years as countries such as the UK, Spain and France roll out the technology ahead of the 2020 deadline. The 10th Berg Insight Report "Smart Metering in Europe" forecasts 170 million installed meters in 2019. As the smart metering market grows, so will the need for standardization and interoperability. Within the EMEA region, standardization organizations are among the main drivers of mass rollouts.



20 October 2005

Mandate M/374: "European Council Mandate to CEN and CENELEC for standardization in the field of measuring instruments".

The Commission requests CEN and CENELEC to draw up standards that are necessary and indispensable for the operation of measuring instruments.

The directive establishes the requirements for devices and systems with a measuring function.

2 June 2008

Fifteen leading companies in the European smart meter market establish ESMIG, the European Smart Metering Industry Group (see page 26). Founding president of ESMIG is Landis+Gyr CEO Andreas Umbach.

12 March 2009

Enactment of Mandate M/441: "Standardization mandate to CEN, CENELEC and ETSI in the field of measuring instruments for the development of an open architecture for utility meters involving communication protocols enabling interoperability".

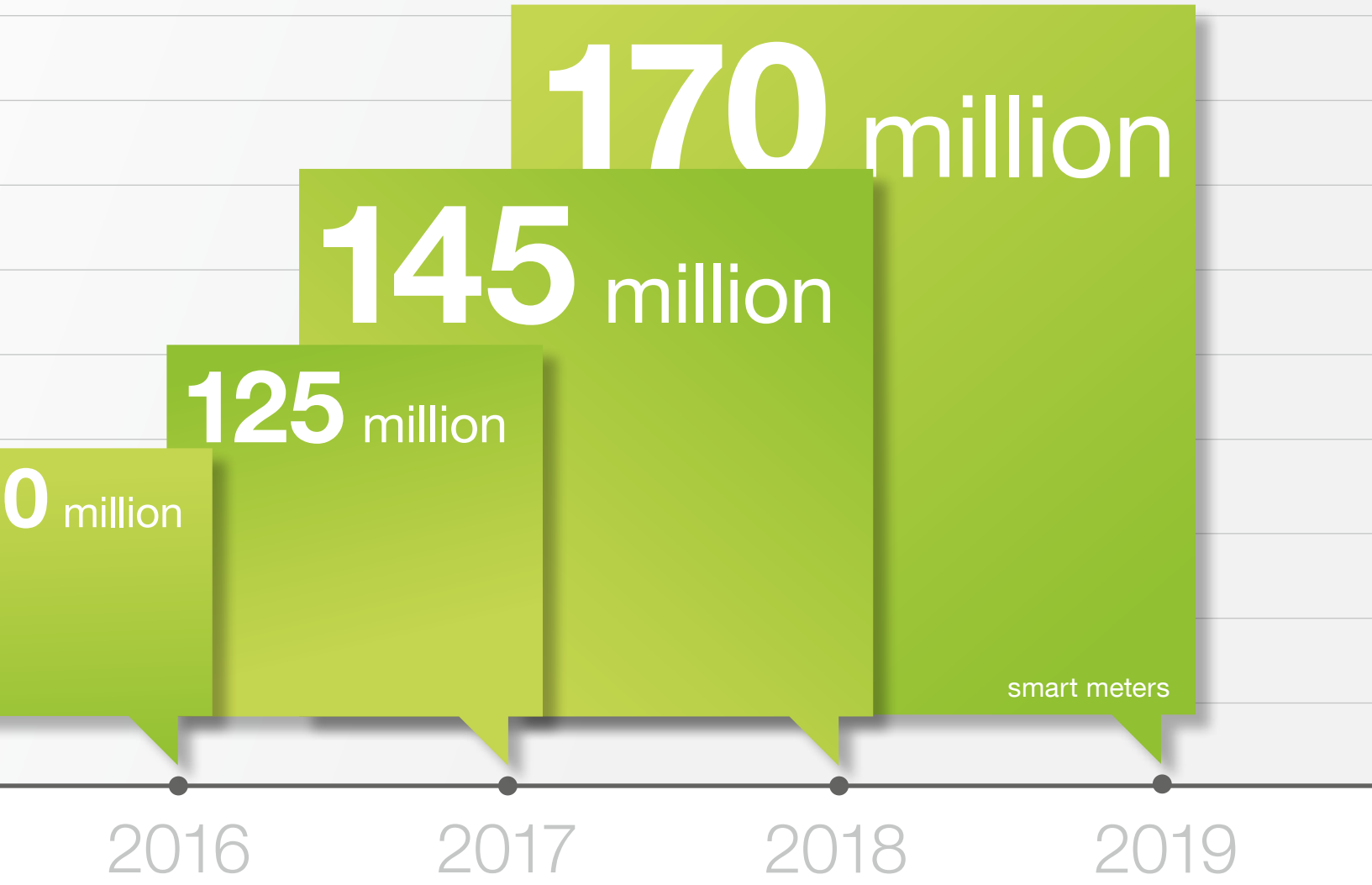
The three European Standardization Organizations (ESO) establish a Smart Meters Coordination Group (SMCG) to assist the mandated work.

ESMIG and other organizations, like FARECOGAZ (European Association of Manufacturers of Gas Meters, Gas Pressure Regulators and Associated Safety Devices and Stations) and CEER (Council of European Energy Regulators) are part of the SMCG.

13 July 2009

Directive 2009/72/EC of the 3rd Energy Package: The directive is aimed at introducing common rules for the generation, transmission, distribution and supply of electricity. Among other things, it also lays down universal service obligations and consumer rights, and clarifies competition requirements.

Annex 1, 2 "The Member States, or any competent authority they designate, shall ensure the interoperability of those metering systems to be implemented within their territories and shall have due regard to the use of appropriate standards and best practice and the importance of the development of the internal market in electricity".



23 September 2009

The Interoperable Device Interface Specifications (IDIS) Industry Association is founded in Zug, Switzerland, as a private initiative of three smart metering companies (Landis+Gyr, Iskraemeco and Itron). (see page 26)

12 October 2009

First phase of M/441: Final report of the Smart Meters Coordination Group "Standardization mandate to CEN, CENELEC and ETSI in the field of measuring instruments for the development of an open architecture for utility meters involving communication protocols enabling interoperability".

The first phase of M/441 requests the ESOs to identify the main possible functional communication implementations relevant for smart metering systems and the standards relevant to meet these requirements.

1 March 2011

Mandate M/490: "Smart Grid Mandate – Standardization Mandate to ESOs to support European Smart Grid deployment".

"The objective of this mandate is to develop or update a set of consistent standards within a common European framework […] that will achieve interoperability and will enable or facilitate the implementation in Europe of […] Smart Grid services and functionalities […]".

December 2012

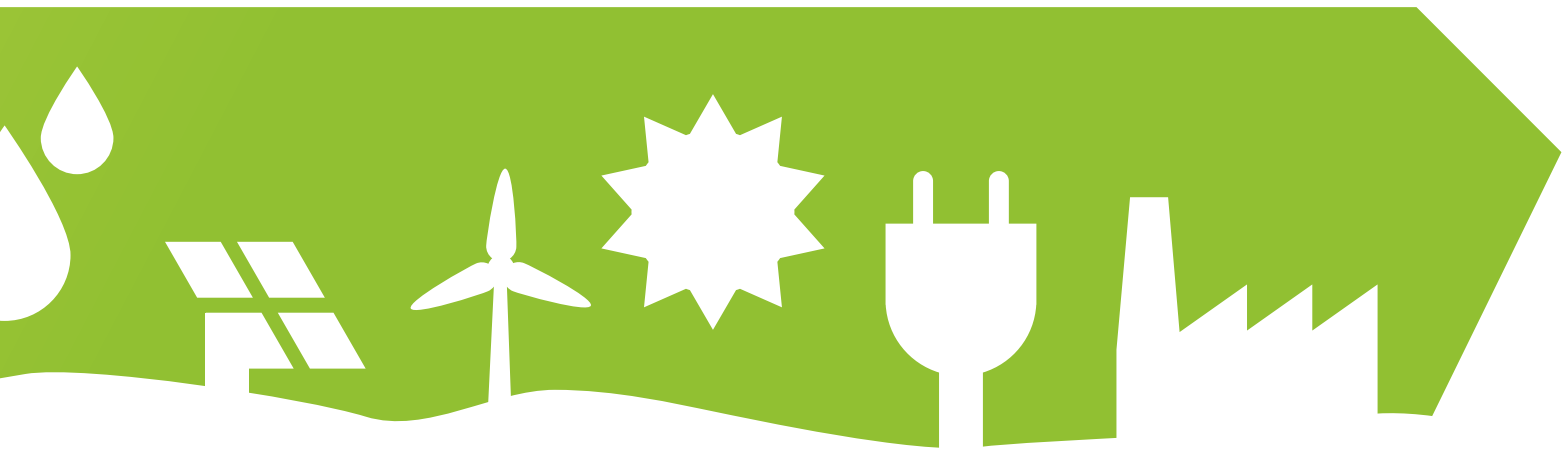
Second phase of M/441: Report by the Smart Meters Coordination Group "Introduction and Guide to the work undertaken under the M/441 mandate".

The second phase invites the ESOs to identify the functionalities and interfaces that the communication standards should address.



In accordance with EU directives, 80% of consumers should be equipped with intelligent metering systems by 2020. Open standards, supported by official standardization organizations, play a critical role in reaching this ambitious goal. Interoperability, however, requires the development of companion specifications and conformance testing. Organizations such as the IDIS Association ensure that companion specifications are up to date and reflect the state of the latest development in smart meter technology.

interoperability:
the key to a smart future



To facilitate the transition to the smart world, the European Commission asked the three officially recognized European Standardization Organizations to define standards for interoperable smart metering systems: the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunications Standards Institute (ETSI). The result is a set of IEC/EN open standards that address business processes for smart meters such as contract and billing, customer support as well as infrastructure management.

Openness means that the functional architecture specified is capable of meeting current as well as future needs. Most important, it means that the standards provide a framework that can easily accommodate new functionalities and communication technologies without cutting back on backwards compatibility and consistency. Open standards are achieved by a consensual process reflecting the requirements of all players in a tightly regulated market.

ENERGY – A SPECIAL KIND OF MARKET

The importance of interoperability becomes especially clear when compared to other industries that extensively deploy IT and communication technologies. Historically, there has been no need for utilities to support or facilitate interoperability among pieces of hardware. In contrast to mobile telecommunication where network operators directly profit from each unit in different networks, utilities have to be incentivized to invest in interoperability.

A suite of open, universal and customizable standards in the energy industry ensures that no single manufacturer can monopolize a market by exerting intellectual property rights (IPRs) on their products. A strict separation between the smart metering data models and the communication protocols means that standards can be separately extended in terms of new functionality (use cases) and in terms of communication technology. It is essential to decouple application modeling from communication technology in order to protect investments in application development while benefiting from the continuous progress of communication technologies.

OPEN STANDARDS + COMPANION SPECIFICATIONS = INTEROPERABILITY

The objective of smart meter open standards is to describe universal solutions that can be further customized to the specific user needs of the European member states. The standards are also important for overcoming trade barriers, critical in an open market such as Europe's. Though they are not laws,



at a European level standards can be harmonized to European directives. Lists of harmonized standards that support specific directives are published on a regular basis by the European Commission. Manufacturers are not obliged to produce compliant components, but the market will create the respective demand.

"Interoperability is crucial. Especially for high-volume devices which operate for a long time without any human interaction." Thomas Schaub

In order to reduce the risk inherent in replacing their meter parks with intelligent devices, utilities prefer sourcing from a market of interoperable products, meaning they can be easily replaced or exchanged within the wider system, regardless of manufacturer. Another important aspect is the availability of spare parts; when the huge wave of smart metering rollouts across the globe subsides, a number of vendors will eventually disappear from the market. If a utility has chosen a proprietary solution and the vendor goes under, maintaining the utility's meter family over the life cycle will become a serious problem. The chance of obtaining functioning spare parts from a different vendor is a lot a higher if an interoperable solution was chosen from the outset.

However, while they enable manufacturers to invest in interoperable products without the risk of patent infringements, open standards do not ensure interoperability per se. The next step is to make interoperable smart meters based on them. "Interoperability is crucial," as Thomas Schaub, Senior Manager Standards and Interoperability, Landis+Gyr, states. "Especially for high-volume devices which operate for a long time without any human interaction, whereas for low-volume components, which require human interaction, such as the head-end system, having a reliable partner for delivery and support is more important."

ENSURING SEAMLESS COMMUNICATION

The reality is that companion specifications and conformance tests are needed to ensure interoperability. While standards are the responsibility of the respective organizations, companion specifications have been traditionally developed only by the very largest utilities or utility associations. Interoperability can only be achieved with a commitment to a specific standard with a dedicated configuration of the options offered by that standard.

Willem Strabbing, Managing Director of the European Smart Metering Industry Group (ESMIG), uses in his article "ESMIG promotes Smart Meter interoperability across Europe" an analogy to human communication to clarify this somewhat complex issue, saying that smart meter devices, their constituent parts, the interfaces and associated networks will talk to each other in a seamless and sophisticated way, which may be likened to the different levels of person-to-person communication: *

- Medium (speaking to somebody across a room, by phone or by exchanging emails)
- Characters (a mutually understood alphabet – such as the widely used Latin set of letters)
- Language (English, French, etc.)
- Style (level of language used to get a message across depending on the audience one wishes to reach)

According to Strabbing, only with universal agreements on all communication levels is interoperable communication possible. The same conditions apply to machine-to-machine communication. In analogy to human communication, the physical medium, the communication protocols and the meaning of the transported data structures must be defined.

There are two examples in Europe in which very large utilities have made a commitment to open standards and undertaken the investment in developing the companion specification as well as the testing environment for interoperable devices: Iberdrola in Spain and ERDF in France. In both projects, smart meters from several sources have been customized and tested according to the utility's own requirements.

* see www.esmig.eu

However, as this procedure is expensive for both the utility and the smart meter manufacturer, it is only feasible in large-scale rollouts. For smaller utilities, a contradiction exists between interoperability and customization because the investment required for a multi-manufacturer customized solution is neither affordable for them nor the suppliers given the small number of devices in total.

Other initiatives to address the issue of developing interoperable smart meters include the Distribution Operator Association Netbeheer Nederland in the Netherlands with the companion specification DSMR customized to the Dutch market's needs.

Landis+Gyr has been supporting customers in all the different approaches to interoperability and is going to supply a substantial number of meters for the very large-scale rollouts in Spain and France. In the Netherlands, the company has developed the meter with the technological support of Xemex, a strong local partner. Thanks to the versatility of its modular approach and the well-established partnering network, Landis+Gyr supplies the meter which has gained a significant market share in the Netherlands.

THE IDIS APPROACH TO GUARANTEEING INTEROPERABILITY

The IDIS Association (Interoperable Device Interface Specification), co-founded in 2010 by Landis+Gyr, is supported by manufacturers across Europe. The association provides companion specifications and a test environment, making interoperable smart meters available for all utilities. The IDIS specifications are completely based on the open standards of the EN/IEC 62056 series.

Smart meters are the foundation of an interconnected system that spans smart metering to smart grids and also smart home applications. Equipping the smart meters with certified, interoperable IDIS interfaces ensures that the comprehensive functionality of the smart meter can also support use cases within the smart grid and smart home domain today and in the future.

IDIS Association membership is open to any smart meter manufacturer that provides conformance-tested IDIS equipment. Members are committed to specifying how the existing and evolving standards are used in products and to providing the necessary testing environment required to achieve truly interoperable smart meter equipment. The specifications are publicly available for any company in order to promote the IDIS standards.

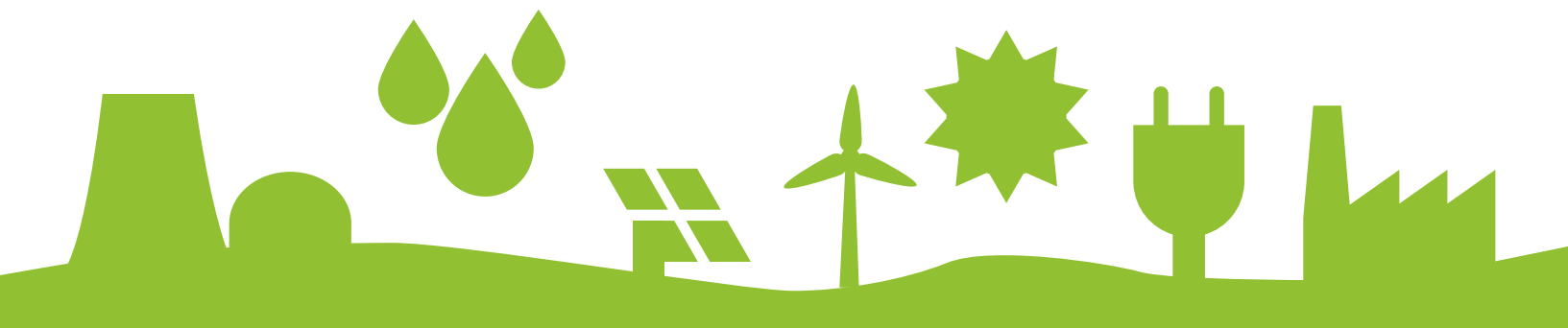
IDIS members are able to offer end-to-end solutions supporting IDIS meters from different manufacturers due to the rigorous testing procedures and the transparent certification process carried out by DNV KEMA.

CERTIFIED INTEROPERABILITY, FUTURE-PROOF INVESTMENTS

Companies providing IDIS smart meters today include Landis+Gyr, Itron, Iskraemeco, Elster, Meter&Control doo and another provider in the testing phase. The process of developing an IDIS meter may take time: only devices which pass more than a thousand tests are granted the IDIS interoperability label. Developing an IDIS meter requires a manufacturer's willingness to make an upfront investment into interoperability and the readiness to share the market with other like-minded suppliers. This can only be achieved if the market size justifies these investments.

The reality is that companion specifications and conformance tests are needed to ensure interoperability.

When it comes to buying smart meter equipment, utilities can minimize technology investment risk by sourcing from a range of manufacturers offering independently tested, certified interoperable devices. Complying with open standards is a basic condition, but this compliance is not sufficient to achieve the desired interoperability. International standards leave room for further configuration to function within various architectures of EU member states. It is through initiatives like IDIS that utilities not ready to make an upfront investment into interoperability can still profit from interoperable products and thus ensure that their investment in smart metering technology is future-proof and open for inevitable technological progress. ■



protecting data flows

The data flow in an Advanced Meter Management (AMM) system is exposed to the threat of intrusion. This is a risk in the field network, in the data center and at the system level. Currently, there are no widely applicable security standards for AMM systems. Vendors are tasked with providing their customers with comprehensive and future-proof security solutions.

Questions about the safety of communication gateways and data storage become more urgent as more data are sent by smart meters. The energy industry is concerned with the risk of widespread fraud. There is a danger that security vulnerabilities might be exploited on a significant scale. If meter readings can be manipulated, whether by returning false readings from credit meters or forging authorization messages to prepayment meters, this could lead to substantial losses.

Smart grid networks must have the capability to protect the integrity of data by implementing security controls that detect improper or unwanted modifications. Network components must have a high degree of confidence that data are coming from a trusted source. Effective measures to ensure the security of the smart grid must be adoptable throughout the utility, adaptable to current and future infrastructure needs, and appropriate to the process or equipment being secured.

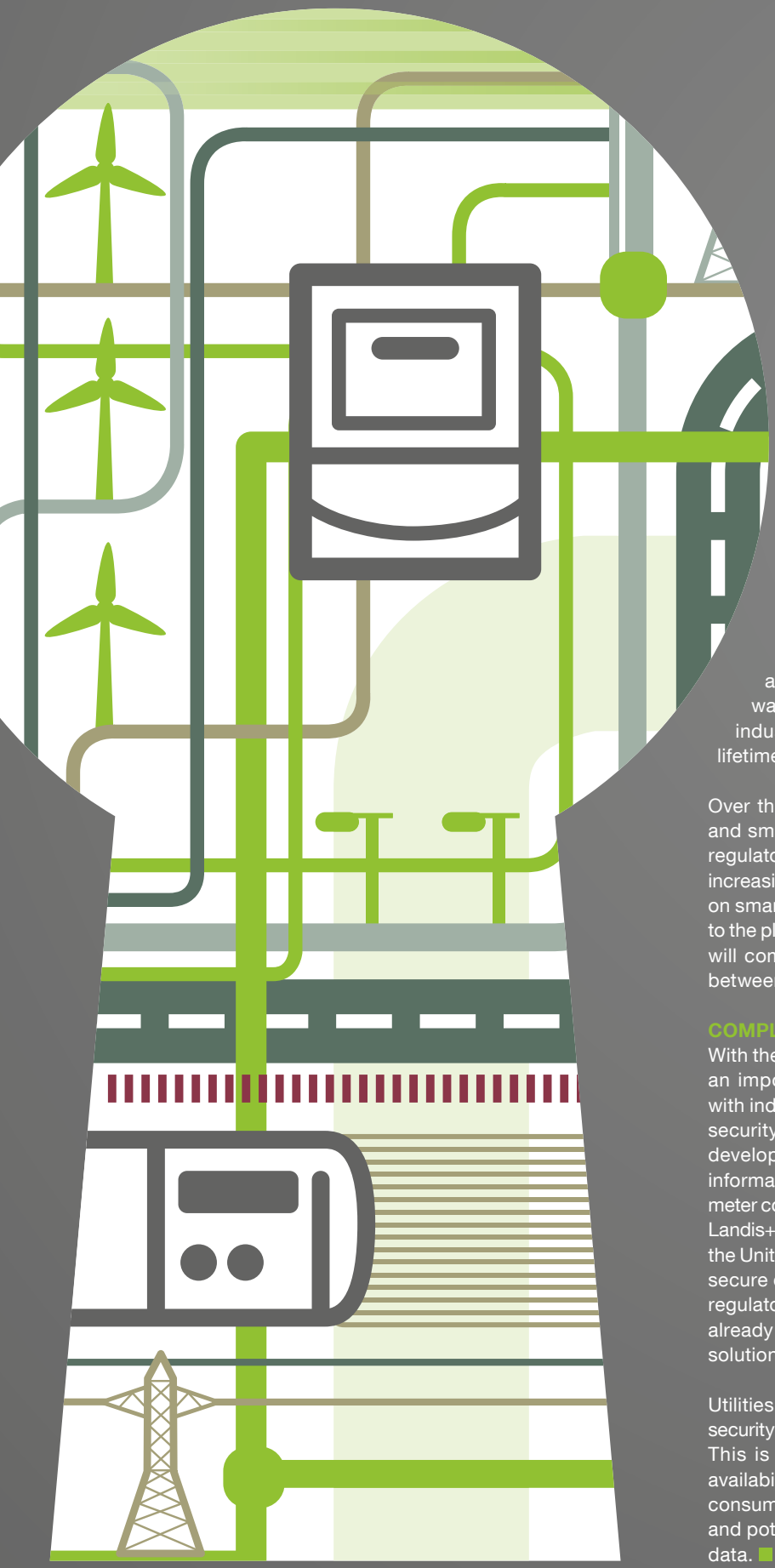
Sending data between smart meters and the head-end system (HES) in an infrastructure that is not secure is like sending postcards; potentially, everybody can read them. The fundamental security challenge is how to maintain the confidentiality, integrity, authenticity and availability of the smart meter data which are transmitted over publicly accessible communication networks. Vendors need to offer a secure communication solution that allows their customers to send specifically addressed letters in sealed envelopes. The security architecture for AMM systems should ensure system and network availability, while at the same time meeting critical security objectives such as confidentiality, integrity and authentication of data. By using a system that focuses on these objectives, a utility can effectively manage security risks.

SECURITY OBJECTIVES

The availability of data matters because utilities need to be sure that they will have constant, uninterrupted access to their meter and billing data. It is vital that an AMM system has the ability to identify and overcome denial-of-service (DoS) attacks or equipment tampering that could be used to compromise an AMM network and inhibit the monitoring and control functions the network provides.

Integrity can be achieved by implementing strategies to detect any changes which have been made to the data. Changes can be made during data transmission and retrieval. Authentication is necessary because utilities need to know who is accessing their data. This authentication is enabled by an identity management system. The system assigns access permission to identities. This prevents hackers from attempting to access an AMM network through the physical network in the field or at the head-end application server and data center.

Confidentiality is a universal concern because information privacy is a priority not only to the utility, but also to the end customer. A utility needs to ensure information such as scheduled customer billing data, meter alarm information and home area network events, is protected against “unauthorized access”, which includes authenticated users lacking the required permission as well as hackers.



WORKING WITH THE BEST

The IT business has developed rapidly and has an entrepreneurial approach to standards. Firms develop systems together and, if they succeed in the marketplace, they try to get the key aspects of their platform adopted formally as a standard. As a result there are often several standards to choose from, and claims of compliance are made lightly. The utility industry's approach is different; it is a mature industry whose players are extremely wary of vendor lock-in. At the same time, energy industry players operate billion-dollar assets with lifetimes of decades.

Over the past few years, as the scale of smart meter and smart grid deployments has reached a new level, regulators, utilities and their customers have become increasingly concerned about the security of information on smart metering systems. Landis+Gyr is stepping up to the plate. The next release of the Gridstream® solution will come with secure data communication channels between the smart meter and the head-end system.

COMPLEX MATHEMATICS

With the latest Gridstream® release, Landis+Gyr solves an important part of the problem. Working together with industry associations, standardization bodies and security industry leader SafeNet. Inc., Landis+Gyr has developed a solution that guarantees the security of information passing over the networks used for smart meter communications. As a globally operating company, Landis+Gyr has been able to benefit from its experience in the United States for the development of its Gridstream® secure data communication system. There is a mature regulatory environment in the U.S. and Landis+Gyr has already successfully deployed secure communication solutions for smart metering there.

Utilities need to adopt a solution that combines proven security techniques and strong cryptographic capabilities. This is necessary not only to protect their network availability and metering data, but also to protect their consumers from malicious attacks affecting operations and potentially compromising their consumers' private data. ■

the test of time

Purchasing a smart metering system is like entering into marriage: it's a decision with serious long-term consequences. While marriages have no expiration dates and sometimes end rather quickly, utility executives know for sure that they are making a decision that will influeance their business for about twenty years to come. As in the case of marriage, mistakes are often made at the very outset of the journey, during the selection process. Some of the most important and the most challenging aspects are system architecture, integration and interoperability.

One of the key aspects of effective system architecture is its ability to enable near real-time decision making; this is only possible if the utility can harness the data as it is generated and apply it towards a specific objective. Immediacy and seamless data flow between applications and systems are the critical features of such architecture.

Immediacy and seamless data flow between applications and systems are the critical features of effective IT architecture.

A future-proof architecture consists of several layers: the foundation consists of the smart devices connected to a head-end system (HES), which in turn is integrated into a meter data management (MDM) system or a distribution management system (DMS). The MDM is integrated into the utility's advanced business applications. In order to ensure an effective implementation of the IT architecture, there are a number of requirements: first of all, systems need clearly defined functional boundaries and a limited number of applicable standards at the interface points. What is also required is a common semantic model for all interfaces and systems as well as communicating and storing data in a unified way.

FUTURE-PROOF INTEROPERABILITY AND OPEN ARCHITECTURE FOR MAXIMIZED RETURNS

The successful integration of existing legacy and state-of-the-art utility systems with the smart metering solution is dependent on whether or not standard-based devices and software are being used. Industry standards are created in order to give utilities more freedom when implementing smart metering.

Working with open standards in software development ensures simplicity and provides opportunities both for manufacturers and the utilities. For the utilities, open standards provide the most benefits: they ensure a platform for interoperability, freedom of choice and they secure investments in large-scale projects since they can work with more than one supplier. At the same time, open standards facilitate communication and cooperation between utilities, manufacturers and local governments.

There is, however, a broad set of standards that applies to smart metering. What is important for utilities is to choose the "right mix" of standards. The industry focus for software and IT systems is the International Electrotechnical Commission (IEC) 61968 series of standards. The Common Information Model, which the IEC maintains, underlies the 61968 series and has been widely adopted in the utility industry. The IEC is the international standards and conformance assessment body for all fields of electrotechnology.

The DLMS (Device Language Message Specification) User Association, on the other hand, is a non-profit organization with the purpose of developing and maintaining the DLMS/COSEM (Companion Specification for Energy Metering) specification that sets the rules for data exchange between the metering equipment and the data collection system. It provides a conformance testing and certification scheme for a utility's metering equipment, which implements the



specification. It serves as an information exchange forum for users, manufacturers and system providers, test houses and standardization bodies.

DEALING WITH THE ABSENCE OF STANDARDS

The European Smart Metering Industry Group (ESMIG) supports the implementation of comprehensive open standards for metering and communications, which means that research and investment are on the rise. Nevertheless, challenges to interoperability persist since there are a number of proprietary systems on the market, each with its own limitations regarding the ability to communicate with other residential meters or IT systems. It is still common to find that standards haven't been implemented to cover all systems, or that standardization processes are struggling to keep pace with the industry's rapid development.

This means that the solution vendor needs to be able to provide interoperability to its customers without being able to rely only on standards. Solid, service-oriented AMM system architecture is crucial, especially in the absence of standards. Service-Oriented Architecture (SOA) provides the opportunity to gather and standardize heterogeneous functionalities – even from different legacy systems. SOA is a software architecture design pattern based on separate units of software that provide application functionality as services to other applications. A service is a self-contained unit of functionality, such as retrieving the billing data for an individual customer.

EASY TO ADAPT TO CHANGING REQUIREMENTS

What's key to the Service-Oriented Architecture is that the service interface is independent of the implementation. Application developers or system integrators can build applications by composing one or more services without knowing the services' underlying implementations.

Services relating to different legacy systems can be encapsulated in order to keep them isolated from other services. This means that SOA services can remain unchanged despite technological changes in the background, providing the opportunity to introduce new technologies without disturbing the current SOA.

Traditionally, integration between the systems has consisted of billing data being transferred between the smart metering system and a utility's system in a flat file. This was sufficient in the past, but today both the amount of data and the number of functionalities have grown. Examples include new metering data, consumer load management functions, changes in the billing cycle and in tariff setting as well as network monitoring. In addition to integrating the AMM system into the utility's system for information sharing, AMM system architecture should enable a deeper level of integration and interoperability between the systems. Combining the AMM system sub-services is the smart solution for creating customized business processes tailor-made to the needs of individual utility customers. ■

interoperability for a secure future

A conversation about standardization and interoperability with Peter-Georg Koller, VP Technology of the IDIS Association and VP Portfolio and Solution Management at Landis+Gyr.

PETER-GEORG KOLLER

Peter-Georg Koller is responsible for technology in the IDIS Association and for the portfolio of smart energy solutions ranging from smart devices and AMM software to full smart metering solutions in EMEA at Landis+Gyr. He holds a degree in engineering and business administration and has many years of international leadership experience in the telecommunications, IT and smart metering industries.



pathway: *In 2009, a European Commission mandate tasked the European standardization organizations with the "development of the open architecture for utility meters involving communication protocols enabling interoperability". What progress has been made so far? What have been the main deliverables over the past few years?*

Koller: As we expected, the Commission's mandate triggered a number of attempts by different interest groups to get their proprietary solutions stamped as standard compliant. The standardization organizations were at risk of becoming misused as rubber-stamping institutions. Together with a broad range of other players committed to the spirit behind the idea of standardization, it has been possible to put a stop to the attempts to use these organizations as sales platforms. Today, we have achieved a consistent set of standards. This builds the foundations for the open architecture, which enables interoperability as mandated by the European Commission. Contributions to standardization which don't fit this model may still be published as "technical specifications", but aren't accepted as true "standards".

A strict separation between the use case-driven application models and the technology-driven communication protocols ensures that new developments in communication technology can be incorporated quickly without changing the functional model of the devices. You can compare it to the way you use your tablet or laptop: for the user, the important part is that the browser or the email client works, independent of the communication technology that enables the connection to the internet. In our context, this concept allows the system operator to profit from the availability of devices supporting new communication technologies without generating substantial new system integration costs.

pathway: *Complying with open standards is one of the main prerequisites to ensure a successful smart meter rollout, but in itself is not sufficient to achieve the required level of interoperability. Many established standards still leave room for further technology configurations. Why is that? Who in the industry is best positioned to take on the task of specifying these configurations?*

Koller: Standards that leave room for further configurations can be adjusted and used for optional applications and use cases. They enable technology vendors to make their choice for the optimal usage of technology. This is fine as long as there is no need for direct interoperability.

To ensure interoperability, one party needs to take responsibility for choosing the options within the standards and therefore define the companion specification on a selected standard. This party could be either a very large utility or utility association creating a huge economic demand for its specific

equipment or a vendor association addressing the needs of many customers.

IDIS was founded to accomplish this task by ensuring a tested and validated interoperability through certification and maintaining the definition of the standards and the companion specifications over many years thus providing investment protections for our customers.

The standardization concept doesn't come for free: it needs permanent engagement by the industry. As the market leader, we at Landis+Gyr feel a special responsibility to drive this process, but we know full well that we can't do it alone. We therefore work closely together with other major players, both inside and outside the IDIS Association.

The functional part of the standards must be extended with new models which support new market requirements as well as new legal requirements. On the communication protocol side of things, new technologies have to be considered and integrated into the standardization framework. But the consistency of the framework as a whole has to be guaranteed since that will eliminate the risk of stranded investments for manufacturers and utilities alike.

pathway: *Standards and interoperability are complex and counterintuitive topics. What can the IDIS Association and Landis+Gyr do to boost the level of comprehension of all the parties involved?*

Koller: As a first step, it is essential that our customers and the regulators understand the challenges posed by standard-based smart meter interoperability. I feel that we are making real progress in this area, and I have been personally involved in many workshops where I could see that our message is coming across. Many big customers weren't so concerned about standards a couple of years ago. Now they are starting to realize the advantages of solutions based on open standards. Nevertheless, some utilities, typically those with many millions of metering points, are willing to invest into their own companion specifications to have a customized solution based on standards.

Other customers request interoperable solutions but still ask for some customization. In such cases, it's our duty to make clear that customization of the existing IDIS solution is possible but either these add-ons are not supported by the other IDIS providers, or the customer has to provide an economic justification for other manufacturers to invest in these add-ons. On the whole, we see that the advantages of IDIS interoperability are being recognized more and more; we see a growing number of utilities requesting interoperability in their tenders.

pathway: *How successful has IDIS been in easing the minds of utility executives in terms of the security of their investment? What steps should IDIS take in the future to maximize its effectiveness?*

Koller: We have achieved a lot of attention in the market both from vendors and utilities with the successful introduction of IDIS. Still, IDIS is a new concept, and we have to consider that it will take some time for the market to fully comprehend the major benefits of the initiative. It's crucial for us to send the right message to the market: IDIS is open for all manufacturers and for the latest communication technologies. It's important to stress that IDIS is not meant to set a new standard; its aim is to provide customers with devices that are truly interoperable based on the existing standards. It's a new concept, not only for our customers, but also for the manufacturers. Even for us at Landis+Gyr, it's sometimes difficult to accept that part of our offering is now the successful integration of a competitor's devices into our solutions.

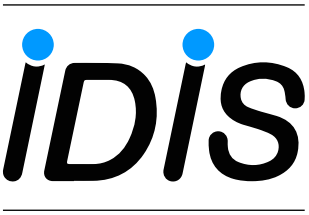
pathway: *What security services are provided by the open standards and companion specifications respectively? And how are they achieved?*

Koller: Security is an important issue which has already been tackled in the first IDIS package. Today, we are proud to be able to say that the certified IDIS meters are the first interoperable PLC products which support meter access protection, data integrity and the protection of personal data according to the key IEC 62056 standards. Together with Landis+Gyr's Gridstream® system, we offer our customers the tool to efficiently establish and maintain secure end-to-end solutions.

pathway: *Apart from IDIS, what is the best way for Landis+Gyr to leverage its expertise on these matters to help the process along and inform regulators and customers alike?*

Koller: Landis+Gyr contributes to the foundations of a robust smart metering market; the basis for this market is the availability of open standards. Our constant engagement for the official standardizations makes it possible that open standards to be available to the entire industry. We also support open standards by investing in products according to these standards. With IDIS, we go one step further in order to achieve true interoperability. We are convinced that this will help expand the smart metering market and that all stakeholders are going to profit from this initiative.

Read more about European standardization on page 18.



"As a first step, it is essential that our customers and the regulators understand the challenges posed by standard-based smart meter interoperability."

Peter-Georg Koller

delivering on a promise

Landis+Gyr helped TAURON Dystrybucja to conduct a successful pilot and delivered a full end-to-end smart metering solution, integrating meters from three different vendors. The TAURON Dystrybucja pilot was one of the first smart metering projects in Poland where interoperability played a key role in the choice of smart metering technology and supplier.

Smart meter interoperability is crucial for utilities in ensuring that their investment in modern energy management solutions is future-proof. With the IDIS Association, Landis+Gyr and other leading manufacturers have made the promise to produce these interoperable devices. Now, Landis+Gyr has delivered on this promise: the successful completion of the pilot for Polish utility TAURON is the first smart metering where IDIS, certified meters from three different manufacturers are being used in the same meter park.

According to Landis+Gyr Poland CEO Andrzej Szymanski, "Achieving interoperability was the aim of this project. We were working with technology familiar to us from previous projects while integrating devices from other vendors at the same time – without experiencing a drop in system functionality." The majority of the nearly 12,000 devices in the field are Landis+Gyr meters, but it was important for the customer to integrate about 1,500 meters from other IDIS-certified manufacturers. The delivery includes Landis+Gyr data concentrators, and all devices are managed in the Gridstream® AIM smart metering system.

CRUCIAL USE CASES UNDER CONTROL

The total solution provides maximum benefits with Landis+Gyr meters, as all smart meter functionality can be fully utilized at the system level. However, all the most important smart metering use cases can be covered with any IDIS-compliant meters. "There are some use cases that are outside of the scope defined by IDIS, but that doesn't pose a problem; we have all the most important use cases and functionalities under control", Szymanski explains.

TAURON Dystrybucja had set strict criteria for the smart metering system: it needed to be a full end-to-end solution interoperable with third-party vendor



devices from the very beginning of the implementation. Two-way communication throughout the metering chain was an absolute necessity – remote controls of relays and connecting/disconnecting loads were regarded as very important functionalities, as were remote firmware upgrades, and the system had to adapt flexibly to TAURON's existing IT infrastructure. "The project was very instructive for both organizations. The massive data flow increase is like a stress test for our customer's IT infrastructure and challenges us to help them in the best possible way," says Szymanski.

SIGNIFICANT BENEFITS

In total, the TAURON Dystrybucja Group has a domestic customer base of 5.2 million – 33% of the total population. The company delivers 23% of the electricity in Poland and operates on 18.3% of the country's surface area."TAURON expects to reap significant benefits from this smart metering investment," said TAURON Dystrybucja CEO Piotr Kołodziej. "While still only in the pilot phase, the system has shown its capability potential in terms of identifying technical losses within the network as well as losses caused by tampering."

At the same time, 600 TAURON customers took part in a successful energy efficiency pilot enabled by Landis+Gyr's solution. On a general level, TAURON can now optimize its customer service further; the system delivers nearly real-time consumption information and enables on-demand reading requests as well as remote load control. TAURON's end customers participating in the pilot can track their personal consumption data via a web portal. First results of the web portal availability show that customers are initially enthusiastic about the increased control over their energy use. However, in order to maintain their enthusiasm for energy savings over the longer term, additional demand response programs need to be put in place, as awareness alone is not enough.

CLOSER TO THE SMART GRID

TAURON Dystrybucja is preparing for a full rollout of smart meters to its entire base of 5.3 million customers by 2020, in accordance with regulations in Poland and the EU. In order to prepare for the rollout, the project was completed by the end of 2011. Based on the results, the distribution system operator will be able to identify and establish best practices across the business, from logistics to IT infrastructure and internal administrative resources. It will also gain a solid understanding as to how it, and its customer base, can maximize the benefits that smart metering technology offers.

"We are very happy with Landis+Gyr's comprehensive Gridstream® solution. Due to their broad experience in smart metering, we knew that they could provide us with functionality that delivers a lot more than just billing values – their advanced network monitoring tools are bringing us one step closer to a smart grid," said CEO Piotr Kołodziej after the pilot successful completion.

Rapid smart metering development in Poland follows the signing of a declaration in June 2009, calling for the introduction of smart metering in Poland to increase energy efficiency for individual, institutional and industrial customers. The declaration is supported by the Polish National Energy Conservation Agency as well as the three largest consumer organizations.



leaving room for innovation

A glimpse behind the scenes of European standardization and consensus-finding processes.



pathway: *The European Commission has given CEN, CENELEC and ETSI the challenging task of developing open standards for smart metering and the smart grid. What can be done to help the process along, both by standardization organizations and leading manufacturers?*

Jean-Paul Vetsuypens: CEN, CENELEC and ETSI are working together with industry, utilities and other stakeholders to develop and adopt European standards in support of the implementation of the European regulatory provisions, the successful integration of the European energy market and the implementation of the EU's climate and energy targets.

In order to carry out the requested work in an efficient and timely manner, CEN, CENELEC and ETSI combined their forces and established the Smart Metering Coordination Group. This platform brings together experts from a number of technical committees, as well as representatives of various stakeholders: utilities, IT industry and consumer organizations.

"The participation of key stakeholders in standardization is crucial."

Jean-Paul Vetsuypens

This successful cooperation has resulted in the publication of a CEN-CENELEC-ETSI Technical Report which identifies the functional entities and interfaces that the communications standards should address. It is intended to support the development of software and hardware architecture and related standards and assist the active participation of consumers.

The participation of key stakeholders in standardization is crucial. Companies such as Landis+Gyr play a predominant role in setting the elements of the playing field, which is then embedded in the formal standardization arena. Without that drive on the part of the industry in offering solutions to the market place, standardization would be a purely academic exercise.

Thomas Schaub: Under the mandate M441, CENELEC has developed – in close cooperation with its international partner organization IEC – a suite of smart metering standards EN/IEC 62056 that are open, universal and customizable. These standards cover the full range of smart metering use cases, supporting the "contracting and billing", "customer support" and "infrastructure management" business processes of a utility. Security is provided at the access level and at the data protection level. Due to a strict separation between the smart metering data models and the communication protocols, the standards can be extended in a consistent way considering new use cases and new developments in communication technology. The EN/IEC 62056 standards include classic power line communication and communication technologies based on IPv4. New communication technologies can be integrated via IPv6. Worldwide, more than 300 different types of electricity meters from more than 20 different manufacturers have been certified to fulfill the EN/IEC 62056 standards.

pathway: *What is the relationship between standards and interoperability? Would it be fair to say that standards are a prerequisite for interoperability, but not sufficient to guarantee true interoperability? What is CEN and CENELEC's stance with regard to interoperability in smart metering?*

Jean-Paul Vetsuypens: Smart metering is all about interoperability; it is built on products and systems that work together, even if they are of a totally different nature and involve various market segments ranging from utilities to users and manufacturers. Standards lay down minimum requirements for this. The efficiency and effectiveness of the interoperability provisions are, however, set through the solutions offered by the industry and on the basis of the industry's know-how. Standards should not provide interoperability answers as such, but rather offer the playing field for industry to present its competitive and innovative solutions through dedicated company specifications. In the standardization arena, there can be several barriers

Jean-Paul Vetsuypens holds the position of Director Standards at CEN and CENELEC, European standardization organizations and business catalysts that remove trade barriers for European industry and consumers. Their mission is to foster the European economy in global trading, the welfare of European citizens and the environment. They provide platforms for the development of European standards and other technical specifications.

Thomas Schaub is Landis+Gyr's Senior Manager Standards and Interoperability. As chairman of several IEC working groups and as member of the management board of the DLMS User Organization, he contributed substantially to the establishment of international standards that support the introduction of smart metering and smart grid systems. Thomas Schaub is also one of the founding members of the IDIS Association.



and challenges to interoperability in the process of developing and implementing a standard. These restrictions and challenges can be overcome by coordinated action from the industry and by involving a wide spectrum of stakeholders.

Thomas Schaub: Interoperability is not a value in itself; it is a feature of a product. Without products, there is no interoperability. Open, interoperable products fully comply with the standards. Customization is restricted to choosing the options which are offered by the standard. Following this rule ensures that the products do not conflict with the standard and – most important – no hidden intellectual property rights are introduced. The result is documented as a "companion specification" defining the interoperable product based on open standards.

With the standard and the companion specifications, we have established the tools to produce interoperable products. However, this does not guarantee the availability of interoperable products. To reach the ultimate goal, it requires the commitment from several manufacturers to invest into interoperable products, i.e. products which are designed for a market to be shared between competitors. This is only possible if the individual market share can justify the investment. The larger the market, the lower the price for interoperability. In other words, interoperability is expensive for products customized for niche markets. Finally, "Trust is good, control is better" also applies to interoperability, meaning that a neutral party has to take the responsibility to maintain the companion specifications and to execute rigorous conformance testing.

pathway: *Critics claim that there are too many standards. If so, what can be done about this?*

Jean-Paul Vetsuypens: CEN and CENELEC prepare voluntary standards, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a single European market. This leaves room for innovation, for example in relation to remote reading protocols. Standards are also designed to be neutral as regards market structures and outcomes. They should promote open and fair competition by preventing restrictive practices that could lead to closed markets and monopolies. The standards published by the ESOs do not impose identical solutions on all smart metering projects in EU member states, nor do they provide a "best practice" solution or recommendations. The standards which have been developed should rather be seen as a kind of common "toolbox" of standards to facilitate smart metering deployments. This approach recognizes that different countries (including the EU member states) will each have their own priorities and will conduct their own cost/benefit analyses. In addition, there are important differences between electricity, gas, water and heat, which inevitably lead to different solutions in different countries.

Thomas Schaub: Standards are the result of a consensus-finding process to which all stakeholders can contribute. Only those standards documents that go through a rigorous, well-defined evaluation process reflect the position of all stakeholders. This consensus-finding process is necessary to minimize the risk that a standard contains hidden intellectual property rights, or that it is limited to the requirements of a very specific market. Subjects which are still under development or for which no broad consensus could be found are often published under the title "Technical Specifications". As a consequence of the open development process, standards tend to cover a comprehensive set of requirements. The resulting specifications are rather universal. However, the markets are requesting solutions optimized for their specific requirements. It is left to the skills of the successful manufacturer to transform the universal standard into a product which covers the specific needs of several markets at an attractive price. ■

"Only those standards documents which go through a rigorous, well-defined evaluation process reflect the position of all stakeholders."

Thomas Schaub



powerhouses for art – a different kind of energy

Art galleries, such as London's Tate Modern and the Santralistanbul in Turkey are exemplars of urban regeneration, as these old power stations pulse with a different kind of energy.

When they were originally constructed, the buildings housing the Tate Modern, on the Southbank, and Santralistanbul, in what was once Istanbul's oldest industrial district, were designed for one purpose only: to produce and distribute electricity. Today, these structures are open to the public, ostensibly drawn there to indulge in art and cultural activities, a leisure pursuit that is a multi-million euro industry for major cities. But visitors cannot help be awed by the original industrial functionality that continues to echo within these buildings' walls.

ICONIC INDUSTRIAL CATHEDRALS

Tate Modern is stripped back. The vast space of the building's main Turbine Hall has often been used to make art into an interactive experience. Santralistanbul has embraced the building's heritage to create the Museum of Energy. The Museum is based on a restoration of the original Silahtarağa Power Plant's engine rooms, built in 1913 and 1921.

When built, Silahtarağa was a state-of-the-art power plant. The number one and two Engine Rooms allow visitors to see the equipment supplied by industrial companies that include AEG, Brown Boveri, Siemens and Thomson-Houston. One turbine generator has been restored to its original appearance, while the other has been preserved in its final state. The Control Room, which oversaw the generation of electricity and its transmission to Istanbul's various districts, has been preserved intact. The ground floor of the Museum of Energy is an energy play zone, with interactive exhibits of scientific and technological themes related to energy and electricity.

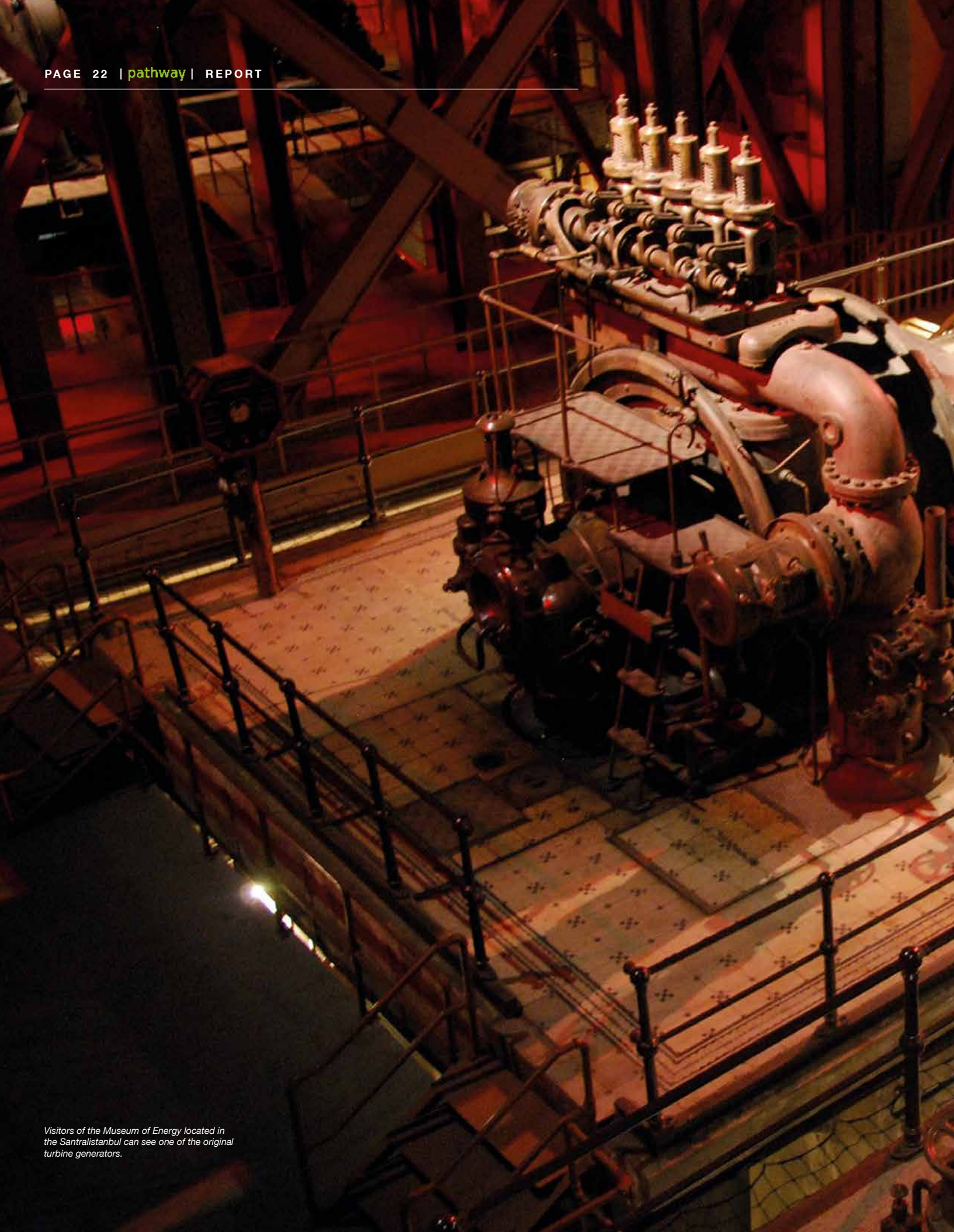
In 2007, the Silahtarağa Power Plant opened its doors as an art gallery and centerpiece for education, social life and culture in Istanbul.

In service from 1910 to 1983, Silahtarağa functioned as the Ottoman Empire's first urban-scale power plant. Built at the mouth of the Kağıthane and Alibeyköy rivers at the tail-end of the Golden Horn, Istanbul's oldest industrial area, the power plant was the city's sole electricity provider from 1914 to 1952. Silahtarağa's generating capacity reached a peak of 120 MW in 1956, after which it gradually declined until the plant was decommissioned in 1983 because it was no longer economically viable.

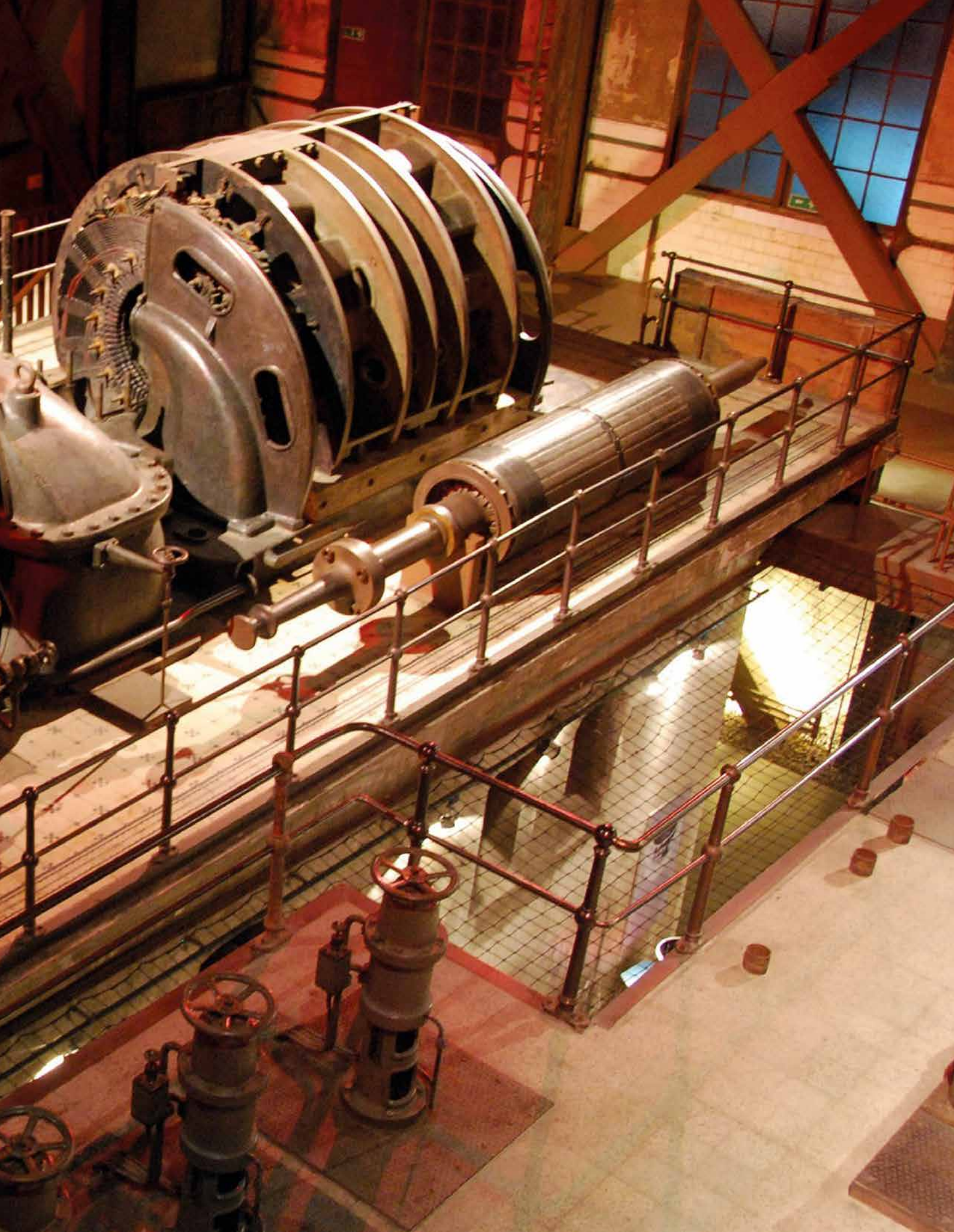
A MULTI-MILLION POUND CONVERSION

Bankside Power Station, by the River Thames, was originally built in 1952 as an oil-fired power station on the site of an older coal-fired plant. But due to rising oil prices, Bankside became uneconomical, closing in 1981. The building, designed by English architect Sir Giles Gilbert Scott who, some 20 years earlier, had

Picture page 20:
Installation: Dominique Gonzalez-Foerster, TH.2058, October 2008 - April 2009, Turbine Hall, Tate Modern



Visitors of the Museum of Energy located in the Santralistanbul can see one of the original turbine generators.







Pictures page 24:
The buildings housing the Tate Modern, on the Southbank, and Santralistanbul were designed to produce and distribute electricity. Today, these structures are open to the public to indulge in art and cultural activities.

Picture page 25:
Ólafur Elíasson, The Weather Project, 16 October 2003 - 21 March 2004, Turbine Hall, Tate Modern.

worked on the iconic Battersea Power Station, failed to win the recognition it deserved. When Bankside was retired, an application to get the building listed was refused. In 1994, when the decision was made by the Tate Gallery to make Gilbert Scott's "Cathedral of Power" the home for the new Tate Modern, the bulldozers had already started demolition works.

Apart from a remaining operational London Electricity sub-station the 'Bankside power station' had been redundant for almost 20 years before opening as the Tate Modern.

The £134 million conversion into the Tate Modern, designed by Swiss architects Herzog & de Meuron, started in June 1995 with the removal of the remaining redundant plant, a process that took five years. Most of the internal structure remains, including the Turbine Hall. This cavernous space, 35 meters high and 152 meters long, has been used to display large, specially commissioned works, from Louise Bourgeois' Maman, consisting of a gigantic steel spider, installed for the Tate Modern's opening, to a replication of the sun (Ólafur Elíasson: The Weather Project, 2003–2004), to indoor slides (Carsten Höller: Test Site, 2006–2007). These exhibits (Unilever Series) have changed perceptions of art as something to interact with, not simply as something to be passively observed. Since it opened its doors 14 years ago, more than 40 million people have visited Tate Modern. The gallery is one of the UK's top three tourist attractions and generates an estimated £100 million in economic benefits to London annually.

PRIVATE PUBLIC PARTNERSHIPS

The remaining link connecting Tate Modern to its original function has been an on-site electrical substation, operated by London Electricity since 1981. In 2006, Tate was awarded a grant to buy the land from EDF Energy, which retained ownership of the western half of the switch station to the south of Tate Modern. The grant is being used to reimburse EDF Energy for the costs of the works required to free the land, including the relocation of the transformer equipment nearby.

As part of a £215-million capital project for the gallery's expansion, the grant has enabled the Tate to bring the derelict oil tanks in the basement, as well as the western end of the switch house, into public use. Refurbishment of the two underground tanks, which once held millions of liters of oil to fuel the power station above, began in 2010. "The Tanks", which opened in July 2012 to celebrate the Olympics, are the first museum space in the world solely dedicated to live performance art and film. The final phase of Tate Modern's expansion involves construction of a new building designed by Herzog & de Meuron to increase gallery space. The extension, to be completed by 2016, will be a model of environmental sustainability, setting new benchmarks for museums and galleries in the UK. To achieve this, the new building will draw much of its energy needs from heat emitted by EDF's transformers in the adjoining operational switch house. With a high thermal mass and exploitation of natural ventilation and daylight, the new building will use 54% less energy and generate 44% fewer carbon emissions than current building regulations demand.

Like Bankside's transformation into Tate Modern, Silahtarağa's rebirth as Santralistanbul involved the collaboration of public sector, private sector and non-governmental organizations. Opening its doors in 2007 following three years of conversion work, Santralistanbul has succeeded in becoming one of Turkey's most ambitious urban renewal projects in the field of arts and culture, attracting over half a million visitors and exhibiting the works of international artists.

Further afield, the transformations achieved by Tate Modern and Santralistanbul are being emulated. In China, the Nanshi Power Station built in 1897 was reopened in 2012 as the Shanghai Power Station of Art. As art galleries, these buildings are experimental and experiential, all while preserving a vital link to their city's industrial heritage. ■



Tate Modern

EXHIBITIONS 2014

Malevich
16 July – 26 October 2014

ARTIST ROOMS: Robert Mapplethorpe
11 May – 26 October 2014

ARTIST ROOMS: Lawrence Weiner
27 September 2012 – 31 January 2015

Conflict, Time, Photography
26 November 2014 – 15 March 2015

Louise Bourgeois: Works on Paper
16 June 2014 – 12 April 2015

Find more on: www.tate.org.uk

protagonists of standardization

A number of groups and initiatives are committed to standardization and interoperability. The following are mentioned in this issue of pathway.

The European Telecommunications Standards Institute

produces globally applicable standards for information and communications technologies. ETSI is a not-for-profit organization with more than 750 member organizations.

See more at: www.etsi.org

The European Committee for Standardization

brings together the national standardization bodies of 33 European countries. CEN has been officially recognized by the European Union and is assuming responsibility for developing and defining voluntary standards at a European level.

See more at: www.cen.eu

The European Committee for Electrotechnical Standardization

prepares voluntary standards, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a single European market.

See more at: www.cenelec.eu

The European Smart Metering Industry Group

provides knowledge and expertise on smart metering and related communications at a European level, giving support to European Union institutions, member states and standardization organizations.

See more at: www.esmig.eu

The Interoperable Device Interface Specifications Industry Association

is a non-profit association of smart metering companies established to maintain and promote publicly available technical interoperability specifications based on open standards and supports their implementation in interoperable products.

See more at: www.idis-association.com

white paper: IDIS interoperability – securing long-term investments with interoperable solutions

Landis+Gyr is proactively supporting international standardization initiatives, thereby forming the basis for interoperable smart metering products. With the establishment of the Interoperable Device Interface Specification (IDIS) Association, Landis+Gyr and other members commit themselves to the implementation of open standards into interoperable future-proof solutions.

This white paper will help you understand

- The European standardization framework
- The importance and benefits of interoperable technology in ensuring the success of the large-scale smart meter deployments
- The IDIS Association approach to interoperability at all levels of the data exchange
- The IDIS process from specifications to conformance testing and certification of fully interoperable smart metering devices

To download the complete white paper, please scan the QR code or go directly to:
http://bit.ly/1lZ8V11

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