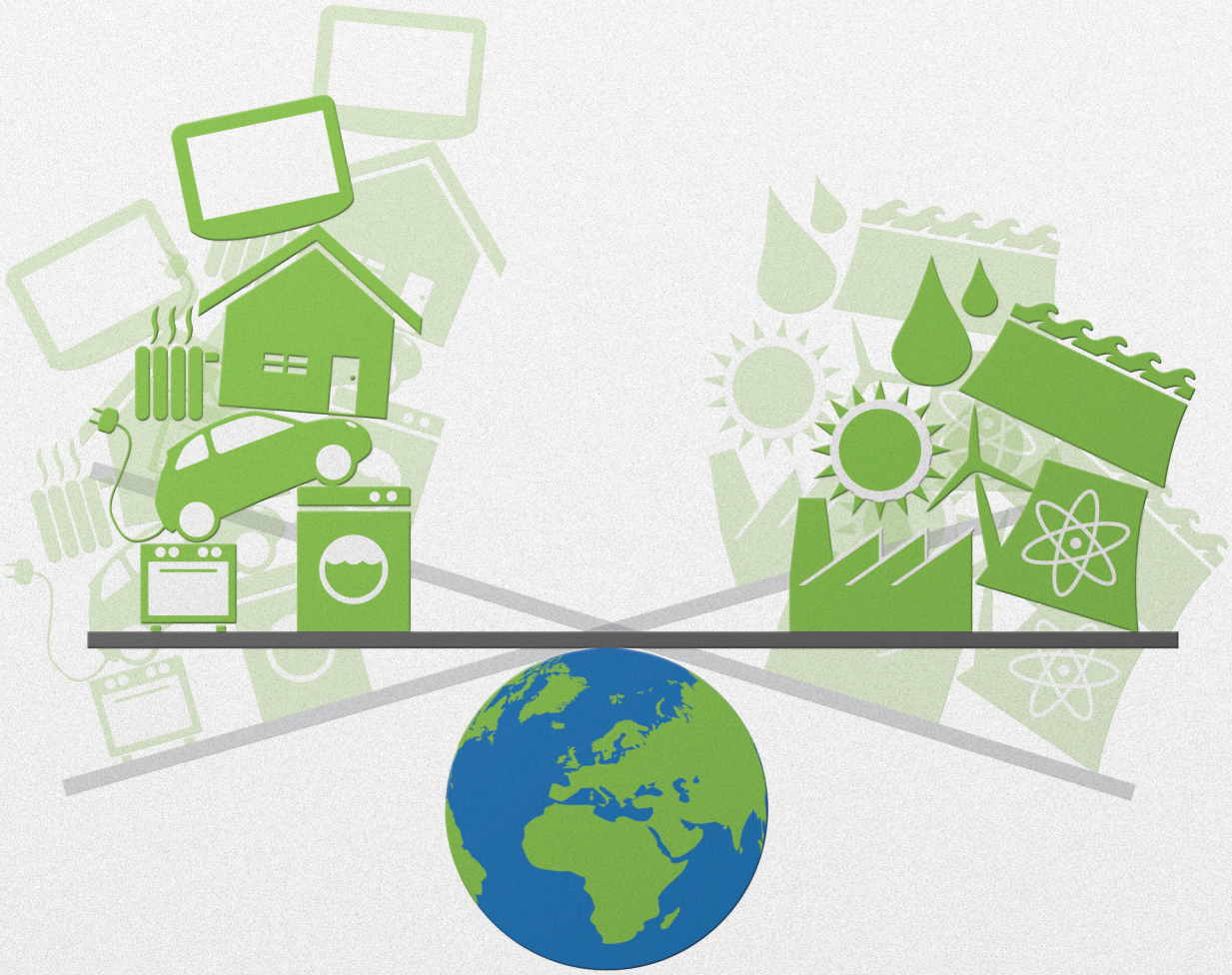
Landis+Gyr
manage energy better

pathway 03



keeping the balance

from demand response to energy efficiency

from the editor

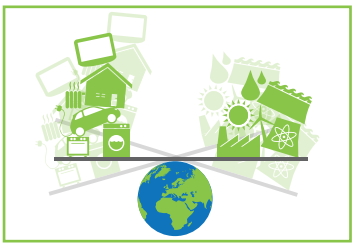
Dear readers,

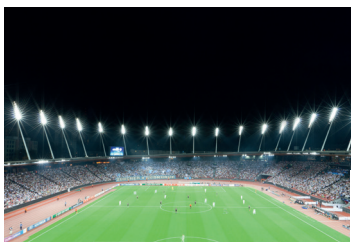
The significant costs and the political challenges of building new generation power plants can lead to supply constraints: accordingly, many utilities are taking a new look at Demand Side Management (DSM) as a tool to manage consumption and demand of smaller commercial and residential customers. Advanced metering infrastructure (AMI) and other smart grid technologies offer utilities the necessary real-time visibility and intelligence to monitor and control millions of devices over a wide network, allowing them to take DSM to a new level. In Europe especially, the other side of the coin seems to become more and more important: Supply Response™, which incentivizes customers to make use of clean and cheap energy from renewable sources when it is available.

Demand Side Management in its many forms has the potential to be part of the solution for a stable energy supply in a smart and sustainable 21st century. In this issue of «pathway», we want to move past the industry jargon towards a clear and focused definition of DSM. To accomplish this, we spoke to a well-known independent consultant, Jessica Stromback, and Fiona Hall, a member of the European Parliament in Brussels who also serves on the Industry, Research and Energy Committee (ITRE) and draw on the expertise of the knowledgeable people within our company. With the first issue of our customer magazine in 2013, we would like to once again contribute to a constructive and fruitful discussion about managing energy better.

Jon Stretch
Executive Vice President EMEA, Landis+Gyr

contents





energy today vs.

Floodlight + ambient light

Energy consumption for lighting a medium-sized soccer arena, such as the Letzigrund stadium in Zurich with a capacity for 26,000 spectators, is 5,800 kWh per match.

CO_2 emissions

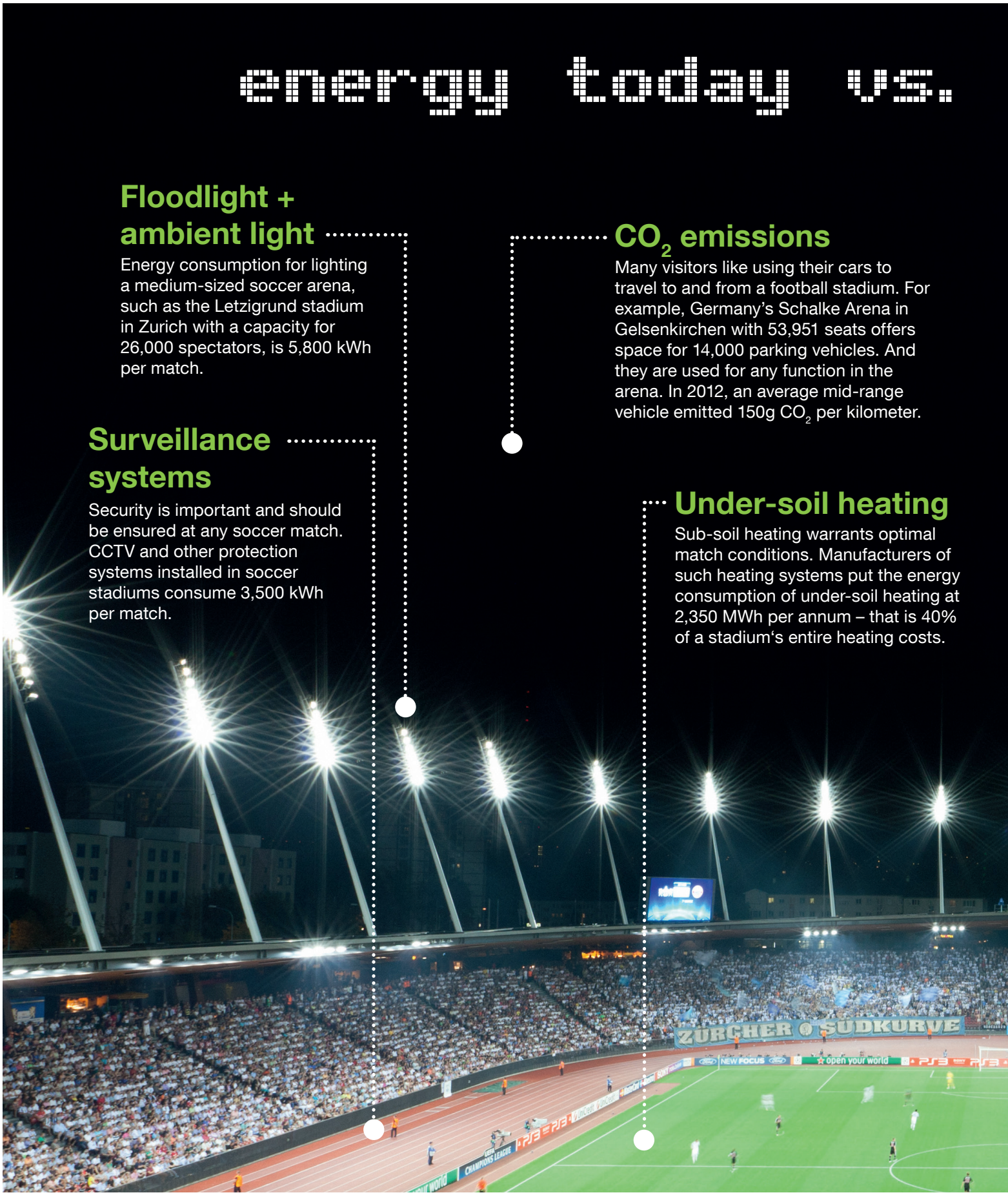
Many visitors like using their cars to travel to and from a football stadium. For example, Germany's Schalke Arena in Gelsenkirchen with 53,951 seats offers space for 14,000 parking vehicles. And they are used for any function in the arena. In 2012, an average mid-range vehicle emitted 150g CO_2 per kilometer.

Surveillance systems

Security is important and should be ensured at any soccer match. CCTV and other protection systems installed in soccer stadiums consume 3,500 kWh per match.

Under-soil heating

Sub-soil heating warrants optimal match conditions. Manufacturers of such heating systems put the energy consumption of under-soil heating at 2,350 MWh per annum – that is 40% of a stadium's entire heating costs.



energy tomorrow

Saving potential for lighting

More and more soccer stadiums are improving their lighting management. Changing to energy-efficient LED lighting and using motion detectors helps save energy. In the meantime, diverse stadium operators are testing to which extent energy can potentially be saved.

District heating

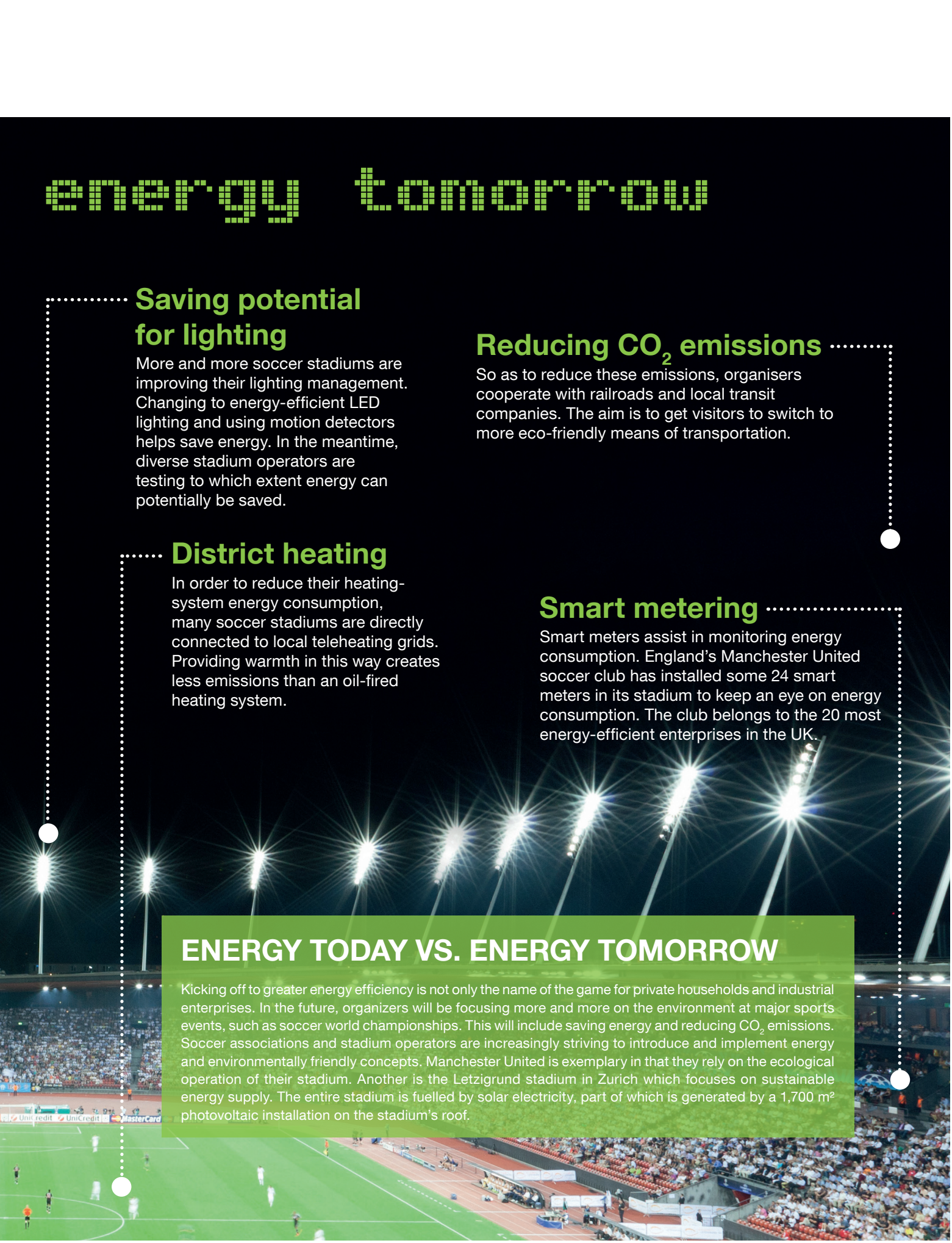
In order to reduce their heating-system energy consumption, many soccer stadiums are directly connected to local teleheating grids. Providing warmth in this way creates less emissions than an oil-fired heating system.

Reducing CO_2 emissions

So as to reduce these emissions, organisers cooperate with railroads and local transit companies. The aim is to get visitors to switch to more eco-friendly means of transportation.

Smart metering

Smart meters assist in monitoring energy consumption. England's Manchester United soccer club has installed some 24 smart meters in its stadium to keep an eye on energy consumption. The club belongs to the 20 most energy-efficient enterprises in the UK.



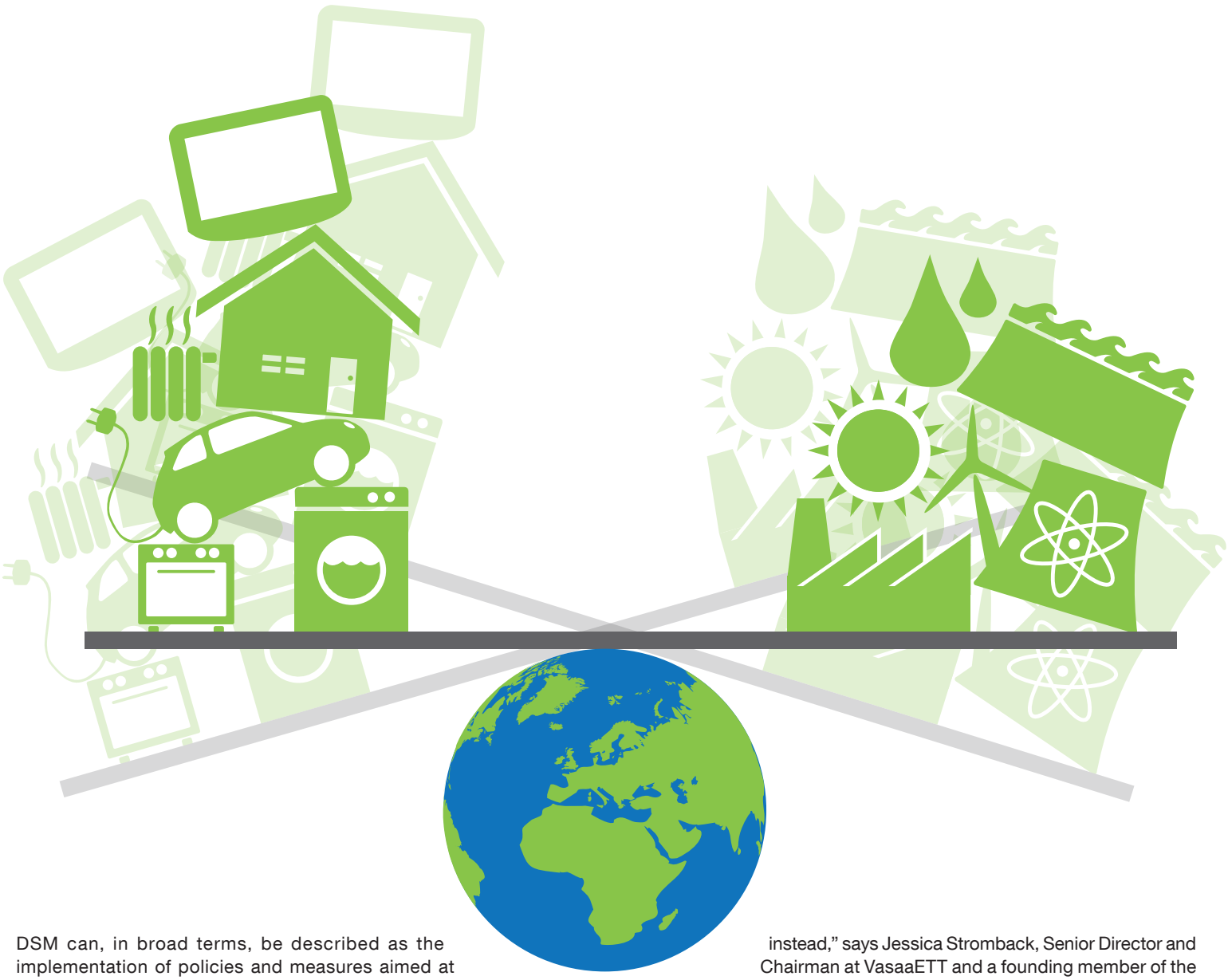
ENERGY TODAY VS. ENERGY TOMORROW

Kicking off to greater energy efficiency is not only the name of the game for private households and industrial enterprises. In the future, organizers will be focusing more and more on the environment at major sports events, such as soccer world championships. This will include saving energy and reducing CO_2 emissions. Soccer associations and stadium operators are increasingly striving to introduce and implement energy and environmentally friendly concepts. Manchester United is exemplary in that they rely on the ecological operation of their stadium. Another is the Letzigrund stadium in Zurich which focuses on sustainable energy supply. The entire stadium is fuelled by solar electricity, part of which is generated by a 1,700 m² photovoltaic installation on the stadium's roof.

demand side management

keeping the balance

The idea of Demand Side Management (DSM) has experienced a stunning renaissance in recent times. Traditionally focusing on the reduction of peak demand, it has become the master key to consistent energy and network management, featuring energy efficiency, Load Management and Demand Response as well as Supply Response™ – a new concept introduced by Landis+Gyr (see page 12).



DSM can, in broad terms, be described as the implementation of policies and measures aimed at controlling and steering electricity demand. It is a process rather than a tool and aims to manage consumption, i.e. demand of energy, in response to supply conditions.

The first generation of DSM programs started in the U.S. as a reaction to the oil-price shocks of the late 70s. They proved to be complicated and impractical. Reportedly the term DSM was created in 1983 during an emergency meeting of senior energy industry managers. It was designed to encompass a variety of customer-side activities, including energy efficiency and Load Management.

DEMAND SIDE MANAGEMENT 2.0

"DSM is generally used as an umbrella term for anything using demand side resources; though today we rather use the term 'Demand Side Programs' instead," says Jessica Stromback, Senior Director and Chairman at VasaaETT and a founding member of the Smart Energy Demand Coalition (SEDC) (see interview on page 10). The programs that are now being discussed aim to combine customer engagement, technological innovation, codes and standards for appliances, buildings and machines as well as innovative energy pricing with sophisticated financial incentives. These initiatives on the demand side have been regarded as a major solution in the fight against climate change. Energy consumption and peak demand are reduced, installed capacity and distribution network extension can be avoided or at least postponed and greenhouse gas emissions reduced.

The SEDC takes a comprehensive view of the topic and aims to promote demand side programs such as peak clipping and shifting, energy usage feedback and information, smart home, in-home and in-building automation as well as electric-vehicle charging management. On the

whole, it takes an interest in all "programs related to making demand a smart, interactive part of the energy value." The SEDC believes "Smart Demand" to be the key unifying tool within the smart grid.

A MAJOR PARADIGM SHIFT?

Many experts regard Demand Response (DR) as one of the most powerful applications in the overall DSM toolkit. DR is the term commonly used for programs designed to encourage end-users to make short-term reductions in energy demand in response to a price signal from the electricity hourly market or a trigger initiated by the electricity grid operator.

A "smart consumer" is essential to the success of energy transformation.

The authors of a recent study for Capgemini strongly believe in the potential of DR. They consider that this management tool, if applied correctly, could be an efficient and effective method for reducing overall energy use and cutting peak load "thus positively impacting the EU commission objectives to increase sustainability". According to them, in a best case scenario: "Long term Demand Response can be at the core of a major strategic paradigm shift for the electricity sectors' business model, aiding utilities to change their business model from a volume centered model to a more tailored, customer centered approach with increasing focus on value-added services provided to specific customer segments."

However, the potential of Demand Response varies. "It's important to differentiate between the regions when it comes to the potential benefits of Demand Response," says Aitor Galdos, Senior Vice President Strategy and Portfolio Management at Landis+Gyr. "For example in North America, air conditioning and pool pumps are very common and the focus of many American DR programs is on those appliances. The potential in Europe depends on the markets – for example in France, where heating is mostly powered by electricity, there is more room for successful DR programs than in some other countries," Galdos explains.

ENERGY EFFICIENCY AND LOAD MANAGEMENT

Increasing energy efficiency is another important aspect of Demand Side Management and it covers the efforts to use energy more efficiently at most stages of the energy chain – from the transformation of energy and its distribution to its final consumption. Energy efficiency is commonly perceived as a widely untapped resource, not only for industrial customers but also for utilities which benefit in the form of a quick, clean and effective option beyond generation itself (see interview on page 24).

Intelligent Load Management is also a tool in the DSM toolbox that holds quite a lot of promise: it gives utilities the possibility to actively shed loads when necessary. Advanced smart switching technology also enables utilities to execute load control programs that quickly and reliably allow command and control of load shedding across a range of consumer appliances.

The momentum towards truly smart grids in Europe is growing with every smart metering rollout and the introduction of more sophisticated Load Management technology is a logical next step. “Whereas the potential of Demand Response in Europe may be limited compared to North America, I do believe in the smart meter based Load Management solutions will find broad application in the region,” says Aitor Galdos (For more about Load Management, see the article on page 16).

EMPOWERING SMART CUSTOMERS

For modern DSM programs to succeed, it is important to create offerings which, on the one hand, make it easy for the customer to become engaged and participate while on the other hand leaving him in control of his household. A “smart consumer” is essential to the success of energy transformation; most experts agree about the importance of consumer engagement as well as the need to address security concerns with the new smart technologies. The ESMIG “Empower Demand” report – a large study comparing smart metering pilot projects across Europe – has shown that providing consumption information is an essential first step and encourages changes in consumer behavior. It shows that customers need to have immediate, simple access to their consumption information.

Creating awareness by providing information is crucial for gaining customer approval and engagement. Awareness should go hand in hand with automation and ease of use: residential customers should not have to spend a lot of time tracking their energy supply on a daily basis – it needs to be automated, but it is the customer who should be in charge of this automation.

SPREADING THE MESSAGE

There are still some hurdles that need to be overcome, particularly, when it comes to the quality of relationships between energy providers and their residential customers. “In today’s environment, most energy providers lag behind other home service providers in creating a “trusted relationship” to support emerging consumer energy needs and preferences,” is how Accenture consultant Greg Guthridge puts it in a report from 2012. According to the Accenture report, many utilities typically still provide a “one-way, low-value customer experience” with 70% of the interactions currently being seen as “neutral or negative”.

Obviously, what is needed is an improved approach to marketing and messaging. Exploring the benefits of the smart meter – the key appliance at the center of the smart home – will require a careful balance to build trust and prepare the ground for further conversations about new services. Nevertheless, the potential for implementing DSM policies in the EMEA region and in Europe especially is real and largely untapped. In the U.S., the country where DSM was “invented”, the Institute of Electric Efficiency estimates that utility-run DSM programs saved 112 million kWh nationally, sufficient to light 10 million homes in 2010. ■

“a huge untapped potential”

JESSICA STROMBACK

«pathway» spoke to Jessica Stromback, Chairman at VaasaETT. VaasaETT is a Global Energy Think-Tank based in Finland, one of the world’s top centers of expertise in Utility Customer Psychology, Customer Behaviour and Demand Response in energy markets. Jessica Stromback is a recognized expert in smart metering and Demand Response as well as in market structure and requirements for the demand side program development. As a founder and Executive Director of the Smart Energy Demand Coalition (SEDC), she works actively with European policy makers to enable demand side participation throughout European energy markets.

pathway: *The US leads the way when it comes to implementing Demand Side Management (DSM) programs. What is the situation in Europe?*

Stromback: On the whole, Europe has quite a bit of catching up to do. Nevertheless, the picture across Europe is quite diverse and it would be inaccurate to say that leading economies like Germany, Italy, France or the UK are the most advanced when it comes to DSM – or actually we nowadays rather talk about “Demand Side Programs” instead. There are interesting pilots and projects under way in places like Slovenia and Portugal, for example. Or, if we are just talking about smart use of energy from renewable sources in everyday life, the Greeks are actually doing quite well: there are hardly any conventional water heaters in Greece anymore, many people are using solar. Demand Response, one of the key applications under Demand Side Programs will probably only be significant in a few countries within Europe by 2020. And even after the large scale rollouts of smart metering technology that empowers Demand Side Programs, I don’t think that we will see a uniform picture within any given country. You simply can’t get the whole population engaged.

pathway: *What needs to be done to achieve significant levels of customer engagement?*

Stromback: First of all, it’s important to provide easy and quick access to energy consumption information. The information that customers require to make timely and educated decisions should reach them in appealing, aesthetic and highly motivating ways.

It's unrealistic to expect customers to put in lots of effort to find out if they are behaving in an energy-efficient manner.

Residential customers shouldn't be presented just with kWh values either, it's better to provide them with meaningful measures about savings and the environmental impact of their behavior. Customers need help to realize that simple actions will bring clear rewards for their environment, society and their pockets. Likewise, customers shouldn't have to sit around at home to wait until they get a signal to switch on their washing machine; we need standardized, off-the-shelf automation technology that is self-learning, intuitive and affordable. At the same time, customers need to have the possibility to opt out of the automation, the final decision-making power has to stay with them.

pathway: *So, consumer engagement initiatives should go beyond a mere provision of data?*

Stromback: Overall, it's crucial to create the right psychological environment. The more an offering is perceived to meet psychological need drivers, the more likely customers are to go for it. There are a number of relevant need categories; we distinguish between lifestyle, fairness, predictability and social conformity. To give a more concrete example: under predictability we would find the need to feel empowered as a customer, to have the ability to simply reduce costs as and when it's necessary or desired, to keep within a budget and to mitigate endless uncontrollable price rises. The customer is provided with the information and the tools to manage the cost environment. Here the marketing message has to be something along the lines of: your costs are in your own hands.

pathway: *In many discussions about implementing DSM – or DSP measures, as you say – the focus is on residential customers. In most European countries, however, the largest consumers of electricity are industrial, like for example aluminium producers. They have had some form of DSM and flexible tariffs for a long time though. So at the end of the day, is DSM in Europe old news?*

Stromback: No, absolutely not. The very largest industrial consumers already have some kind of contract which they negotiate directly with their DSO. This is not the case for small and medium-sized businesses, however. For them, so far there have been no offerings whatsoever, so we are looking at a huge untapped potential there.

pathway: *What have the main developments in electricity consumption patterns been over the last twenty or thirty years? People use a lot more appliances now, many gadgets have found their way into the homes, and how does this impact on DSM policies?*

Stromback: The interesting thing is that if one compares the total consumption figures in the 1980s and now, they are surprisingly similar. Yes, people have more electronic equipment in their homes now, but this equipment on the whole is a lot more energy efficient than it was in the past. What has risen significantly across the board are peak consumption levels. This directly impacts the discussion about Demand Side Programs because there are only three types of power plants that can be used for providing peak capacity: coal, gas and hydro. This is a huge problem for utilities because we are talking about 500 million dollar power plants that are only active about 150 hours a year or even less. There is no way that energy providers can recuperate their investments in such a plant. Therefore, we need to become a lot smarter about this. It's imperative that consumers get direct access to the market and the European Commission has been working hard on making this a reality.

The other step which needs to be taken is recognizing the value of flexibility. You must begin to allocate the real value for being there at the crucial moments, such as peak consumption times when no energy from renewables are available, for example. As of now, there is no mechanism in the market that rewards this kind of flexibility. The regular rates which are being paid for electricity don't reflect the price of providing peak generation capacity.

pathway: *DSM is part of a larger drive towards energy efficiency, towards reducing consumption and getting more out of less wherever possible. Doesn't that run contrary to the interest of the energy industry which in the end profits from selling more?*

Stromback: That's an oversimplification. It very much depends which player in the market we are looking at. A retailer, for example, benefits from efficient energy use during peak times. When the wholesale price of energy goes up but the retailer has agreed to sell electricity at a certain, lower price, it's of course in his interest to encourage his customers to be energy efficient in their behavior. Also, in mature, fully developed markets, energy efficiency is a strong competitive factor and marketing argument which can increase a consumer's loyalty. The cost of winning a customer is about 80 euro, while profits are about seven to ten euros per household per year. Nevertheless, the energy industry is certainly going through a time of enormous change and it will need to adapt or face the danger of being left behind. ■

"It's important to provide easy and quick access to energy consumption information."

Jessica Stromback

2

Demand Response is often seen as key application for the smart grid, adjusting consumption to the currently available energy. With the Supply Response™ concept, Landis+Gyr introduces a new perspective into the discussion with a focus on the supply side of the grid.

THE DEMAND SIDE PERSPECTIVE

As part of Demand Side Management, Demand Response (DR) looks at the customer side of the poise. It incentivizes energy users to reduce consumption. "Overall, the objective of Demand Response is load shifting, that is shifting peak demand to other hours or reducing it," says Aitor Galdos, Senior Vice President Strategy and Portfolio Management at Landis+Gyr. Utilities put Demand Response Programs into place because it's less costly and easier to curtail demand, especially at peak times, rather than adding generation capacity. In effect, customers stabilize the grid by agreeing to lower their demand for electricity if needed.

There is no question that the best possible implementation of Demand Response requires a new retail pricing mind-set. To reach its full potential, prices need to reflect a fluctuation in resources and encourage overall efficiency improvements by customers. Utilities will probably have to face an element of public opposition to price unpredictability and seasonal bill variations. The challenge for players in the energy industry will be to achieve sufficient volatility and tariff contrast to control demand while obtaining customer support and retaining revenue streams.

There are some hopeful pilots however, that make use of dynamic pricing dependent on weather conditions. One of them is Electricité de France's (EDF) Tempo tariff: Around 350,000 residential customers and more than 100,000 small business customers use the Tempo tariff. Days are distinguished according to price using a color system of "white" and "red" days, combined with an indication of whether the hour is currently one of eight off-peak hours or not.

Customers are notified of the current conditions via SMS or email alert. They can adjust their consumption either manually or by selecting a program for automatic connection and disconnection of separate water and space-heating circuits. It has been estimated that for the average 1 kW French house, the Tempo tariff brought a significant reduction in consumption especially on ''red'' days resulting in average savings of 10% on their electricity bill.

For a longer period Demand Response has been regarded as a market instrument that is effective in reducing the costs of load peaks for the system. However, it was not seen as a key solution for addressing the environmental objectives and climate change targets agreed among EU member states. The market designs and policies in place in several countries have not promoted innovations or opportunities for Demand Response in electricity markets. The initiatives in place have thus far focused on large industrial users and fail to harness the benefits that would be possible for a more comprehensive approach to Demand Response, inclusive of informed shedding operated by commercial and household consumers.

The 2010 study "Demand Response: a decisive breakthrough for Europe", co-authored by the consultancies Capgemini, VaasaETT and Enerdata, has developed a number of scenarios for the implementation of Demand Response in the EU. For the most optimistic of those scenarios, the "dynamic scenario", the authors conclude that: "To invest in Demand Response to curb peak load requirements and overall load consumption would present a more proactive and constructive solution. In this scenario, our calculations show that Demand Response alone achieves 25-50% of the EU's 2020 targets concerning energy savings and CO_2 emission reductions, as well as pre-empting the need for the equivalent of 150 medium-sized thermal plants in EU-15." ■

Sides of the coin

THE SUPPLY SIDE PERSPECTIVE

Aitor Galdos is one of the proponents of an alternative concept for balancing the supply and demand of energy, a concept he calls "Supply Response". In effect, he is shifting the perspective from one end of the grid to the other. Looking at the reality on the ground when it comes to Demand Response programs, Galdos points out that they are only of interest to customers with high energy bills. "Just saving a few dollars is not attractive for customers that have low energy costs, anyway," he says. "Furthermore, the customers who do take part could possibly experience a reduction of comfort," says Galdos.

"We have a steady rise in the availability of comparatively cheap energy from renewable sources, like wind for example. Supply Response is about encouraging customers to use this energy when it's available or to store it if it's generated at an inconvenient time," Galdos continues. He admits that energy storage is a tricky problem and a work in progress. At the same time, there are a number of promising avenues that are already in use and others that are being explored. Pumping water into reservoirs or heating it when there is abundant energy from wind and solar are examples for methods of energy storage that are already in use. "Then there is steam or compressed air to power turbines and of course we are exploring a variety of battery technologies," says Galdos. An important part of his argument is that the need for storage decreases the more intelligent the smart grid becomes – a topic which is at the very core of Landis+Gyr's agenda.

Galdos agrees with Demand Response proponents that more advanced functionalities will unleash the full potential of Demand Response as well as Supply Response. Landis+Gyr and Toshiba are working on the development of Smart Energy Boxes that allow direct control of water heaters and the scheduling of electric appliances. "Automation and ease of use for the customer is key – he needs to be given the choice to use, generate, store or consume. Those functions have to be automated, and they must work without the need for a customer to pay much attention to them. It's like your blood circulation or your digestive system – complex, interdependent systems that just work in the background," Galdos concludes. "In a nutshell, Supply Response means to encourage supply when energy from intermittent renewable sources is available rather than only curtailing peak demand." ■

personal energy management in great britain

intuition + technology

Landis+Gyr supplies a number of British consumers with an energy visualization solution: the ecoMeter, an advanced In Home Display. This small and portable energy display provides detailed information about energy use in pounds and pence, and in real time. The ecoMeter has played a part in many smart metering projects in the UK and is an integral component of the smart metering rollout of British Gas.

In Home Displays, like the ecoMeter, function as an interface between domestic consumer and utility.

"We want people to understand their energy usage and make informed choices about when to use it and how to save it. The new smart meters and energy displays are the foundations for doing this. That's why we're rolling out these user-friendly, sleek display units to British Gas homes," says Dean Keeling, Managing Director of British Gas Smart Homes.

With the Landis+Gyr device, customers are able to follow gas and electricity use by the hour, day, week and year. They can also set their own energy targets. A simple traffic-light system acts as a warning when large amounts of electricity are being used – giving customers the chance to change their consumption behavior and stay in control of their bills.

EMPOWERING THE CONSUMER

"Empowering customers – this is the core of the message that British Gas wants to get out there," says Joe Andrews, Product Manager for Landis+Gyr UK. "The feedback we've had so far has been extremely positive."

"Empower Demand", an international pilot study, conducted by the Global Energy Think-Tank VaasaETT for the European Smart Metering Industry Group (ESMIG), reviewed 100 smart metering pilot projects globally, involving over 450,000 residential energy customers, to determine which factors were most effective in creating energy saving. Various tools and technologies were examined: In Home Displays, websites and informative billing, as well as pricing schemes including time of use, critical peak pricing and critical peak rebates. The results show that residential feedback on energy consumption is crucial for awareness and behavioral change. Enabling, as well as motivating consumers to realize substantial energy savings is the keystone of any DSM strategy. According to the study, In Home Display applications resulted in the highest energy savings, averaging 8.7% and becoming one of the most effective tools of Demand Side Management.

"For maximum enablement, it is important that the smart meter is capable of communicating a rich data set to the consumer locally in an open and standardized way. Only then can the utility be confident that they are really enabling consumer benefits in a sustainable way and in such a way that their investment to the meter point is sound," says Joe Andrews.

A SUCCESSFUL FIRST MOVER

Between 2014 and 2019, the UK is planning to install over 47 million smart meters and supply 27 million In Home Displays to domestic consumers. "British Gas has been following a first-mover strategy and we are their partner of choice," says Joe Andrews. Pioneering, being "first-to-market" has a strong appeal in the business community and beyond, and this position provides clear benefits also for British Gas: it has the advantage of being a frontrunner and can gain all the experience necessary to provide customers with the best possible service early on. British Gas has installed over 500,000 meters in homes and businesses already, more than any other supplier.

"Our very successful cooperation with British Gas started several years ago," says Joe Andrews. "Overall, I think our customer British Gas got the best of both worlds: with the In Home Display, we deliver a tailor-made solution built on the platform of robust, tested off-the-shelf product." ■

With the Landis+Gyr device, customers are able to follow gas and electricity use by the hour, day, week and year.

load management

automation and customer empowerment

Load Management is no longer synonymous with ripple control: automated load management and load control at individual household level are just two of the benefits utilities and customers will be able to reap from the migration to the smart world.

You fill your dishwasher and know that Home Energy Management will receive information via the smart meter to switch on the dishwasher when energy is offered at the best price within a pre-defined timeframe. That same afternoon your parents drop in on an unannounced visit, you offer to cook them dinner and need clean china urgently. You touch an icon on your In Home Display or your smart-phone and switch on the dishwasher, overwriting the automated setting you have with your energy provider.

Your dishwasher is new and already came equipped with the appropriate hard and software for automated load control, while your washing machine had to be retrofitted with an appropriate module. You pay the "standard" rate for exactly the time that your dishwasher needs to run on that particular afternoon.

OVERWRITING POWERS

This is what the future of a comprehensive energy management system to maximize use efficiency could look like. Such forms of automated Load Management in combination with dynamic pricing are certainly realistic and entirely feasible with technology available today. While the focus is currently on increasing awareness and incentivizing changes in consumption behavior, moving to partial automation promises even more significant increases in efficiency.

"The jury is still out on customer acceptance of advanced Load Management," says Daniel Aepli, Head of Product Management, Business Line Load Management at Landis+Gyr EMEA. He adds, "In my opinion, there is a good chance that it will happen by combining attractive pricing with an increased awareness of the environmental benefits of such an integrated approach. We just need to make sure that the customer keeps overall control on what is going on." The Landis+Gyr experts insists that the overwrite capability needs to be a central part of the customer offering.

Load control of this form has been possible for a while. Aepli recalls switching on his mother's washing machine remotely many years ago, but it becomes a lot more feasible and attractive in the context of smart grids and broader Smart Communities. The momentum towards truly smart grids in Europe is growing with every smart metering rollout, and the introduction of more sophisticated Load Management technology would be a logical next step.

Landis+Gyr's smart meters already include relays the utility can use to control the loads in a residence, which can be done by customer service agents or automatically based on a set schedule. This functionality is used in many of the smart metering solutions Landis+Gyr has delivered; water heaters or outdoor lighting can be switched on and off automatically, normally according to pre-defined tariff settings. However, the number of relays in a standard smart meter is limited; only a few loads can be controlled remotely and additional

switches might need to be installed for more advanced Load Management.

MOVING ALONG THE MIGRATION PATH

Intelligent Load Management is set to play an increasingly important role on the road towards boosting energy efficiency and optimizing energy management. “From the Landis+Gyr point of view, we call it a migration path,” says Aepli. “For the last decade, ripple control has been the main focus of the load management activities at Landis+Gyr. Now, we are gradually moving towards bidirectional communication as the new standard,” he explains.

Utilities have been using some form of ripple control based load control technology to unilaterally shed customer loads and to provide critical peak-load reduction for many years. Landis+Gyr retains a keen interest in ripple control technology and is one of the key suppliers on a global level.

UPGRADING COMMUNICATIONS AND FEEDBACK

Despite its merits, one of the key problems with ripple technology is that communication is only unidirectional. Furthermore, ripple control communication is based on broadcasting a signal. Though grouping is also possible with today’s ripple receivers, Load Management in a ripple control environment affects less diversified customer groups. The ability to fine tune Load Management at individual consumer level is a crucial tool to keep the costs down for utilities and DSOs.

In the smart world, utilities can broadcast specifically to a pre-selected number of recipients and can perform what is called “unicast” Load Management. This smart load-balancing and management will happen automatically, according to pre-defined business rules. In a typical peak-load situation in which the operator needs an additional five megawatts, he can, instead of shutting down a whole area, broadcast information to a clearly specified number of consumers that the operator will, for instance, temporarily shut down their heat pumps. Instead of inconveniencing a large number of customers, the problem can be solved with precision, affecting only customers who have agreed to this kind of dynamic Load Management in their contracts. The system will become a lot more dynamic with granular-level, two-way communication in place.

The migration path towards dynamic, next-generation load control is, however, not quick and easy. It is a price sensitive topic, and ripple control is a reliable, cost-efficient technology with a proven track record. “Customers ask us about their ROI as they, of course, want to know what they will get out of this technological progress and how long it’s going to take,” Aepli acknowledges. Landis+Gyr’s Gridstream™ solution offers a migration path from today’s ripple based Load Management to unicast Load Management: a legacy ripple control system can be used side-by-side with the AMI control system, and the functionality can gradually be built up and phased over. ■

new online tool for e.on customers in finland

“my energy” – turning data into awareness

E.ON Kainuun Sähköverkko Oy was the first company in Finland to introduce a web portal for end consumers to view their metering data and to enable personal energy management. Meeting an excellent response, the innovative tool increases customers´ satisfaction and energy efficiency while decreasing the operational costs of the utility.

E.ON Kainuu web-tool

Finland is the third largest of the Nordic countries with an average annual electric-power consumption of 7,400 kWh per household.

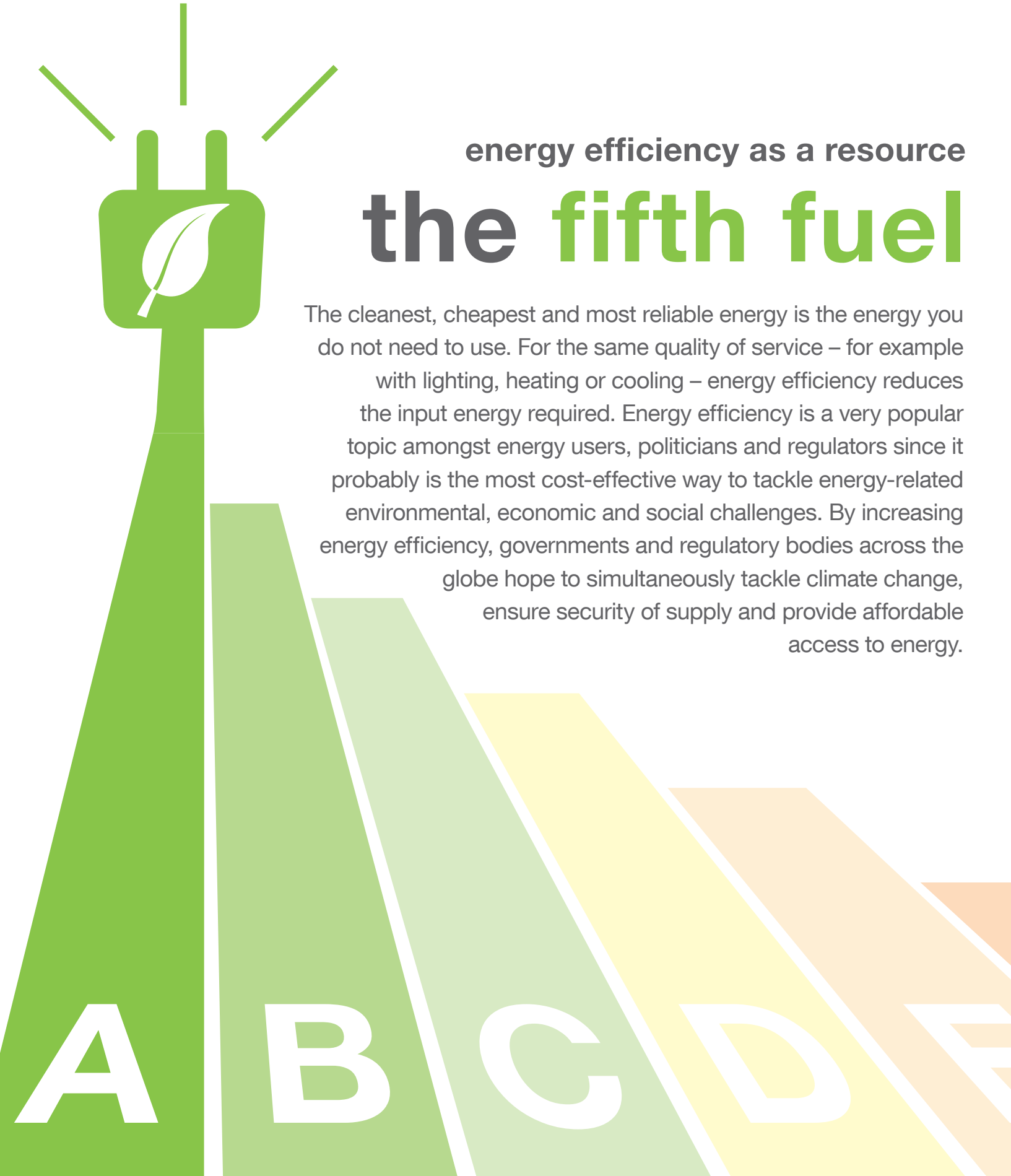
Transparency is one of the main characteristics associated with the Finnish energy sector. E.ON Kainuu is a pioneer in customer-oriented utilization of hourly energy metering data from its 60,000 customers in one of the largest distribution areas in the country. "The initial impetus came from our customers," states Jari Rusanen, Metering Manager at E.ON. As smart metering had been deployed and invoicing was based on actual consumption, the interest rose and the utility received increasing requests for consumption reports on a regular basis. "It's all about the customer. We have developed new functionalities for a web-tool that has been available for E.ON Kainuu customers under E.ON's "My Energy" brand for a couple of years," enlightens Jari Rusanen.

"My Energy" has become an essential part of E.ON's customer service, providing customers with information about their current and proceeding energy consumption profiles. It allows near real-time monitoring and as a highlight offers "benchmarking" as one of the most popular features, where a comparison of the individual's consumption profile is made with those of peers. This "benchmarking" concretizes the personal consumption level and heightens awareness about one's own consumption habits. "My Energy" offers tools which assist customers in taking energy saving actions: the "speculator" functionality, for instance, enables new-device simulation effects or changes in consumption behavior. The web-tool also works as an efficient feedback channel in terms of reducing energy consumption. Customers can view their consumption history over the last five years and see the effects of changed behavior. As elaborate as it is, "My Energy" has additional potentials that E.ON wants to exploit so as to strengthen its market position. "Speaking of transparency, we can hardly leave out the electricity price," says Rusanen. In the near future, E.ON's "My Energy" will also show the hourly electricity market price. Other complementary services such as a smartphone mobile-consumption monitor will round off the range of services.

The positive effects of "My Energy" on customer loyalty and E.ON's competitive position in the Finnish market are accompanied by a clear reduction of operational costs in customer services. The web portal as a self-explanatory, intuitive customer interface has led to a considerable reduction of contact with customer service and in many cases supersedes the hotline. With the help of the portal, "the consumption data is easily accessible and in a clear format," Rusanen observes. The increased level of information also heightens the awareness of individual consumption habits – a key factor in helping consumers change their consumption behavior and take responsibility for energy efficiency. ■

E.ON AND LANDIS+GYR: MORE THAN 20 YEARS OF COLLABORATION

E.ON and Landis+Gyr jointly pioneered smart metering in Finland. Starting with monitoring and remote reading of ICG meters in the 80s, E.ON selected Landis+Gyr as a preferred supplier and partner in its smart-metering projects. In addition to 60,000 smart meters, Landis+Gyr has provided the utility with a comprehensive smart-metering solution including communications, software and system integrations. The software in use for online reporting is provided in cooperation with Landis+Gyr's partner Ecore Oy.



energy efficiency as a resource

the fifth fuel

The cleanest, cheapest and most reliable energy is the energy you do not need to use. For the same quality of service – for example with lighting, heating or cooling – energy efficiency reduces the input energy required. Energy efficiency is a very popular topic amongst energy users, politicians and regulators since it probably is the most cost-effective way to tackle energy-related environmental, economic and social challenges. By increasing energy efficiency, governments and regulatory bodies across the globe hope to simultaneously tackle climate change, ensure security of supply and provide affordable access to energy.

Energy efficiency can take many forms: efficient appliances, transportation and use of energy in industrial production are obviously an important part of the equation. Another very important factor is energy-efficient buildings; according the World Business Council for Sustainable Development (WBCSD), buildings account for 40 percent of the world's energy use. The resulting carbon emissions are substantially more than those of the transportation sector. Local micro-generation, producing electricity where it is needed rather than centralized generation and transmission will probably also make an important contribution to energy efficiency, since the centralized methods result in only 25% to 30% of the original fuel energy reaching the point of use.

An important aspect of energy efficiency is securing global energy supply: in its report "World Energy Outlook 2012", the International Energy Agency estimated the required energy capacity additions by 2035 to be more than the currently installed capacity. One third of investments will flow towards replace retiring plants with the rest earmarked for meeting increasing demand. Utilities will be confronted with a huge challenge of managing infrastructure and securing the supply, while energy efficiency measures have the potential to become an important tool to meet the challenge.

RISING DEMAND FOR POWER

On the upside, energy efficiency will create jobs that, most of the time, cannot be outsourced to emerging countries. For example, it is estimated that efficiency measures could create up to 3.5 million jobs in the building sector in the EU and U.S. alone. Smart grid investments are expected to deliver up to 280,000 direct jobs as a result of technology deployment.

Intelligent micro-generation, secure jobs, smart, energy-efficient fridges and ovens, well insulated, modern buildings; it is hard to see how anybody could be opposed to it. What about the utility industry, however? At first glance, it has a very good reason to oppose the idea of encouraging their customers to buy less electricity. After all, nobody expects the butcher to promote a vegetarian lifestyle.

While this argument makes superficial sense, it is far from certain that increased energy efficiency will actually translate into decreasing revenue for energy providers. First of all, gains in some domains could be offset by new sources of energy demand in others. While individual appliances are becoming more efficient, their multiplication could more than compensate the individual savings. Overall, the demand for electricity will probably rise as it has been doing for decades.

CHANGE PROCESS

Nevertheless, it is true that increased energy efficiency, while being beneficial for society in general, at first glance seems unprofitable for energy providers. It is a situation where this much overused expression, "the paradigm shift", is actually appropriate (see interview with Fiona Hall on page 24). Without an adequate business and policy response to the paradigm shift implied by energy efficiency, utilities might suffer from the decline in energy consumption in certain areas. Provided the appropriate market and regulatory incentives are in place, however, electric and gas utilities can become more than just commodity providers and make energy efficiency a profit center.

Many utilities are in the process of changing their business towards a model of selling less energy but more energy services. It is in the utilities' best interest to do more than just generate and transfer units of energy at declining growth rates: they can benefit from offering energy services to their residential and industrial customers. ■

CASE STUDY: PARADIGM SHIFT IN THE UK

A number of British companies are starting to offer energy-service packages that include home energy audits, insulation and the installation of condensing boilers, heat pumps, solar panels and smart meters. Energy efficiency services are an opportunity for cross-selling; British Gas parent company Centrica, for example, sees this resulting from energy efficiency efforts. In response to questions posed as part of the Carbon Disclosure project, the company stated that: "recent corporate strategy work highlighted that low-carbon energy services, and in particular low-carbon and renewable micro-generation, have the potential to create a material profit pool that can offset the reductions associated with reduced consumption."

Many end users need innovative solutions to help them address the need for capital expenditure; it is expected that an investment of £6,500 per household could improve the energy efficiency of most British homes. Utilities could help customers to finance those efficiency improvements, with customers repaying over 20 to 25 years, starting when the efficiency savings begin to be realized. Utilities can also acquire new customers by adding value, via energy services, to the supply of commodities such as electricity or gas. Centrica estimates its customer fluctuation rate to be 22% lower among customer groups who have dual-fuel accounts and energy services, as customer loyalty is higher in those cases.

The UK illustrates that in liberalized energy-supply residential markets, energy-efficiency services provide revenue-offsetting and cross-selling opportunities for utilities. Such services can also serve as a means of attracting new customers and securing their loyalty. Increasing the proportion of customers who buy both energy supply and energy services tends to increase profit and value per customer. Energy services for residential customers generate higher growth rates and higher margins than mere energy supply.

modernizing the public lighting infrastructure

throwing light on saving potential

Saving potential abounds in street lighting: the EU could save 4.3 billion euro in running costs through energy-efficient lighting every year. Street lighting is responsible for a big part of the peak demand in the evening when fossil generation is most heavily relied upon. Industry vendors such as Toshiba and Landis+Gyr are ready to step up and offer intelligent answers to provide energy-efficient street lighting.

"Just by exchanging conventional lighting for LEDs you can make significant efficiency gains. The best results are achieved through a combination of LEDs and smart technology," says Jens Hauggaard, Head of Business Line Load Management, Landis+Gyr EMEA. "We work very closely with Toshiba on this. They have the fixture, that is the lamp itself, and we have the communication technology."

This combination brings new value to the lighting sector and enables Toshiba and Landis+Gyr to provide comprehensive end-to-end solutions to their customers. One of the outcomes of the partnership is the recently announced outdoor lighting solution using Toshiba's LED lamps in combination with Landis+Gyr's ripple control technology, which aims at lowering maintenance costs and reduce the energy consumption of each individual lamp.

The picture across the EMEA region in terms of managing street lights is very diverse. "Some customers are already far advanced in their approach to street light while others are more cautious", says Hauggaard "The advantages of LED lights are undeniable, but some customers remain hesitant because there is little long-term experience with this technology," comments Hauggaard.

A number of pilots, however, have shown promising initial results: "I'm confident that we will see the predicted long lifetimes of about 10 to 15 years realized in the field", says Alexander Romanschtschak, Product Manager Lighting, Toshiba.

With that kind of longevity, the LED solutions offer three times the life of current technologies. The much less frequent need to service or replace LEDs directly translates into lower maintenance costs. In Germany, as in many other countries, maintenance costs represent more than 30% of the overall allocated asset-management costs.

ASSET MANAGEMENT

Clearly, asset management is an important topic when talking about street lights. Smart street light, that is integrating street light into an AMI infrastructure and turning the fixture park into a part of the smart grid, has great potential to make life easier for utilities and other service providers. "Once there is a citywide AMI network, we can leverage it and create room for many innovative features", Hauggaard explains.

A smart street-lighting system is made up of clusters of street light lamps with the ability to communicate with each other and provide lighting data to a data concentrator. The concentrator manages and transmits relevant data through communication technologies to the utility's smart-metering system. What makes the street light smart is its bidirectional communication capability. A smart street-lighting system allows facility managers to remotely control street lights while keeping track of power consumption in the lamps and the circuits.

The data provided by the AMI infrastructure facilitates the planning of maintenance routes and makes roving inspections a thing of the past by pin-pointing the status of every individual device. Beyond dimming the light at pre-defined levels at certain times, immediate automated responses to information provided by sensor that detect motion for example are being tested. Temperature detection is another topic. Ice on the roads has an impact on lighting intensity for example. "Two-way communication down to the device level creates a platform for innovation and efficiency gains." ■

"Some customers are already well advanced in their approach to street light while others are more cautious."

Jens Hauggaard

LIGHTING EUROPE

The directive "2006/32/EC" in particular sets an energy-saving target that member states are required to fulfill to measure the progress obtained in energy efficiency. It also provides an energy-saving target for the public sector and supports leveraging the large energy efficiency potential in important sectors like buildings and lighting.

Street-lighting systems are normally owned and operated by public bodies. There is a development towards cost reductions and outsourcing of these services: Public Private Partnership (PPP) models are gaining ground and can be successful tools to save energy costs while guaranteeing quality standards and maintenance of the street-lighting systems.

On a general level, the public owners of street-lighting systems have a duty to keep the systems in good working order to ensure road safety and meet their other obligations. The difficult fiscal situation on many municipalities has led to a stagnation of investment in the energy efficiency of public street lighting in several European countries. In many places, the situation has now become critical due to the high operating costs and large refurbishment necessities.

“energy efficiency is a win-win”

«pathway» talked to Fiona Hall, Member of the European Parliament for North-East England and one of the most prominent advocates of a European concept for Energy Efficiency.

pathway: *You were the rapporteur on the Action Plan for Energy Efficiency in 2007 and one of the shadow rapporteurs on the recently passed Energy Efficiency Directive. Why do you think that energy efficiency is such an important issue?*

Hall: It is very simple: the cheapest energy is energy not used. It follows from this that the cheapest and most cost-effective way to cut CO_2 emissions and cut our energy spending is to reduce our energy consumption through energy efficiency and saving measures. Energy efficiency is a win-win for everyone: consumers save money on their energy bills, industry becomes more competitive, and our economy grows more efficient as we save money on avoided oil and gas imports. And all this is accompanied by decreasing the amount of carbon we pump into the atmosphere.

pathway: *The merits, and the need, of energy efficiency are undisputable – why is it so difficult to push it through?*

Hall: Energy efficiency is a complex issue – it is difficult to measure, it is less visible than installing renewables for example and it also requires significant up-front investment. While the medium to long term benefits of energy efficiency are indisputable, it does require political and financial support in the short-term to stimulate investments, increase uptake and raise awareness among all energy users.

pathway: *How can regulatory bodies and governments assist in creating incentives for energy-efficient behavior?*

Hall: A robust and coherent regulatory framework is key. One of the most successful ways to stimulate uptake of energy-efficiency measures is setting binding targets for countries to meet. It is telling that out of the three EU 20-20-20 climate and energy targets for 2020, the 20% energy efficiency is the only one that is voluntary; it is also the only one not on track by more than a half. Having an overall energy-efficiency target is also a more flexible approach than setting individual mandatory measures for different economy sectors such as housing, energy intensive industry, power sector, etc. Countries are free to introduce various policies tailored to their national circumstances provided they meet their energy-efficiency target by a set deadline. Tailored and sufficient funding mechanisms are equally important since most energy-efficiency measures require upfront investment. This is why the European Parliament has fought very hard to ensure that the new EU Energy Efficiency Directive requires member states to establish national energy-efficiency funds.

pathway: *What role does energy efficiency have to play in making the transition to a more sustainable European energy supply?*

Hall: Energy efficiency has a crucial role to play in the move to a truly sustainable energy system, as it eases the amount of effort needed to decarbonize our energy supply. Using less energy means we need

fewer gigawatts of power, so we need to build and modernize fewer power installations and grids. Simply put, energy efficiency will make our transition cheaper and quicker.

pathway: *Does increased energy efficiency and distributed generation threaten the traditional business model of utility companies? In other words, isn't asking energy companies to reduce the annual energy usage of their final customers, as the Energy Efficiency Directive does, a little like asking a butcher to convert his clientele to vegetarianism?*

Hall: Energy efficiency and distributed power generation will only undermine businesses that do not want to embrace this new opportunity to change their business model. At the moment, energy utilities make most of their profit from selling energy. In the future they will be making profit from selling energy services such as energy performance contracting, energy-efficiency advice and installation of energy saving technology and appliances. Choosing this business path is therefore a smart solution for energy utilities.

pathway: *What should be the contribution of the utilities to encourage energy efficiency?*

Hall: Energy utilities, like any other sector of our economy, should take an active part in the transformation to a highly energy efficient society. The most obvious way of contributing would be to offer energy-efficiency and saving services to their customers. Another would be to adapt their energy tariffs to incentivize energy saving, not reckless usage of energy. This is why in the recently adopted Energy Efficiency Directive we introduced the so called energy-efficiency obligation schemes that require energy utilities in each member state to save 1.5% of energy sold to final customers each year. This measure has already been successfully introduced in a number of member states such as the UK, Denmark, Italy, and France and its main result is the increased uptake of insulation and energy-efficient technology in households.

pathway: *What could the role of the consumer be in achieving higher energy efficiency? People do not want to give up on comfort.*

Hall: Energy efficiency is not about giving up comfort, it is about achieving the same or even an improved level of comfort with less energy consumption. To achieve this, consumers need better knowledge and understanding of their energy consumption patterns. New smart technology such as smart meters is key, but consumer advice and awareness-raising campaigns are equally important. Once consumers have information on their energy consumption, they can take action in changing and reducing it, for example by turning their thermostat one degree down or using their washing machine at a lower temperature. Again, in the Energy Efficiency Directive we ask energy utilities to provide their customers with accurate information on their actual energy consumption, so that consumers can actively participate in making our society more energy-efficient.

pathway: *In the original proposal and the European Parliament's version of the Energy Efficiency Directive, there were some very specific requirements on smart metering systems, such as an interface to the home and regular feedback to the end user on energy usage. Why were these left out of the final text?*

Hall: The negotiations on the Energy Efficiency Directive were very difficult and lengthy, not least because they were overshadowed by grim economic forecasts and painful budget cuts. Member states were reluctant to agree to anything that would require significant public investment. This is why in the end, the text dealing with smart meters is not as ambitious as I and indeed a majority of MEPs wanted. However, the directive is flexible enough to allow member states to go beyond the requirements set, so it is now up to energy-efficiency stakeholders to push for more ambitious measures to be adopted nationally.

pathway: *What can vendors like Landis+Gyr do to help realize the EU's 20-20-20 goals? What are they doing already?*

Hall: Companies like Landis+Gyr have been of great help during the negotiations on the Energy Efficiency Directive by providing their expertise and sharing their experience in steering energy efficiency. All stakeholders can contribute by spreading the positive message about increasing energy efficiency – that it helps in both curbing climate change and increasing our economic competitiveness. I think it is the second part of this message that needs a particular stress in the current economic times. Energy efficiency should be seen as a contributor, not an obstacle, to economic growth and jobs. ■

"Energy utilities, like any other sector of our economy, should take an active part in the transformation to a highly energy-efficient society."

Fiona Hall

nutshell – facts & figures

trends for 2035

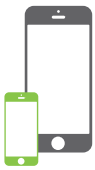
...world energy outlook 2012

1/3 more

The global energy demand increases by over one-third in the period to 2035. With 60% China has the largest growth. OECD countries only rise about 3%.

47%

In the OECD, wind energy accounts for a major share in the growth of renewables with 47% in 2035. Solar PV covers 15% with hydro being the lowest at 11%.

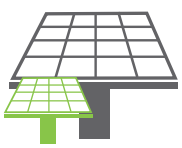


over 70%

The global demand for electricity increases more than 70% by 2035. This represents almost 32,000 TWh.

$16.9 trillion

Over the period 2015-35, the total worldwide power sector requires an investment of $16.9 trillion. An estimated two-fifths of this investment is needed for improvements of electricity networks.



31%

The share of renewable electricity in the global generation mix moves up to 31% by 2035.

5,890 GW

Over the Outlook period a total of 5,890 GW of capacity additions is required. This is more than the total installed capacity of the whole world in 2011.

Source: World Energy Outlook 2012 Factsheet, © OCDE/IEA, 2012

pathway is published by
Landis+Gyr AG
Theilerstrasse 1, 6301 Zug, Switzerland
pathway.emea@landisgyr.com
www.landisgyr.eu

Photography:
Stadium Letzigrund, Badenerstrasse 500, 8048 Zurich;
Photographer; Christian Dietrich and Beat Bühler (page 4-5)
iStock.com; mustafa deliormanli (page 8)
iStock.com; Tony Tremblay, Alexandru Magurean (page 9)
iStock.com; Jacob Wackerhausen (page 14)
iStock.com; TommL (page 17)
Additional photos by Landis+Gyr/Seidl PR & Marketing GmbH

Editorial and layout:
Landis+Gyr AG
Seidl PR & Marketing GmbH, 45131 Essen, Germany

Landis+Gyr

manage energy better

Landis+Gyr AG
Theilerstrasse 1, 6301 Zug, Switzerland
pathway.emea@landisgyr.com
www.landisgyr.eu