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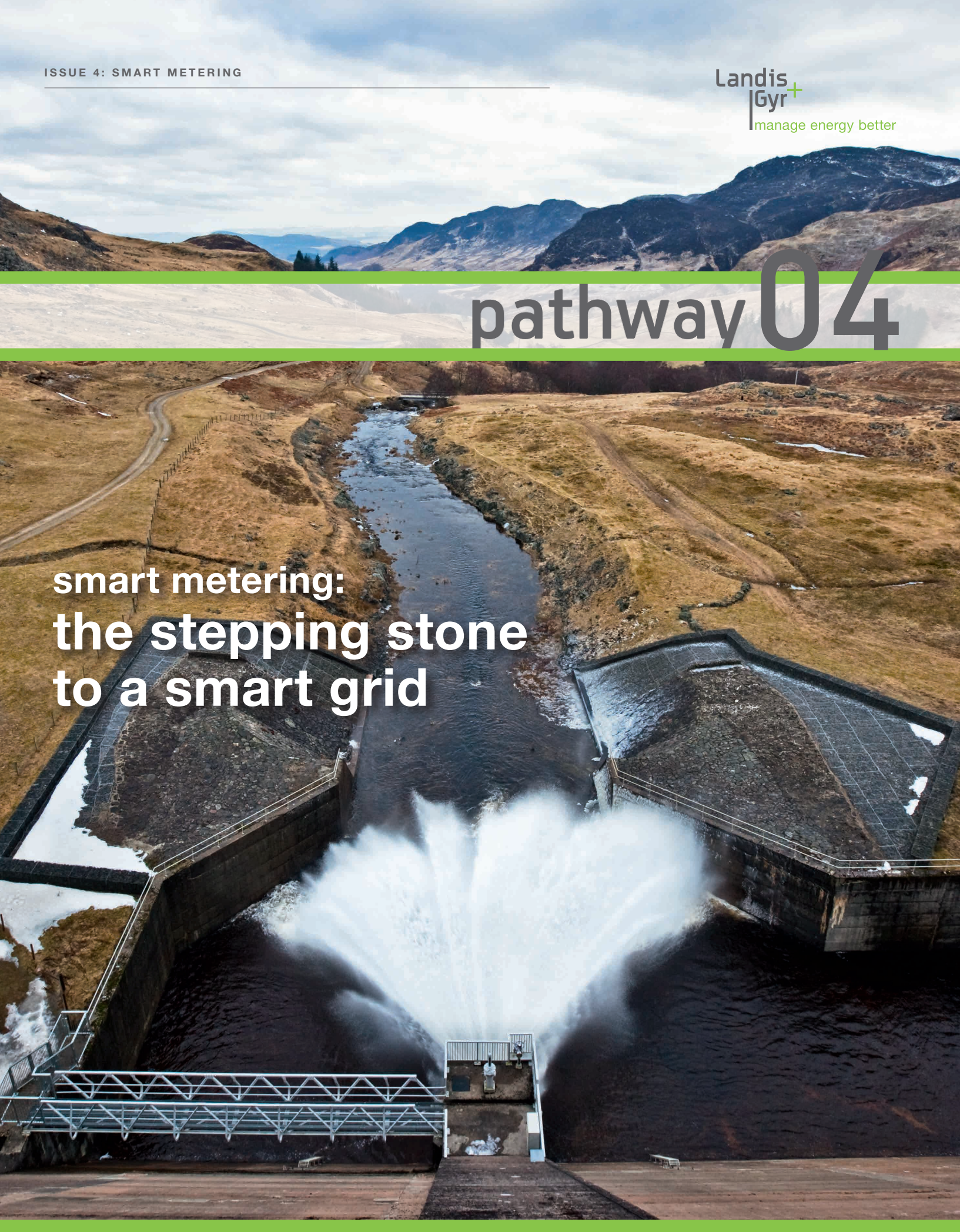


smart metering: the stepping stone to a smart grid

from the editor

Dear readers,

The future of the energy industry can be seen from many different angles: for this issue of pathway, we decided to look through the lenses of British photo-journalist Toby Smith. He battled tough conditions in the Scottish Highlands to bring back some powerful pictures that will change your perception of power generation. Toby's story is also one of how an energy company embraced change in the way it presented itself to its customers. He shares the story with us in an exclusive interview.

One of the most important projects on the road to a sustainable, future-proof society is the development of a comprehensive smart grid. At Landis+Gyr, our ambition is to help our utility customers go through this change process as smoothly and intelligently as possible. Smart metering is the stepping stone to the smart grid and in this issue of pathway, we take a closer look at how far along smart metering rollouts have come.

Apart from the logistical challenge the sheer quantity of devices pose, choosing the right kind of smart metering solution is an important strategic decision that utility companies need to take. At the same time, an advanced metering infrastructure means a lot more than just installing a new set of meters and software; it's the beginning of a transformational project affecting the entire organization. We share our insights about the issue in our strategy article and revert to it when we look at IT integration.

Enjoy the read!

Jon Stretch
Executive Vice President EMEA, Landis+Gyr

contents

STRATEGY

managing change 6

stepping stones on the path to a smart grid 10

getting integration right 12

a real-time system using aggregated data 14

REPORTS

mass rollout in the nordics 16

hiukkavaara – a living lab far up north 18

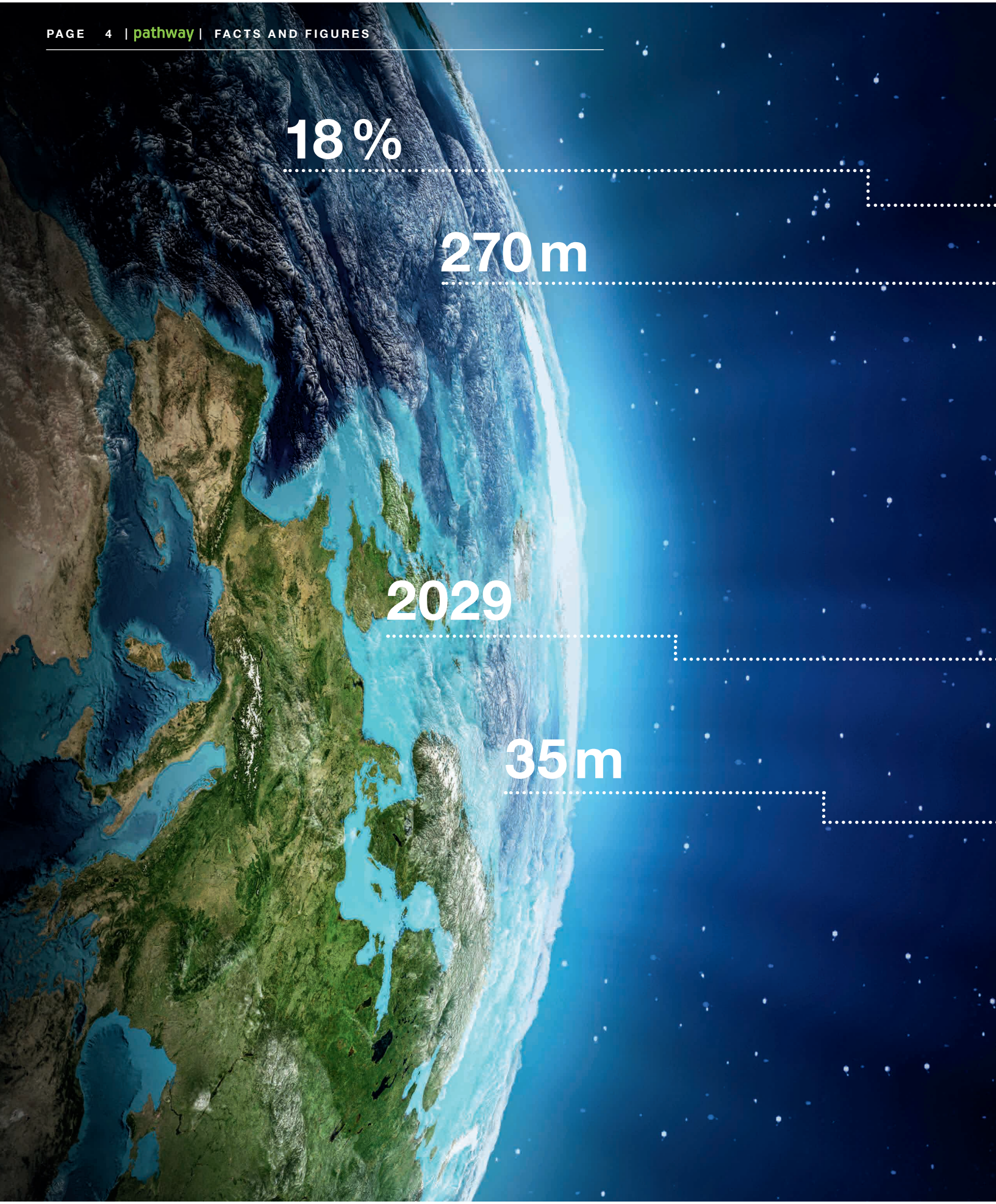
a smart grid pilot 20

deconstructing the process 22

FACTS AND FIGURES

smart metering – facts and figures 4

reader's survey 26


18 %
270 m
2029
35 m

smart metering facts and figures

In the EU, 20/20/20 continues to be a major driver for growth in advanced metering solutions.

Penetration for smart meters, providing more comprehensive functionality than basic meter data collections, was 18 percent at the end of 2011 in the EU 27+2.

20/20/20

In 2012, the global installed base for communicating electricity meters was estimated to be approximately 175 million, and is projected to grow to nearly 270 million by the end of 2017.

According to IHS, several countries have already committed themselves to nationwide rollouts of advanced meters, most notably the UK, France and Spain. Italy and the Nordic region have, for the most part, already implemented advanced metering solutions and have some of the densest advanced meter penetration rates of any of the sub-regions in the world.

20.5 %

The installed base of smart electricity meters is forecasted to grow at a compound annual growth rate of 20.5 percent between 2011 and 2017, reaching 154.7 million units at the end of this period.

At the end of July 2013, results of the German Smart Metering cost-benefit analysis (CBA) were made public. The study foresees an annual installation rate of four million meters (with and without communication) until 2018, at which time 40 percent of Germany will be covered. By 2022 there should be a 68 percent coverage, and the national rollout will be completed by 2029.

In October 2013, France kicks off the tender process for the first phase of its national smart meter rollout that will comprise a total of 35 million endpoints. Four million smart meters are expected to be installed from 2015 to 2016. From 2017 onwards, in the second phase of the rollout, the remaining meters will be deployed at an installation rate of 5 to 7 million endpoints per year. The entire rollout is expected to be completed by 2021 at the latest.

Austria developed a regulatory roadmap in April 2012. Sweden and Italy completed deployments at the end of 2009 and 2011 respectively and Finland will be ready by the end of 2013, followed by Estonia and Norway in 2017. Spain has set a target date in 2018, while Austria, Ireland, the Netherlands and the UK are aiming for nationwide rollouts to be completed during 2019/2020.

2019/20

In addition to this, the governments in Denmark and Malta have put their countries on track for full smart meter coverage by the end of the decade, supporting rollouts by state-controlled electricity companies. Cyprus, Poland, Portugal and Romania are leaning towards regulation-driven smart meter rollouts too.

Sources:
IHS Smart Electricity Meters – World – 2013; Berg Insight Smart Metering Europe 2012; Landis+Gyr AG. Terms and synonyms for smart meters used in this article originate from the sources.

PETZL

managing change

Smart metering and advanced metering infrastructure (AMI) are stepping stones on the path to a fully smart grid. Choosing the right kind of smart metering solution – a solution which supports future smart grid applications – is a crucial strategic decision for utilities to take. At the same time, implementing an advanced metering infrastructure means a lot more than just installing a new set of devices and software; it is a transformation project that will affect the entire utility. Effective, accessible communication by governments, utilities and other stakeholders is particularly important to take customers along on this journey.

Smart metering is the foundation of the smart grid, since acute operational awareness is crucial to guaranteeing grid stability. Without smart metering, it will not be possible to reach a sufficient level of awareness. The smart grid will be unable to meet the industry's high expectations if there is no comprehensive smart metering coverage: distribution system operators will need to increase operational awareness of distributed generation, electric vehicles and consumer response to demand management programs.

Modern smart meter penetration in the EU 27+2 was 18 percent at the end of 2011. By 2017, Berg Insight projects "that the rate will increase to 56 percent." As a result of the massive replacements, smart meters will come to dominate the European electricity metering market, eventually accounting for over 95 percent of the total volume. In many parts of Europe however, a more extensive smart metering coverage is needed before smart grids become operational.

TREE HIDING THE FOREST

Xavier Ringot, VP Smart Metering Solutions Center EMEA, Landis+Gyr, describes the process that small- to medium-sized utilities usually go through when they decide to install a smart metering solution. The risk he says, is to see a smart meter rollout as a necessary suffering, limited to comply with the regulations, without considering whether the solution is future-proof and can easily be upgraded and extended to support

smart grid applications, especially data analytics. Landis+Gyr's Gridstream solution is designed to enable this modular and scalable approach and ensures that additions can be made.

Another important aspect for a successful rollout is to keep the big picture in mind. If the focus is too narrow and technical, purely on the meter and its functionality, it becomes the tree which hides the forest. Utilities that enter into smart metering have a large transformation project ahead of them. Beyond managing the rollout, which is a complex logistical challenge in itself, utilities need to decide on a choice of business model. This decision boils down to two basic questions: What will I do myself? What will I have others do for me?

In the pioneering Nordic countries for example, the majority of smart meter rollouts were handled by one main supplier, whereas in other parts of Europe most utilities decided to go with a number of suppliers and took on responsibility to integrate the entire solution themselves (see report on page 16 for a turnkey solution in Finland). When several suppliers are involved, they tend to carve up responsibilities amongst themselves and there is a risk that none of them takes on final accountability for the end-to-end performance of the smart metering solution. The right business model depends on whether the utility has the necessary resources and in-house expertise to manage such a process; Landis+Gyr has successfully supported customers with the execution of all kinds of business models.

SOFTWARE TAKING THE SPOTLIGHT

Up to now, the primary benefit of smart metering realized by utilities has largely been the reduction of operating expenses through automation of meter reading and billing processes. Smart meters are capable of monitoring, recording and communicating multiple parameters – the kind of data that can provide insights into both the status of the distribution network as well as consumer behavior. In other words, a smart metering solution is the necessary foundation for an advanced metering infrastructure (AMI), an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and their customers.

There is usually a one to three-year delay until software-based analytic solutions are adopted, since there is an unavoidable transition period between installing, provisioning, and updating the billing process from manual to automated reads on the utiliy side. Implementing integrated and advanced analytic software can take significantly longer. "What we see is that when our customers first install smart metering, the initial focus is logically on implementing their main processes around contract and billing. Afterwards, we implement additional functions. Of course when you select your smart metering technology and choose a very basic smart metering system, it might be impossible to upgrade it. This becomes a problem when you want to go all the way to a near real-time smart grid," Ringot explains.

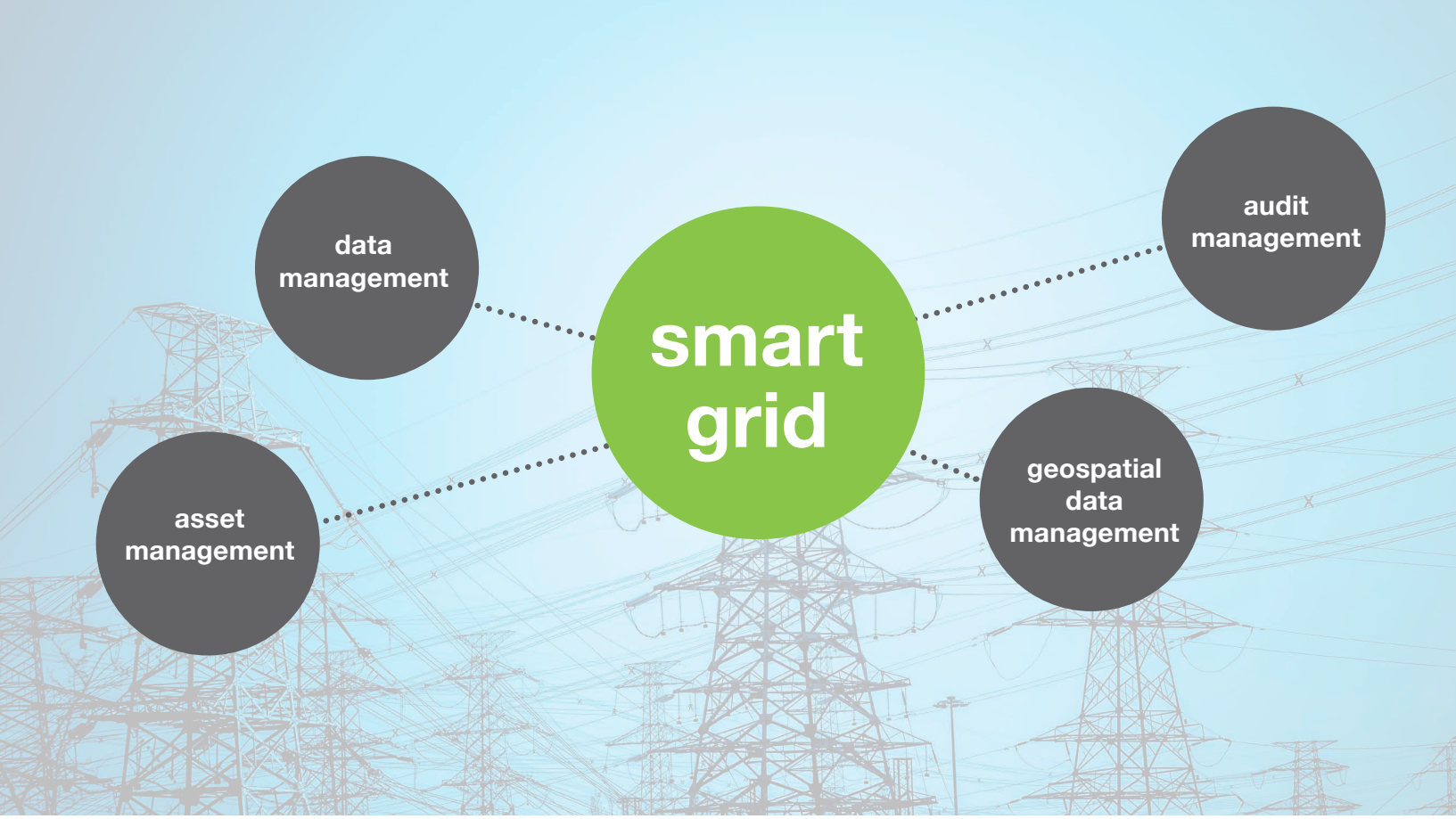
In the "Utility AMI Analytics for the Smart Grid 2013-2020" study published by GTM Research, analyst Zach Pollock states: "In isolation, however, smart meter data rarely provides measurable benefits. It is only through the implementation of software solutions which can provide additional context that the true value of advanced metering infrastructure can be realized." When the high penetration of smart metering that Berg Insight predicts is finally realized, the focus will shift to software that allows utilities to use big data analytics to track, visualize and predict.

LEVERAGING GOOD WILL

A successful, comprehensive transition to intelligent automated transmission and distribution of energy, allowing for decentralized production and integration of renewables, is however only one part of the equation to make the energy supply of the future work. Energy consumers, both industrial and residential, also have a crucial role to play and they stand to benefit from smart grid applications that improve reliability, enable enhanced energy efficiency, demand response and the integration of distributed energy resources such as solar rooftops and electric vehicles. While there is general support among residential customers for the idea of energy efficiency, there still is a lack of education when it comes to the nitty-gritty of it and how to go about it.

Even though smart meters are a tangible symbol of the change that is underway and one which most people will end up having in their house, a study carried out in 2012 for Telefonica in the UK found that 63% of British energy consumers did not know what a smart meter was. 75% were not aware of the Government's smart metering program but 60% were in favor of the smart meter rollout when it was explained. 75% supported increased visibility of energy usage.

These figures indicate that there is a knowledge gap of a fundamentally sympathetic majority. This is an opportunity which governments and industry stakeholders could seize to engage especially residential customers through increased public information campaigns and demand response



Strategic fields of action in a smart enviroment

programs. Even though data privacy is an important concern in Europe, there is less of the hostility that smart meter rollouts have encountered in some regions of the US, for example.

Increased electricity prices are already being felt by a number of customers throughout Europe and they create an economic incentive to become more conscious of energy usage. Smart meters and device-level visibility through end consumer feedback portals put an end to estimated billing and could be presented as tools allowing customers to actively take part in how they use energy. The economic incentive alone might not be sufficient for all income levels but the broader message of using resources consciously will probably resonate with all strata of society.

A minimum of customer buy-in and education is also important to keep the costs of the actual rollout process low. Very simply, if people don't know why this is important, they might well reject it and just not be home when the installer comes round. If this happens frequently, it will incur high additional cost.

NEW QUESTIONS TO GUIDE STRATEGY

ERDF's experience during the pilot rollout in France shows how important it is to take customers along. Initially, the customer's association rejected the installation of smart meters. It was only when ERDF recognized the need to step up its communication efforts and customers were informed about the benefits of smart metering that the prevailing attitude changed. It seems that customers are interested and that they do listen, but they need to hear the message from a variety of sources in order to take it seriously.

It seems as if the utility industry is approaching an inflection point and has the opportunity to reconsider their use of information. This could fundamentally alter the way in which business is conducted. If customers can be got on board and smart metering becomes more prevalent, new strategic fields of action will present themselves to enterprises including management in the areas of assets, maintenance and modernization for 'smart' infrastructure. This will be supplemented by geospatial and data management for the purpose of using grid information for faster and more effective processes. Last but not least, audit management will have to deal with a multitude of new technical devices with associated diverse hard and software that will need recording and documenting.

In Europe, the political will for fundamental change in securing the EU's energy supply and the larger trend towards digitalization that has finally reached the energy industry, coincide and are driving smart grid development. Many utilities are in the process of becoming more proactive in their decision-making, trying to capitalize on the smart grid technologies which are being deployed. Predictive analytics, capable of managing intermittent loads, renewables, rapidly changing weather patterns and other grid conditions all represent the ultimate goal for smart grid capabilities. ■

stepping stones on the path to a smart grid

A conversation with Frits Verheij, Director Smart Energy DNV KEMA and Richard Haagensen, Head of Smart Grid and Business Strategy, Smart Energy Solutions EMEA, Landis+Gyr.

Frits Verheij has been working in the renewable energy business since the start of his career in 1987. He provides policy advice to governments and frequently works with utilities and grid operators to support them in defining innovation strategies. DNV KEMA Energy and Sustainability is part of DNV, a global provider of services for managing risk with more than 10,000 employees in over 100 countries. As an objective and impartial knowledge-based company, DNV KEMA provides innovative solutions in the fields of business and technical consultancy, testing, inspections and certification, risk management, and verification advice and support to organizations along the entire energy value chain: producers, suppliers and end-users of energy, equipment manufacturers.

Richard Haagensen is Head of Smart Grid and Business Strategy, Smart Energy Solutions EMEA at Landis+Gyr. He manages Landis+Gyr's smart grid portfolio and business development in EMEA and coordinates the joint portfolio activities with Toshiba. Richard is also a member of Landis+Gyr's global Software Architecture Board as well as the European Smart Metering Industry Group (ESMIG).

pathway: *Could you explain in what way smart metering is the stepping stone to a smart grid?*

"All customers need to become more aware of the energy system."

Frits Verheij

Haagensen: Meters and sensors for measuring and detecting are the basic components of a smart grid. They enable the different stakeholders to monitor and exchange data; they also enable the control of all kinds of devices, eventually encompassing the complete grid. With the introduction of renewable energy sources like PV-solar in the grid and new technologies like electric vehicles entering the picture, the ability to measure precisely and detect in real time is becoming more and more important. At the same time, market players like data aggregators need data to provide services in a smart grid environment. At Landis+Gyr we are currently looking at two main segments: the traditional grid operators providing, securing and optimizing electricity capacity for core smart grid opportunities. This is the technical side of things, if you like. We have numerous projects in which we support such smart grid initiatives such as with ACEA in Italy, the Lyon Confluence project in France, or EKZ in Zurich. Then there is the energy trade and market selling, providing services and producing/consuming energy for smart market opportunities.

pathway: *The EU has set ambitious energy efficiency goals and mandates for smart meter rollouts. Is that enough or is there a need for further, more specific legislation and regulation to move towards smart grids?*

Haagensen: As long as the level of renewables stays under 20%, there will only be serious problems in certain areas where these renewables are introduced, islands of problems if you like, which can be managed locally, typically with traditional non-smart solutions – thus there is currently no major drive for smart grid solution in the market. Apart from that, the DNOs are neither incentivized to enable smart grid solutions and applications and here is a lack of regulation to enable DNOs to recoup their investments; this is a problem across Europe. The situation in the USA is different, for example, because most US energy companies remain bundled, they see the incentives for energy efficiency. The

Frits Verheij, Director Smart Energy DNV KEMA

EU has set energy efficiency goals and legislated that smart metering needs to be rolled out, but for the smart grid there is no incentive, there is nothing really in terms of energy efficiency and how to enable it.

Verheij: If you look at the present system, you see that it is a centralized, top-down one which has remained unchanged for a very long time. However, if you look at most of the developments, apart from large wind farms and some high-voltage technologies maybe, they are decentralized. Neither the grid nor the market is designed to deal with that, so regulation needs to be adapted and adjusted further. There are working groups dealing with these issues in Brussels, however, so things are moving forward. This is also true at national levels: the energy law in the Netherlands, for example, has recently been amended; it now allows stepping away from present regulation in specific pilot projects and provides more freedom to introduce and experiment with time-of-use rates.

pathway: *Data privacy is a major issue that needs to be solved before you can really leverage the benefits of smart grids and intelligent energy management. What is the current status of ensuring data privacy?*

Verheij: It would be best to come up with solutions which are applicable internationally, that's the ideal situation. As far as I know, there are no international standards but there are companies and consortia working on it. We call this security by design; it should be incorporated in all kinds of technology developments and solutions, whether it's a smart meter or any other device in the smart grid.

Haagensen: I agree with Frits that there should be internationally applicable standards but there will always be country and technology-specific elements when it comes to security. Today, there are limitations at the low end of the solution. If you talk about smart meters, smart devices and the communication between them, it very much depends on what is the preferred communication technology, whether it's radio-based like in the US or PLC based like in Europe, for example. So, it depends on the communication technology and there can be significant differences, not only between countries but also between different regions in the same country. At the same time, there are different levels of security. When you build up a solution, you have to consider how to enable security from end to end, that means that all the building blocks have to address security on different levels. Landis+Gyr is working very intensively on this topic. Together with industry associations, standards bodies and an internationally proven supplier of secure systems, we developed an energy management system that guarantees the security of information passing through the networks used for smart meter communications. In the near future, we're planning to release our end-to-end Gridstream solution with encrypted data communication channels between the smart meter and head-end-system.

In addition to this, there is also the challenge of dealing with the market communication within each country. Here it depends very much on the country's regulator.

Richard Haagensen, Head of Smart Grid and Business Strategy, Smart Energy Solutions EMEA, Landis+Gyr

For example in Denmark and in the UK, the idea is to build a large-data hub that can be accessed by various players in the market.

pathway: *While there is a lot of talk about electric vehicles and smart homes, the level of customer interest has been fairly low up to now. What is your take on this?*

Verheij: First of all, you have to make a distinction between the industrial and commercial and the residential segment. From a business perspective, commercial and industrial companies have a stronger incentive to be early adopters because energy is often an important cost factor to them. At the same time, if you look at the enormous amount of what we call local initiatives, there are 800 in Germany and more than 300 in the Netherlands. We see a lot of those local initiatives in Denmark and in England too. So, local energy communities using all kinds of smart grid applications, this is something which is growing and will continue to grow in the next years. In the end, these initiatives need to have some common grounds to get widely spread.

pathway: *In a similar vein, despite pilots and large rollouts all over Europe, the majority of the population isn't aware of smart metering or the smart grid. Some level of end customer knowledge and buy-in is necessary. What can be done?*

Verheij: I think first of all customers need to become more aware of the energy system, most people don't know how to read their annual energy bill, for example. It's important to deliver value for customers showing information about their energy status, showing them how they can save energy and money. I believe that the retailers, the ones who provide energy to the consumers are the ones that need to inform customers, but governments can help too. In the end, it will probably spread and become popular when new cost-saving services are offered to customers. You can compare it to the rise of the internet: it has been around for a long time but it took several years to really take off and reach the mainstream. ■

"Meters and sensors for measuring and detecting are the basic components of a smart grid."

Richard Haagensen

getting integration right

Successfully integrating a smart metering solution is a task that actually warrants that over-used expression: "it's a challenge." The prize is the shift from the traditional forecasting model to a near to real-time system which makes use of aggregated data. In order to engineer this transition, a successful integration of new technology with the utilities' IT systems is crucial. Utilities need to link new hardware and applications like smart meters, smart appliances and thermostats to equally new business processes, like the integration of renewables and altered network operations. The best approach is joining the two layers by means of future-proof solution architecture using standardized, proven solutions since they hedge the significant investments. The rapid innovation in business applications makes it necessary to separate the data model from the AMI. It is useful to hide the details of the underlying communication and data acquisition machinery to provide a logical model which the business applications can then leverage. Choosing the standards for enterprise system communications can be more challenging than the device-level standards.

A UNIFIED WAY TO STORE DATA

A future-proof reference 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. The MDM itself is integrated into the utility's advanced business applications. In order to ensure an effective implementation of the solution 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.

Software plays a critical role in the successful integration of legacy and state-of-the-art utility systems. A structure with straight forward interoperability ensures maximized return on investment for the utility while standard-based development minimizes risk and provides consistent end-to-end results. There is, however, a broad set of standards. What is important for utilities is to choose the right mix of standards and an efficient strategy in the pre-integration phase: 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 utilities industry.

FINDING THE RIGHT PARTNER

Mistakes are often made at the very outset of the journey, during the selection process. It is crucial to choose a provider and a solution with a proven track record of deployment and integration. Utility customers sometimes overlook that many providers have limited experience with successfully handling such large-scale solution and integration projects. The rollout and IT integration of AMM solutions often involve multiple parties; not properly defining and agreeing on the responsibilities is another potential source of problems.

The consequence of this is that when utilities select a solution, they should focus on both the solution and the provider. From the solution perspective, selection criteria should be flexibility, interoperability and standardization.

From a provider assessment perspective, selecting providers with a strong-proven background in complex integration projects is a necessity. Utilities executives from different companies should share experience and compare notes with each other to profit from lessons learned. In the end, the utility should be looking for committed trusted partners who are open about the difficulties and are also able to explain how they can be overcome and how they will work together with the utility to ensure joint success.

LEVERAGING UNIQUE EXPERTISE

Landis+Gyr has long recognized that solution integration is of paramount importance and as such, it's a key consideration in the solution portfolio customers can choose from. Using this approach, Landis+Gyr is at the forefront of pushing open standards and published interfaces. Landis+Gyr considers the use case requirements for the utility's business, not just the AMI components. Just one example of this in action is the Gridstream MDUS (Meter Data Unification and Synchronization) solution that enables end-to-end business processes by connecting smart metering landscapes to SAP® for Utilities.

Due to the complexity of AMI technology, there is a clear need for strong project management skills and experience. The integration teams need extensive operational knowledge to guide them through the process. It might sound simple, but a clearly defined and agreed scope, clear areas of responsibility, stringent success criteria and addressing business readiness early on are the most important factors for a successful integration project. Landis+Gyr is in the fortunate position to leverage the experience and skill from its global organization to define proven software-solution delivery and integration processes, building on foundations of its unique experience and expertise in all relevant areas. ■

Selecting providers with a strong-proven background in complex integration projects is a necessity.

a real-time system using aggregated data

A conversation with Neha Vikash, Senior Research Analyst, Energy & Environment – Europe at Frost & Sullivan. Frost & Sullivan, the Growth Partnership Company, works in collaboration with clients to leverage visionary innovation that addresses the global challenges and related growth opportunities that will make or break today's market participants. Neha recently published an article titled "Looking into the future of smart grids."

pathway: *Where do we stand with the smart grid and what role do smart meters play in it?*

Neha Vikash: I think smart meters are the cornerstone for smart grids – used directly or indirectly. It is crucial that countries create economic incentives to change behavior so smart meters are implemented. This will also enable load shifts and peak balancing.

pathway: *The smart meter wave is rolling but there have been some delays. Which countries specifically are lagging behind and why?*

Neha Vikash: In contrast to Finland, Denmark and now Spain, a lot of countries are falling behind, most of them in Central Europe like Latvia, Lithuania and Hungary for example. When you look at the hotspots like France and the UK, they have timelines in place but they are not being adhered to. To some extent, smart meter implementation has been delayed across the European Union. The reason for this setback, especially in the Central European region is a lack of tenders. The causes tend to vary – they can also be political or technical in nature. Legal specifications and government regulation are the major drivers, and everybody is waiting for these to emerge. Also when it comes to owning a meter, there are a lot of strings attached. In some countries like the UK and the Netherlands it's retailer driven, but in others it's the DSO that owns the meter. It is very important as a part of regulation to clarify those issues between the different stakeholders.

pathway: *In your article, you point to interoperability as an important problem to solve. How do you see the role of leading manufacturers like Landis+Gyr?*

"Leading manufacturers must ensure that open standards are available for utilities and that their products are interoperable."

Neha Vikash: There are several international standards in the market. The solution basically needs to be defined in very different ways for differing markets; emerging markets probably require more options than the others. When it comes to leading manufacturers, they must ensure that the open standards are available for utilities and that their products are interoperable. They should guarantee future-proof investments for

NEHA VIKASH

Neha Vikash started her professional career in market research as an associate analyst with The Datamonitor Group. Currently working as Senior Research Analyst at Frost & Sullivan, she tracks the Smart Energy sector with industrial expertise in the Smart Metering and Advanced Metering Infrastructure markets. She holds a Masters degree in International Business from Brunel University, London, UK and a Bachelor of Technology in Electronics and Communication from Jawaharlal Nehru Technological University, India.

their customers. Defining these standards is not such a big deal, but proving them and making them operable is something which is very important. I see interoperability and standards more at regional level; different regions put standards into practice in different ways. In the UK for example, a lot is happening; they are defining standards and issuing licenses.

"To some extent, smart meter implementation has been delayed across the European Union."

pathway: *You also talked about the fact that IT integration is going to play a more prominent, if not dominant role in making smart grids a reality. What do utilities need to keep in mind when planning their AMI solutions?*

Neha Vikash: I believe the bridge between the Meter Data Management system and the utility's applications is the key. The MDM has to be integrated into the enterprise's application, the customer relationship management system and other applications like outage management, distribution planning and demand forecasting. Back-office integration and enterprise architecture is integral for an AMI and a smart grid is only possible with the help of strategic integration architecture. Different data sets, from the smart meters and operational data from SCADA system for example, play a major role and need to be integrated. What then becomes important is how to make use of data analytics, how to make use of the information in the running of the business and how to move away from the traditional forecasting model to a real-time system using aggregated data. Utilities have never experienced such data volumes to date and often don't really know how to make use of that data or to turn accessible data into actionable data. There is also something of a trend towards AMI as a service, using private cloud-based solutions to deal with the large data volumes. ■

mass rollout in the nordics: smart game changer

Oulu in central Finland is not only Europe's largest northernmost city with a population of over 190,000, it's a technological boomtown. Well known for its science parks, research institutes and universities, its inhabitants are savvy with ubiquitous computing in nearly all facets of everyday life. Oulu is also home to the Finnish-owned Oulun Energia utility, which together with Landis+Gyr, has rolled out more than 60,000 smart meters in one and a half years.

Oulun Energia Siirto ja Jakelu Oy, part of the Oulun Energia Group, delivers services spanning the entire energy supply chain from production at Oulun's locally operating Toppila 190 MW Power Station to transmission and distribution in large areas of Oulu. This is realized by a team of 44 employees using a network of more than 2,500 km of power lines. Its lean organisation promises to remain highly efficient in the future thanks to Landis+Gyr's extensive turnkey solution including maintenance and operating services as well as reading services. This will enable Oulun Energia to focus on utilizing metering data for billing and network monitoring.

EXCEEDING MANDATORY REQUIREMENTS

As with all Finnish energy companies, Oulun Energia has been obligated to make sure 80% of its 90,000 metering points are remotely readable by the end of the year 2013. In 2011, as part of a successful pilot scheme, some 28,000 customers were already using Landis+Gyr electricity smart meters. Landis+Gyr then developed a comprehensive solution including the delivery of a further 62,000 meters, the merger of the existing metering infrastructure as well as communications technology. The hardware installation was carried out by a trusted external partner, supported by the Landis+Gyr Site Manager application for managing the installation and field maintenance operations of smart meters. This mass rollout was concluded in May this year well before the obligatory deadline, exceeding mandatory requirements by 18,000 units. This was facilitated by a smooth implementation process during operations, thanks to the close cooperation between all participants involved in the project. The DSO's Development Manager Mikko Rasi reported that "As our long-term partner, Landis+Gyr contributed not only as a technical expert and system integrator, but also with a deep understanding of our business processes which turned out to be valuable in the planning phase."

BENEFITS FOR BOTH CUSTOMER AND OPERATOR

Due to its strong focus on customer services, Oulun Energia was ranked among the three best electricity utility suppliers in a customer survey commissioned by the Finnish Energy Industries in 2012. Besides other innovative services, Oulun Energia runs online-reporting feedback systems, enabling customers to monitor their energy consumption. This was met with great acceptance. More than 30,000 customers already registered for the web based Energiatili platform that provides an hour-by-hour consumption history. But it also sheds light on the specific characteristics of the Nordic market: "It can cause upsets in wintertime, when the electric heating is reflected on the bill," comments Mikko Rasi. "But beyond that, the need for real-time monitoring and immediate feedback is undisputable."

Based on Landis+Gyr's solution, Oulun Energia is able to streamline its processes, leading to greater cost efficiency and improved customer services. This is added value, sourced from the meter data which is collected, validated and delivered by Landis+Gyr. "The high quality of the data allows network management functionalities like alerts, fault location and anticipation of malfunctions," is how Tuukka Toivonen, Head of Service Delivery Landis+Gyr Finland, describes some of the benefits.

AN EVOLUTION OVER TIME

Oulun Energia's successful rollout is an important milestone on the path to the smart grid. Yet there is still plenty of room for further development – not only in the visionary smart city project of Hiukkavaara in the Oulu district (see report in this issue), but also for day-to-day operations. "A smart multi-energy solution that can be used for heat and water as the next logical step is in reach," Toivonen points out. "But we also have a strong interest in more sophisticated forms of network management and smart grids." This however, is more than a technical issue. According to the expert, the Finnish market is in a state of waiting, looking for an appropriate business case. From his perspective, load control – which is subject of a current pilot project being run in cooperation with Landis+Gyr – and distributed generation could be driving the next steps. "The transition from distribution networks into smart grids is an evolution over time," he states. And Oulun Energia is ready for this evolution. Given Finland's lead together with Sweden in the use of smart meters, it will be well worth monitoring Oulun Energia's progress in the coming years: the forward-thinking Nordic attitude towards new technological ideas has the potential to produce a game changer. ■

THE FINNISH MARKET IN BRIEF

Finland's total energy consumption in the first quarter of 2013 amounted to around 392 petajoule, the consumption of electricity to 24.6 terawatt hours. The average electric power consumtion is among the highest in Europe, partly due to the fact that electric heating is the most popular form of heating. Energy distribution and meter reading are challenging in this country with vast lakelands and the third lowest population density in the EU.

hiukkavaara – a living lab far up north

Some of the award-winning proposals for the Hiukkavaara design competition (Arkkitehtuuritoimisto Bruun & Murole Oy and Arkkitehdit Anttila & Rusanen Oy)

10 years ago, Hiukkavaara was little other than a woodland region some 15 kilometers inland from the west Finnish coast. Known for its military barracks, the area was targeted by winter sports, hunting and fishing enthusiasts. Back in 2006, an outline plan was proposed for the vicinity. In March 2013, a 1.8 billion Euro investment plan was launched to build a sustainable arctic smart city, which is to be a model for environmental design in the northern hemisphere.

The arctic smart city is an ambitious project. Building in subarctic and arctic zones requires special skills and technology. To create an energy-efficient, climate-friendly and user-aligned winter municipality with innovative services and logistic processes is even more challenging. The future-oriented urban district covering 1,500 hectares (3,700 acres) intends to house 20,000 people in 10,000 homes and to create 1,800 workplaces by 2035. Furthermore, it will provide smart services to 40,000 consumers at any one time. Development themes in tomorrow's Hiukkavaara will include energy-efficient city living with smart grids, alternative and renewable forms of energy, an ecological water system and centralized waste management. As a district of Oulu City, which was rated Europe's most intelligent community by the Intelligent Community Forum ICF in 2012, it will provide smart city services, functional public transportation and safe wintertime cycling.

PIONEERING THE FUTURE

Hiukkavaara is to be the hub of Finland's fastest-growing technological region and is being targeted as an important investment area – not only financially but also at an interest level. The smart city will combine numerous single technologies already in existence, including virtually zero-energy consumption in all new buildings as required by Finnish law by 2021. Microgrid services will be used for energy storage, the distribution of produced energy including renewables as well as off-grid implementation for macro-scale demand response. Utility and distribution services will be employed for the large-scale control of energy consumption as well as supporting new innovations in electricity distribution and new business models for the value chain. The Finnish WintEVE consortium will also use Hiukkavaara as a test bed for various electric vehicle projects, including intelligent charging. The accent being set for this smart city is that it should be people-driven, self-initiated and age independent with a city center comprising single-family houses. Its transport is to offer protected interior thoroughfares for bad weather and "nature" routes for good weather.

TECHNOLOGY FOR A NEW ENERGY SYSTEM

The regional network operator, Oulun Energia Siirto ja Jakelu Oy (see report on page 16) is responsible for electricity transmission and distribution in Hiukkavaara. According to their Development Manager Mikko Rasi, the smart city will be exemplary for demonstrating load control technologies and demand side management applications that will find their way into everyday life in future : "It serves as a living lab for energy-efficient concepts and solutions." Together with Oulun Energia and Toshiba, Landis+Gyr is contributing to several projects in this smart city. SEAS – Smart Energy Aware Systems – for example are part of the Hiukkavaara theme "Utility and distribution services." Started at the end of 2012, SEAS will in future enable the operator to co-control subsystems and devices in on-site and independent grids. They will also allow reactive and proactive adaption of the system behavior by monitoring and prediction. "Enerficiency", part of the Smart Home theme which is another project Landis+Gyr is involved in, will soon enable user-led energy efficiency management.

EVALUATING THE EVOLUTION

While Scotland's Findhorn Ecovillage, which received the UN Habitat Best Practice Designation in 1998, is one of few worldwide examples of genuine long-term sustainability, this smart city promises to test the limitations of many of today's new technologies in the attempt to harmonize better with the harsh local environment for tomorrow. During its evolution, Hiukkavaara will monitor development using an Ecocity Evaluator – a software that assesses energy consumption, carbon dioxide emissions and costs. Assessment will take into account building, traffic, energy production, industry, agriculture and carbon sinks and can be compared with other cities. ■

Hiukkavaara is to be the hub of Finland's fastest-growing technological region.

a smart grid pilot: tracking transformer stations and street lights

Dutch energy company Stedin consolidates its smart grid infrastructure with a street lighting solution: the approach is providing a blueprint for further efficient and cost-effective rollouts. With subsidiaries in Rotterdam, Utrecht and Delft serving 2.1 million customers (equating to almost four million electricity and gas meters in total), Stedin is one of the main distribution system operators in the Netherlands.

Stedin chose a comprehensive, cutting-edge solution to replace their out-dated centralized control system (CS) and installed two Landis+Gyr S650 Smart Grid Terminals in each of the 75 transformer stations in the Houten area. Prior to the decision to roll out the terminals in all transformer stations, another distribution system operator ENEXIS and Landis+Gyr successfully completed a smart grid pilot which demonstrated how the Landis+Gyr technology facilitates tracking and monitoring of transformer stations and street lights. The S650 Smart Grid Terminal collects data from the transformer station and switches the tariffs for meters that are not remotely readable yet.

The positive effects of replacing the rather old-fashioned, centralized system with a modern, decentralized infrastructure became immediately apparent during the first installation phase. ”It had a huge impact on customer satisfaction,“ says Henk Fidder, Expert Asset Manager at Stedin. “With the CS, any defect would affect a large area and we received too many complaints. Now we receive information about problems a lot more quickly and are able to respond much faster. System reliability increased significantly.” He also points to an increased need to integrate renewable energy, especially solar, as a driver for the update of Stedin’s technology. “Now, we need to know what’s happening in the low voltage network and the old system simply can’t supply this information.”

CONCURRENT OPERATION – PARALLEL COSTS

In the past, tariffs for electricity consumption were switched by a centralized system (CS). The use of smart meters – 80 per cent coverage will be mandatory in the Netherlands by 2020 – now eliminates the need for a CS. The parallel operation of a CS and a smart system is inefficient and expensive. “Beyond the technical level, it is also a question of accounting,” says Tjakko Kruit, Landis+Gyr’s Commercial Director in the Netherlands. The operational costs of the CS have to be allocated to the remaining applications that make use of it – first and foremost public street lighting, besides very few niche applications. On the other hand, since street light can act as a valuable, integrated part of a smart grid, rolling out a combined smart infrastructure for street light and transformer monitoring is highly productive and cost-efficient.

METERING, LIGHTING, CONTROLLING: THE TRIPLE PLAY OF THE TRANSFORMER STATION

The two S650 devices are installed in the transformer stations in one fitting, keeping installation costs to a necessary minimum. The Smart Grid Terminal comes equipped with an on-board astronomic clock that enables geographical position settings and allow for

accurate sunset and sunrise trigger signals to switch the street light. One S650 controls and measures the street light application while the other monitors the transformer station; both devices use the same communication channel. This efficient approach keeps data transmission costs low.

Using the Smart Grid Terminal, the Dutch energy provider has an easy way to track street lighting energy consumption. “In the past, we had to count the number of street lights and estimated consumption,” explains Fidder. The S650 also optimizes energy consumption and facilitates maintenance as well as relamping. Both the data collected from the households and from the streetlight are used for network monitoring. This combination provides a valid database to calculate net losses. Malfunctions can immediately be detected and any significant disturbances are tracable.

BLUEPRINT FOR MASS ROLLOUT

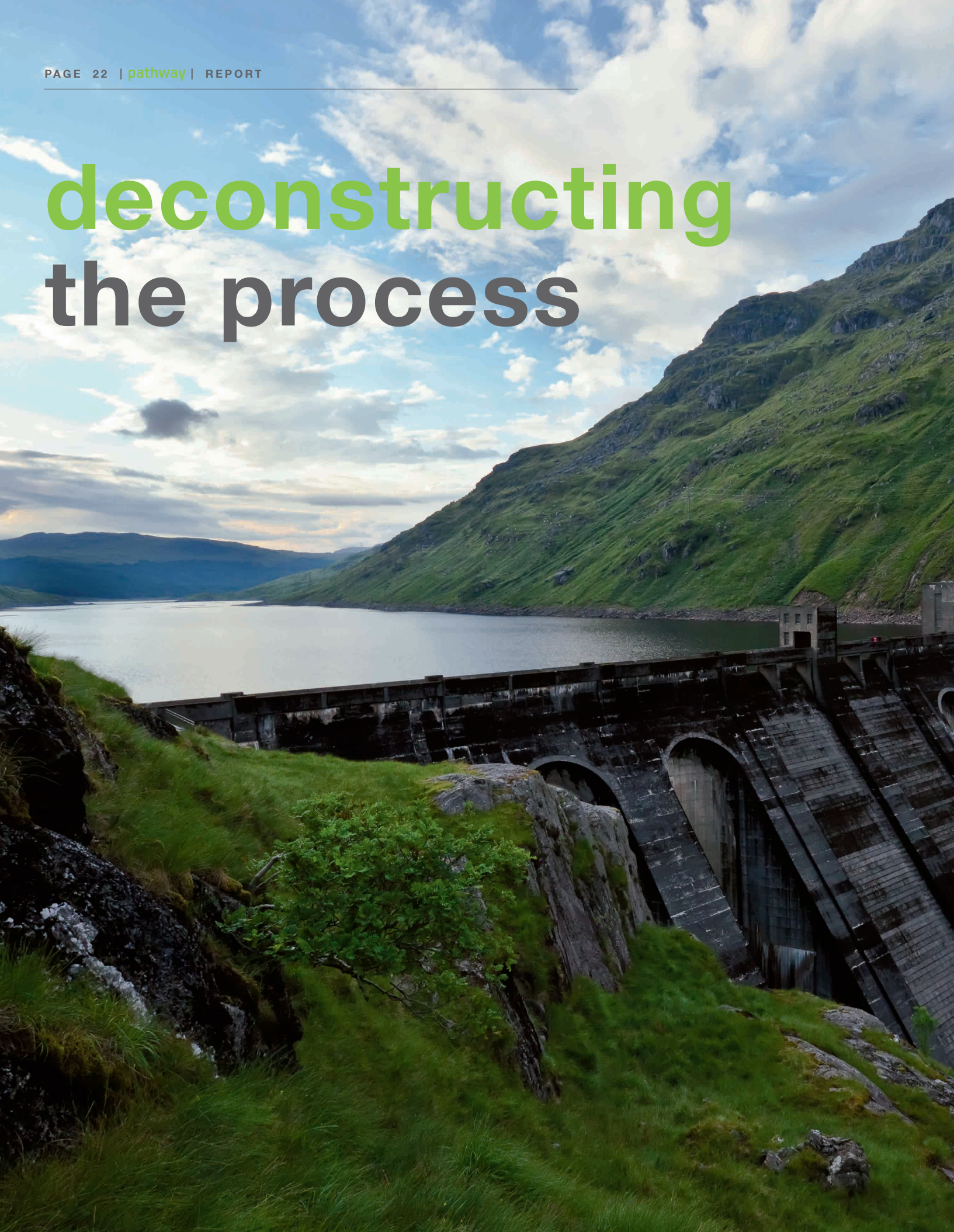
Landis+Gyr and Stedin are realizing a combined step-by-step rollout and review the process thoroughly after completion of each milestone. Successful collaboration and the large scale rollout is the result of thorough preparation and extensive testing under laboratory conditions. Ten devices were tested for a two-month period before the first installation phase started. “As trusted partner, we wanted to deliver an innovative, tailor-made solution based on our proven technology,” says Kruit. Following the experience of the Houten combined rollout, a smart grid solution and smart street lighting is planned in the Hoeksewaard area in 2014. 200 transformer stations will be equipped with the S650 Smart Grid Terminals and 40,000 smart meters will be installed in local homes. ■

THE DUTCH MARKET IN BRIEF

The Dutch energy industry is responsible for a good 6% of the country’s GDP, or 36 billion euros per year. The sector currently employs 100,000 people and the Netherlands is among the largest importers and exporters of oil and oil products in the world, and has a highly developed gas industry. A gradual transition to green energy should enable Dutch energy companies and institutions to become a top economic sector.

source: Government.nl

deconstructing the process



Teasing out the raw beauty and arcane power of energy production sites is a task that few have mastered like British photojournalist Toby Smith. His unprejudiced curiosity and sound scientific understanding of the subject matter are the cornerstones of his unique approach. Working together with Landis+Gyr customer SSE, he took breathtaking images of hydro-electric plants in the Scottish Highlands that have found their way into SSE’s brand imagery.

pathway: *What is it about energy production that fascinates you so much?*

Toby Smith: In all the industrial landscapes I work with, I like to visually deconstruct the flow of the raw material and the production process. With energy production, it's especially interesting because electricity is intangible. With SSE's hydro plants in particular, it was fascinating to see how these raw and historically important plants function. At the same time, it's a technology that is designed very organically within the landscape. It was amazing capturing the harsh weather, the raw conditions of the Scottish landscape and turning them into humming cables. Hydro is ideal in that it builds up this enormous potential energy. It also fascinates me how a rainstorm on a Scottish glen links back to consumers and everyday activities like boiling a cup of tea.

pathway: *And when it comes to personal motivation, what is it that keeps taking you back to this kind of demanding project?*

Toby Smith: Curiosity, be it scientific or visual. I do a lot of research on projects that never take shape because I feel that there is enough information, enough imagery out there and I have learned all I want to about them. The most interesting projects are the ones when I get frustrated after a certain amount of research and can't find enough or any original visual representation. Sometimes there are only a few images and they are used over and over again; you find them everywhere. That motivates me to go out there and shoot my own. I like to add to the visual index of a subject in this way. Something else that drives me is the desire to make subject matter transparent and give people the chance to make up their own minds about it. I care about sustainability and nature but I think typical advocacy projects can be ineffective, because they essentially tell people what to think. I prefer to make my own journey when it comes to transparency in my work; I

ABOUT SSE

SSE is one of the UK's largest electricity producers with over 13,000 MW of capacity (UK and Ireland) from the most diverse portfolio of power stations. It is the leading generator of electricity from renewable resources, with a total generation capacity of 3,200 MW.

Through its renewable development division, SSE Renewables, it is involved in the development of new renewable energy projects covering wind, wave, tide and hydro electricity.

think that's a more honest approach and a better way to connect with your audience.

pathway: *How did your cooperation with SSE come about?*

Toby Smith: I reached out to them because I wanted a sequel to my previous projects about thermal power plants in the UK. This time I wanted to focus on renewable energy across Britain and I got hooked on the story of hydro power generation across Scotland. It was surprisingly easy to get in touch with SSE; we had a great initial discussion on the phone and a week later I had to be on another shoot in Scotland anyway. So I just took my portfolio to a meeting with them and it went extremely well. I wish I could pitch into energy clients as easily as that every year! I think what impressed them was that I had really got my head around what they were doing up there. They had never worked with a photographer in that way before and I think they became curious to see the story I was going to tell.

pathway: *Your images ended up having an impact on SSE branding. What happened?*

Toby Smith: Up to that point in time their brand imagery was more consumer and employee led. I felt that it trickled down from the retail end, very colorfully, emotively, and in a safe kind of way. I deliberately wanted to break down that stereotype. I wanted to look at the challenges of the work they were doing and the remoteness of their locations. For me it was fascinating to tell a story about the tough conditions and the challenges they have to overcome to do their job well. This gritting one's teeth approach is not something that energy companies in the UK usually go for in their branding; it's more common in Scandinavia or the US. In the UK, energy companies have normally avoided the challenging aspect and prefer to focus on safety. But in the end, SSE really got behind the project and the idea of mastering tough challenges and successfully managing risk. A good example of how it played out is how hard it initially was to get access to a wind turbine in winter where I would shoot from a perceivably dangerous location high up. It was difficult to justify this location at SSE because photography is operationally not essential. In the end, the resulting picture became the wrap-around photo for their annual financial report and it did very well in the editorial media.

pathway: *You took many of your images in Scotland in difficult physical conditions. You were shooting at low temperatures, without any energy back ups. Which was the most difficult image to take?*

Toby Smith: The problem with the best vantage points is that they are often the most exposed. I did quite a few of the shoots from the top of the dams and even though you are not in any real physical danger, you are at the hand of the elements. You are effectively located at the end of a lake, in the middle of a valley at an artificially raised point; it's a funnel for the wind in the entire valley. And because it's so exposed, it's just freezing. I had to change the grease on some of my camera gear for example, because some lubricants just don't work at minus 10 degrees. Film needs a far longer exposure too, and you have to keep it warm before you expose it. Another thing is, the more challenging the conditions, the harder it is to find enough time to actually take the pictures you want. If you are in pleasant conditions and don't have to worry about cooking and where are you going to sleep, you can spend 45 minutes out of every hour shooting. Doing night photography in these kinds of conditions, you have to deal with basic needs and it puts a lot more pressure on you when it comes to the time you can devote to the job itself. And I did it by myself too; I've learned that there are economies of scale when somebody else is there to help with the expedition aspect of it. On the other hand, you are much more motivated to go and get it done when you are on your own. When there are two people, there is more temptation to just chat and pass the time.

pathway: *Once you get a deeper insight into renewable energy projects, how would you define the ubiquitous term, "sustainability"?*

Toby Smith: What I learned about sustainability is that if it's not going to be sustainable financially, it's not going to be sustainable at all. You see some types of sustainable energy production where you know instantly that this technology is never going to have any significant effect, because the commercial application isn't there. At the same time, I believe that there won't be any significant progress without dreaming, without taking a risk, which also means investing in projects that may not pay off in the end. I think it's important that there is an innovative, risk-friendly spirit and that more daring projects get the necessary financing. ■

TOBY SMITH

Smith is an award-winning contemporary reportage photographer specializing in landscape, environment and energy. His stills and video work have been assigned and published by clients such as National Geographic, GEO, The Sunday Telegraph, The Sunday Times, The Guardian, Fortune, TIME, The New York Times, BBC and Sky News.

www.shootunit.com

reader's survey

With the last edition in spring we set off on a fact-finding mission to discover how our readers rate pathway. Either a hard-copy or online questionnaire was sent to our international readers asking for feedback.

On behalf of Landis+Gyr, Martin Herzog, Key Account Manager Switzerland, handed over the Toshiba tablet to our reader Markus Flatt, Head of Meter Calibration Center of the Swiss utility EWZ

2,600 customers and business partners were asked to participate in this survey where we offered a Toshiba tablet as a participation incentive. The answers enabled us to get a clear picture. Thank you very much for participating!

pathway's average reader stems from middle or senior management on the customer side (75.5 %) holding a highly technical role in the company they work for and predominantly in the metering department. Nearly 60% of those who replied had read either one or both issues previous to edition 03. Interestingly, 17 % of respondents read all the articles, almost 30 % four to seven articles.

Almost 95 % of our readers considered that the articles in pathway present interesting approaches to important industry topics. Some 85.5 % of those consulted rated the articles to be of high quality on relevant topics as well as being written in an intelligible way. Over 57 % saw pathway as partly strengthening their picture of Landis+Gyr as a forward-thinking business partner.

A similar number of those asked were of the opinion that pathway enhanced their view of Landis+Gyr as a customer-oriented company.

The survey also showed that pathway is well-designed with good illustrations. Additionally the articles came across as agreeable to read and not too long. Perhaps the best news was that 100 % of all respondents would recommend pathway. Obviously we are on the right track!

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