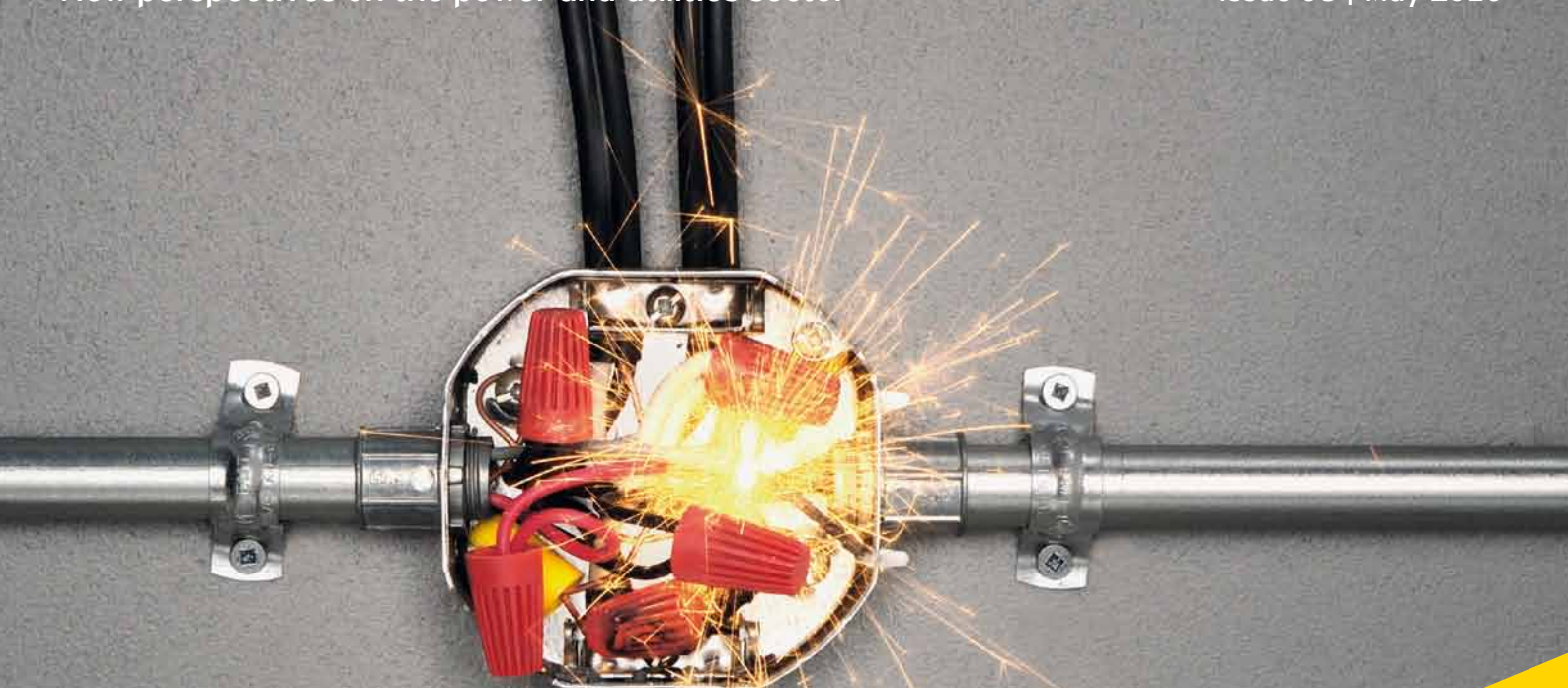


Utilities unbundled

New perspectives on the power and utilities sector

Issue 08 | May 2010



Smart world, smart utilities

Pushing ahead with the smart revolution

What can we learn from the US rollout?

Smart grids: the investors' verdict

Wall Street's view on the value of smart

Desertec: an energy oasis

Desert project has one eye on vision, one on practicality

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Smart world, smart utilities

Governments and legislators are pushing smart technology forward. Power and utility companies need to be ready for the market evolutions and revolutions that could follow

Among the many challenges facing power and utility companies today, the most pressing are the increasing demand for power, an urgent need to build or improve infrastructure, and the shift away from fossil fuels to cut carbon emissions.

To help meet these challenges, the energy industry is adopting intelligent new technology. Worldwide, power and utility companies are expected to invest US\$200b by 2015 upgrading metering, transmission lines and communications to create a new “smart” energy system.

This is a mammoth task. But the technical upgrade is just the start of the story. The combination of smart systems, better use of IT and active involvement from customers will surely have a profound impact on businesses across the value chain, from production to transmission to retail sales. This could change the very nature of who operates in the energy sector and how they make a profit. Utilities could end up competing alongside retailers, telecommunication companies, technology vendors and potentially hundreds of start-ups. The smart technology revolution will cause markets to converge in ways we can hardly imagine.

In this issue of *Utilities unbundled*, we ask power and utility businesses around the globe how they plan to compete in the new smart world. Where do they see opportunities, and how might their business models change in response?

Our main feature (page 8) focuses on the latest developments in the US. There are already signs that the US market is evolving as smart installation races ahead, propelled by government funding. We talk to the people responsible for piloting and rolling out smart projects to discover the lessons they are learning.

Meanwhile, the contrasting experience of smart pilots in Canada and Australia stresses that good customer interaction is vital to the success of the whole process. Canada’s Toronto Hydro (page 28) has seen smooth implementation and public acceptance of smart metering. Australia’s SP AusNet (page 44) has had a much bumpier ride, with rate shock causing public controversy and disrupting the pricing pilot.

And on the brink of such major change, what impact will smart technology have on company valuation and credit ratings? See page 31 for some early views from Moody’s and Credit Suisse.

As always, we welcome your views on all the topics we’ve covered – contact details for our authors start on page 48.



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Market monitor

State of play: how advanced is the smart grid rollout around the world?

Africa

South Africa | Funding concerns: Government legislation in South Africa stipulates that customers with annual consumptions of more than 1,000kWh should have smart meters by 2012. Utilities are concerned about a lack of industry standards and funding – smart meters are significantly more expensive than traditional meters.

Botswana | National pilot: The Botswana Power Corporation has launched a smart meter pilot to shave peak loads and to remotely disconnect water-heating devices. A national rollout across four major towns is anticipated.

Australasia

Australia | Attracting competition: A consortium stands to win A\$100m (US\$91m) from the Australian Government's 'Smart grid, smart city' project. The pilot to establish the country's first commercial-scale smart grid has attracted participants from electricity utilities, information and communication technology companies and technology manufacturers. National and foreign distributors have submitted proposals.

New Zealand | Better billing: In Christchurch, Meridian Energy and Contact Energy have installed 160,000 smart meters and say that customers are already benefiting from greater billing accuracy. Remote meter reads have increased safety and reduced customers' privacy concerns. Debate about interoperability and potential retrofitting costs continues as meters cannot yet communicate with household devices.



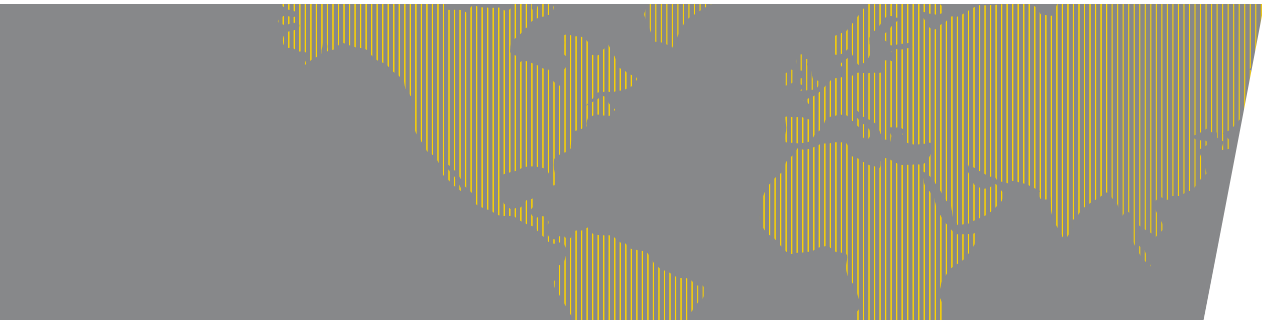
Americas

Canada | Ontario in the lead: Ontario's provincial government recently introduced the Green Energy Act, which mandates a smart grid rollout. This is already ahead of its 2011 schedule (see article page 28). Other provinces are following with rollouts and progressive legislation. Industry Canada, the government entity responsible for business development, has dedicated a wireless spectrum specifically to grid monitoring. This is contributing to national standards. Soon, e-Radio, using cross-country frequencies, will allow utilities to control thermostats and appliances via a demand-response system.

Canada plans to install a smart grid that will allow homeowners to generate power and sell any excess back to the grid. Other initiatives include plug-in hybrid vehicle integration.

US | Massive investment: While other geographies have taken leading positions in smart meter rollouts, the US is focusing on more comprehensive smart grid solutions. Approximately 100 smart grid projects will receive about US\$4b in government economic stimulus funding. These include grid control, distribution automation and advanced metering infrastructure projects.

However, trial programs have revealed concerns about the cost and effectiveness of smart technology. Now regulators are demanding independent tests on advanced meters following customer complaints about higher than usual monthly bills.



Asia Pacific

China | High voltage: State Grid Corporation of China, the country's largest network operator, will invest in ultra-high voltage power transmission and electric vehicle charging infrastructure this year. Upgrading its power transmission network is expected to cost RMB100b (US\$14.6b) over the next three to four years.

India | Emissions focus: In a strategic partnership with Japanese companies, the Indian Delhi Mumbai Industrial Corridor Development Corporation will assess smart grids' potential to reduce carbon emissions in New Delhi and Mumbai. Meanwhile, Bangalore's smart grid investments will eventually focus on time-of-use rates and peak-time rebates to promote energy conservation.

Japan | Testing, testing: Ahead of a smart meter rollout to all its customers from 2013, Tokyo Electric Power Company is launching a pilot program, testing smart technology in 90,000 homes before replacing all of its 27 million meters over 10 years.

South Korea | World's largest smart grid: The world's largest smart grid is being built on Jeju Island in South Korea, as a pilot for a US\$23.7b nationwide smart grid by 2030. South Korea expects US\$10b in annual savings from lower energy imports. The country's largest utility, Korea Electric Power Corporation, sees potential in developing smart grid technology and exporting it to other markets.

US\$10b
Expected annual energy cost savings in South Korea

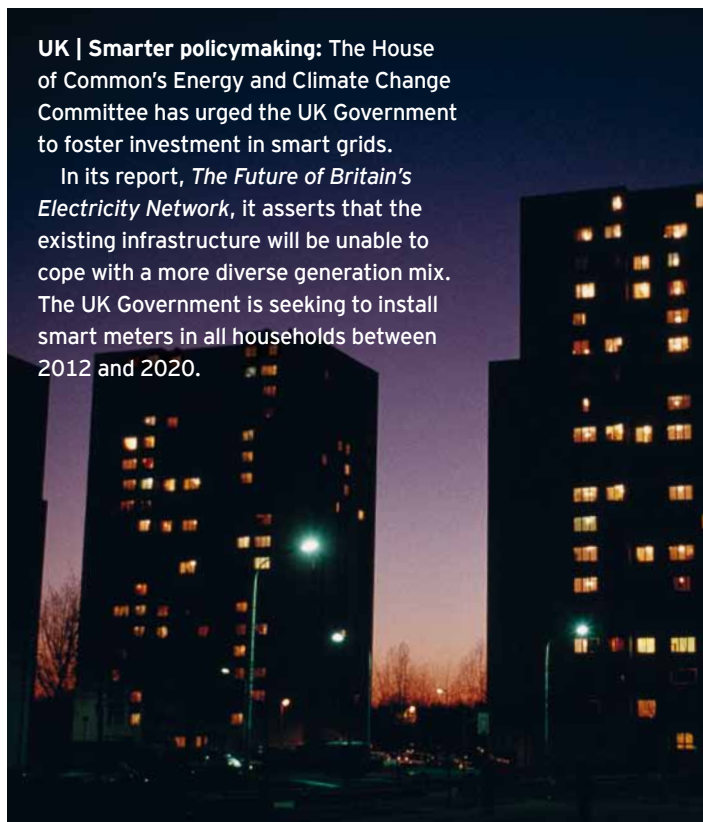
Europe

Austria | Intelligent metering: The country plans to implement intelligent metering systems within seven to ten years. By 2020, about one-quarter of meters in Austria will be smart. The Austrian regulator estimates that implementation will cost about €1b (US\$1.35b) and can be funded using current network fees.

In Upper Austria, in one of Europe's largest field tests, more than 10,000 homes have been fitted with Automatic Metering Information System meters. Energie AG will increase its number of smart meters to 100,000 by 2011 and 400,000 by 2014.

Germany | Helping the customer: EWE, a regional German utility, plans to offer time-variable rather than load-variable rates when it introduces smart meters this year. The decision comes following a pilot study that tested customer preferences. Customers will benefit from remote meter readings and devices that display current gas and electricity demand with regard for individual household consumption.

Italy | Backing standards for Europe: Enel, an Italian utility that has installed more than 30 million smart devices, is backing the non-profit Meters and More initiative to make powerline communication (PLC) an industry standard across Europe.



UK | Smarter policymaking: The House of Commons Energy and Climate Change Committee has urged the UK Government to foster investment in smart grids.

In its report, *The Future of Britain's Electricity Network*, it asserts that the existing infrastructure will be unable to cope with a more diverse generation mix. The UK Government is seeking to install smart meters in all households between 2012 and 2020.

Deals roundup

Highlights

- Year on year, there was a dramatic drop-off in total deal value in 2009 compared with 2008.
- The alternative energy sector was buoyed by economic stimulus programs.

Last year saw an unprecedented decline in M&A activity, even in the power and utilities industry. But there are signs of hope that the worst is over. Joseph Fontana reports

Power and utilities M&A: the big picture

On the whole, 2009 can be best characterized as the year in which everyone was striving for survival, trying to maintain sufficient levels of cash and cutting costs. The effect on mergers and acquisitions (M&A) in the global power and utilities industry has been dramatic. With the exception of the alternative energy sector, which continues to benefit from funds allocated under economic stimulus programs, most markets have experienced a tremendous drop-off in transaction activity.

For corporate buyers around the globe, credit was tight and no one could afford to jeopardize investment grade ratings. As most power and utilities companies still need to deliver significant capital expenditure (capex) programs, maintaining access to capital at a reasonable cost remains key, and that access is reserved for capex rather than M&A. Financial buyers, in turn, could not raise any debt, as there was no credit liquidity in the first half of 2009 and only very limited credit liquidity in the second half of the year. These factors led to a remarkable decline in M&A deal value over 2009, as illustrated in Table 1.

At the end of 2009 and well into 2010, credit markets opened up again and seem to have stabilized. Since asset prices have come down at the same time, those who could afford to hold out for any opportunity to come forward are now in the position to capitalize on the improved conditions. This

is especially true for private equity and infrastructure investors, who still have relatively large amounts of funds that they need to deploy and who have been particularly active in Q4 2009 (see Table 2). Preliminary data for the first quarter of 2010 indicates that power and utilities M&A may have bottomed out and could now be back on an upward trend.

Regional trends

From a regional perspective, it is interesting to note that there are markets where M&A activity, although slowing down, never really came to a complete halt: for example,

Continental Europe, with its relatively cash-rich utilities; China, which has stable deal flow in the alternative energy sectors; and Turkey, where sector privatization is under way at full speed.

In the US market, depressed natural gas prices have significantly affected the profitability of generation assets and acted as a catalyst for increased transaction activity in recent months, as several distressed conventional generation assets and renewable energy projects have been put up for sale. The US is also seeing renewed interest for rate-regulated businesses from a variety of players, including utilities and infrastructure funds.

Outlook

It is probably too early to tell whether the power and utilities industry is on the verge of a new M&A boom or if it will turn out to be more of a normal transaction cycle, as witnessed in the past.

There are signs of modest growth in 2010, but there are a number of factors that could quickly dampen M&A activity, such as general economic development, the impact of potential inflationary pressures on capex programs, and the global prospects for stricter greenhouse gas legislation. Also, financial buyers have played an important role in power and utilities M&A in the past, and the extent to which they can continue to drive deal flow remains to be seen. There are signs of hope, however, that the worst may be over.

Table 1: All deals

	Volume	Total value (US\$b)	Average value (US\$m)
Q3 2008	122	87.9	924.0
Q4	101	29.0	382.7
Q1 2009	85	57.6	966.6
Q2	110	40.4	492.9
Q3	98	16.6	224.7
Q4	130	28.8	303.2

Table 2: Private equity and infrastructure fund deals

	Volume	Total value (US\$b)	Average value (US\$m)
Q3 2008	22	7.0	317.1
Q4	16	3.1	193.9
Q1 2009	17	5.0	295.4
Q2	16	4.0	250.6
Q3	10	4.2	422.2
Q4	26	4.5	174.7

Source: Ernst & Young analysis based on Mergermarket



China deals review

Alternative energy and related new technology are the two main drivers for M&A deals. Report by Eleanor Wu

In China, we are seeing companies pursuing growth primarily via either greenfield investments or M&A. While the largely state-owned power and utilities industry tends to focus on greenfield investments to increase and maintain supply security, a lot of the M&A activity is driven by the alternative energy and new technology sectors. There, M&A activities are flourishing for both inbound and outbound deals.

The two areas of particular interest to both domestic and foreign companies for investments within China are:

- ▶ Coal bed methane, where there is a strong interest from private equity (PE) firms and oil and gas multinationals
- ▶ Water treatment solutions, which attracts PEs, multinational conglomerates and Chinese investors

Both areas respond well to the Chinese Government's macro-environmental protection measures.

On the outbound side, i.e. where Chinese companies are investing in foreign markets, large companies and smaller private companies are seeking to gain technological know-how. While many companies have been successful with low-tech and low-cost models in China, the market dynamics are changing. They need to acquire new technology from overseas – either to sustain their growth by gaining a competitive advantage or to defy the odds in the domestic market, which is overcrowded due to excessive production capacity. Many of them are using cash accumulated during the tremendous economic growth in recent years to, at least partly, finance the outbound deals. Good examples of this include wind energy and solar energy companies entering Western Europe, the US and other developed markets.

Besides technological know-how, there is strong interest from Chinese companies in securing access to uranium as fuel for nuclear power generation. As most of these assets are located in foreign countries, outbound investment in this arena is likely to continue. It remains to be seen whether Chinese companies will embark on a more gradual entry into these markets through



“There is strong interest from Chinese companies in securing access to uranium as fuel for nuclear power generation”

Eleanor Wu

the acquisition of minority stakes or by actively developing partnerships with their overseas counterparts.

Looking ahead, we expect both greenfield and M&A activities in the new, alternative energy and related technology sectors to continue along similar lines, especially with the Chinese Government's financial and regulatory support.

Pushing ahead with the smart revolution





The US is investing billions of dollars to roll out smart energy systems. Beyond the immediate engineering challenge, how will utilities seize the new opportunities of a revolutionized market? Report by Ben van Gils



“Our first smart meter pilot will test multiple combinations of technology and dynamic pricing to see what works best”

Val Jensen, ComEd

Utilities are renowned for their ability to carry out major engineering programs. The push for smart grid development will challenge the industry to demonstrate its formidable effectiveness once again. But this time, there is more than engineering excellence at stake.

The goal of previous major operations was to maintain an unchanged customer experience, to carry on delivering reliable energy supplies. This time, the engineering rollout is only the first step in a wider campaign to create an intelligent network that will revolutionize how we use energy.

The new smart infrastructure will be intelligent all the way from generation to consumption. It will be capable of incorporating distributed, intermittent renewable sources of energy. It will be able to switch pricing to encourage energy use when availability is high and discourage consumption when availability is low. The new grid will be able to capture and analyze

detailed data on how customers are using energy, and provide insight that will help people make changes to curb consumption.

All this will require utilities to develop totally new skills that are not a part of today’s simpler energy supply business. Most importantly, it will demand new levels of expertise in targeting, understanding and managing customers in new, converging and fiercely competitive markets.

This article explores these issues in detail. We examine some of the latest developments in the US, where US\$3.4b of government funding and US\$8.1b of corporate investment is transforming electricity networks from “dumb” one-way streets to smart power grids. Every state except Alaska has planned, or is already rolling out, a smart metering program. With a common goal in mind – but wide variations in state regulation, politics and business circumstances – utilities are responding in diverse and imaginative ways.

ComEd pilots Northern Illinois smart grid

Commonwealth Edison (ComEd), a business unit of the huge Chicago-based Exelon Corporation, provides electricity to some 3.8 million customers across Northern Illinois. The company has just launched one of the largest-ever advanced metering rate pilots, involving web energy management tools, customer energy management assistance, programmable communicating thermostats and distribution automation. The full operation will see ComEd install 131,000 smart meters in homes and businesses in nine towns to the west of Chicago (see panel below).

In April 2010, ComEd's pilot went live with the first tranche of 8,000 customers as part of a Customer Applications sub-pilot. Val Jensen, Vice President of Marketing and Environmental Programs, says: "We're putting people on one of 24 different combinations of in-home technology and

dynamic pricing tariffs. We will monitor each cell of the pilot to see which works best for customers and which has the most significant effect on consumption. The in-home technology consists of simple and advanced devices, including a programmable thermostat that customers can set to react to price information."

ComEd is also running a small solar microgeneration pilot. One hundred customers will be given solar panels and half of them will be given a storage system. "The aim is to find out how customers react, given control over distributed generation and the ability to store or sell the energy back to the grid at real-time prices," says Jensen.

The company already knows that partnering with new players is crucial to success in the new energy business world. It has been working with OPOWER (see page 14) for more than a year on energy saving programs for 50,000 customers. "This has underlined how →

ComEd Northern Illinois smart grid pilot – facts and figures

- ▶ ComEd piloting Northern Illinois smart grid
- ▶ Full pilot: 131,000 customers, installations completed May 2010
- ▶ Customer Applications sub-pilot: 8,000 customers, live in May 2010
- ▶ Testing wide variety of in-home technology and dynamic pricing
- ▶ 100 homes in pilot also get solar panels; 50 get storage systems
- ▶ 50,000 customers use OPOWER's mail/web-based energy use education program
- ▶ OPOWER service to be extended to all customers in the full pilot
- ▶ Full smart metering for approximately four million customers will cost US\$700m

Val Jensen, Vice President, Marketing and Environmental Programs, ComEd

Val Jensen's 30-year career in the energy industry includes positions at the US Department of Energy and the Illinois Department of Energy. He is now



responsible for ComEd's US\$250m customer energy solutions program. The portfolio includes energy efficiency, demand-response and low-income energy assistance.



Michael Meehan, Vice President – AMI Operational Implementation, ComEd

Michael Meehan has more than 30 years' experience at ComEd and leads the company's AMI rollout. His responsibilities include business process and IT change, meter and network installations, as well as business case validation for the AMI pilot and customer application plan.

→ vital communication is in helping customers accept new technologies," says Michael Meehan, VP – AMI Operational Implementation for ComEd. "We run extensive communication programs to help people understand what the new technology can do and how to use it, alongside targeted campaigns for the households where we are installing new meters."

Spreading the cost

New technology doesn't come cheap. The first 131,000 meters and the supporting software will cost about US\$70m to deploy and the full four million will cost about US\$700m. ComEd has won regulatory approval to claw back the full cost of the pilot through its rates.

Customers seem happy to pay, but this could be because the sums involved so far are very small when shared across the utility's 3.8 million customers. By contrast, Australia's SP AusNet has had to deal with much more public resistance (see page 44).

New competitive decisions to come

A wider issue in which ComEd is investing time and thought is understanding how competitive entities – including retail stores, energy service providers, or a business such as Google – might start competing in the smart market.

"Clearly, if we deploy millions of smart meters, we need a competitive, innovative market to provide all sorts of services,

creating value for the customer around the meter," says Jensen. "We're still considering whether we want to get involved in selling metering devices or bundled services ourselves. Thinking about retail competition leads to the bigger issue of who will ultimately 'own' the customer relationship, and that is a question that could have a major impact on our business strategy."

The many complexities of structure in this pilot demonstrate the prevailing uncertainty about where the technical possibilities might lead the energy industry. ComEd clearly believes that the new energy supply world will require utilities, their traditional partners and new market entrants to develop many new skill sets.

Boulder SmartGridCity™: vision for a smart community

Xcel Energy believes that the world needs an end-to-end digital grid solution. The company is building the US's first fully integrated smart grid community in Boulder, Colorado (see panel below). Work began in 2008, with an initial project funded by Xcel shareholders and contributions from six consortium partners. A year-long pricing pilot is proposed to start in the middle of this year and the company has asked for some recovery (via rates) on its investments.

The vision for Boulder is a fully networked power grid that communicates its status (and the impact of consumption) to automated decision-making systems. This

Boulder SmartGridCity™: facts and figures

- Xcel Energy is refitting a community in Boulder, Colorado on smart grid principles
- Grid and network side of project fully operational since August 2009
- Remaining work on smart meters and testing of demand response/energy efficiency programs continues through 2011
- Awaiting approval for one-year pricing pilot
- Expected fully operational by 2011
- For more information, go to www.xcelenergy.com/smartgridcity

Kathleen Hoxworth, Project Manager, Strategic Technologies, Xcel Energy
Kathleen Hoxworth is responsible for managing multiple, cross-functional projects intended to leverage technology to ensure the future success of Xcel Energy. She gives demonstrations on SmartGridCity™ to a variety of audiences, including international energy companies, media outlets, leading technologists, politicians, state regulators and investors.





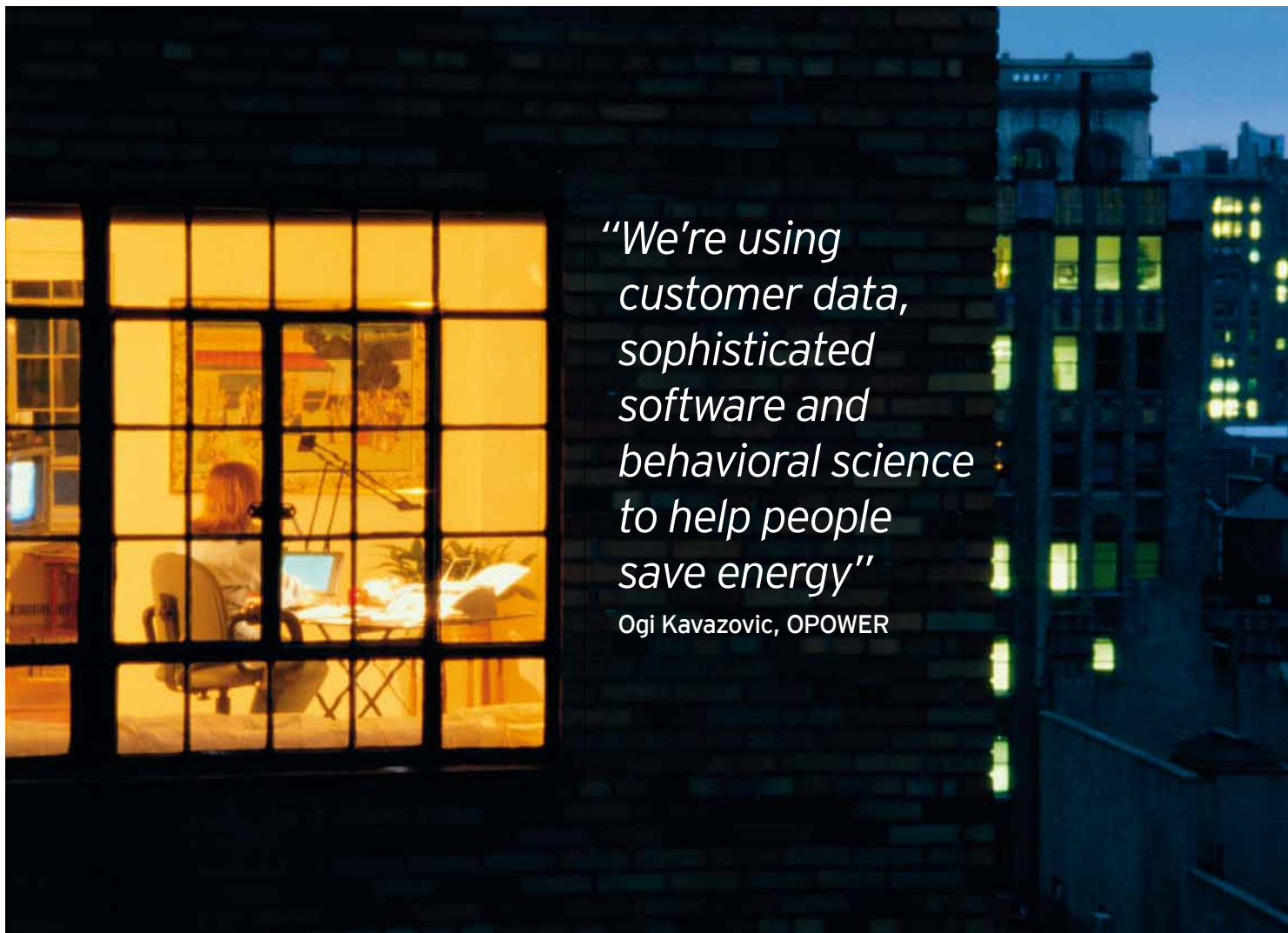
will provide consumers with the information they need to make better decisions on when and how to consume energy. It would also enable the addition of more clean and green power sources into the fuel mix to improve reliability and the environment.

Xcel is awaiting Public Utility Commission approval for its pricing pilot, which will include time-of-use (TOU), critical peak pricing, and critical peak rebates. Kathleen Hoxworth, Project Manager, Strategic Technologies at Xcel, confirms that this will not yet include any kind of real-time pricing adjustments.

Assuming the pricing pilot is approved, the plan is to install up to 1,100 home energy management systems in Boulder homes for testing purposes. These systems will include smart thermostats, load control devices (smart plugs) and possibly some

smart appliances. Hoxworth comments: "We don't need smart meters to communicate with these devices – we are still studying whether we need smart meters for demand management."

Hoxworth makes an intriguing point on the issue of how to influence customers to use environment-friendly energy: "We are still trying to figure out how to implement the right pricing signals effectively. We're not limited by the technology, but rather by trying to understand the appropriate messaging to impact behavior positively. People have asked us to send notifications when renewables such as wind are high on the system, so that they can run optional appliances during those times. The challenge is, regardless of how much wind is on the system, we are always using 100% of it. If we send a notice saying that wind is →



“We’re using customer data, sophisticated software and behavioral science to help people save energy”

Ogi Kavazovic, OPOWER

→ high on the system and people increase their demand, we don't have 'extra' wind we can add to the system... we would have to use coal, gas or another non-green source to meet the demand, which is exactly the opposite result of what we hope to achieve.”

The Boulder project is already indicating the complexities of developing both the physical and the business infrastructure. Hoxworth says the build-out of the communications infrastructure has been “more time-consuming and costly than anticipated because of the geography in Boulder – the granite in the ground is extremely hard, which makes it difficult to dig trenches for our 200-plus miles of fiber-optic cable.”

Behavioral science secures energy savings

Washington DC-based newcomer OPOWER is one of a handful of US companies offering

large-scale energy-saving programs for utilities. The company's work is based on a popular new approach that uses smart technology and social norms to motivate customers to change their behavior and attitude toward energy use.

“We combine customer data analytics, sophisticated software and behavioral science to help people to save energy,” explains Ogi Kavazovic, OPOWER's Senior Director, Marketing & Strategy.

Helping the customer

The company started in 2007 and has already signed up 25 US utilities. Kavazovic explains the basis of OPOWER's approach: “We don't believe you can change people's behavior simply by giving them raw data on their energy use. A recent study in Canada showed that after 18 months, fewer than a quarter of people paid attention to their in-home energy display.”



Instead, OPOWER produces personalized guidance on what steps people can take to reduce their consumption. “We take detailed information from the meter, combine it with wider demographic data and filter it through sophisticated customer profiles. This creates a monthly report, which is then mailed to households. The report shows how customers compare with their neighbors, with recommendations on how to make savings,” explains Kavazovic.

Complementing the paper reports, OPOWER has a strong energy management online portal, a customer service center portal and the ability to present information on handheld devices and in-home displays – a feature that it is currently piloting with ComEd. Kavazovic believes that this integrated approach is behind its strong customer engagement rates and energy savings.

Lower peak demand expected

As smart meters are rolled out, data on energy use becomes more detailed and analytical approaches such as the one developed by OPOWER can deliver effective insights that help customers to take action. This insight reduces overall consumption, and will also help people to

exploit the new variable rates that utilities can offer as a way of reducing demand at peak times.

“In the next six months, we expect to be able to show that our methods are achieving peak demand reductions,” comments Kavazovic.

Energy savings help utilities meet regulatory obligation

Eighty-five per cent of people receiving OPOWER’s personalized reports take sustained action. In the first year, the company has seen average household energy savings of 2.3%. The company predicts that this will rise to 2.8% at the end of its second year.

The regulators are responding positively. “By working closely with energy regulators, we have now managed to get these energy savings accepted as part of the energy efficiency mandates that utilities have to achieve,” observes Kavazovic. “Providing this service gives a clear payback to the utilities.”

Experimenting with simpler technology

In the US state of Iowa, 75 small municipal utilities are taking a “smart thermostat →

OPOWER – facts and figures

- ▶ 25 US utilities run energy-saving programs with OPOWER
- ▶ Programs live in more than five million US households by mid-2010
- ▶ 85% of people receiving OPOWER’s reports take lasting action to save energy
- ▶ Households saved an average 2.3% on energy costs in the first year
- ▶ Savings expected to rise to 2.8% per household in the second year
- ▶ Massachusetts and Minnesota regulators accepted OPOWER’s energy-reporting program as an efficiency resource; California expected to follow
- ▶ In Massachusetts, National Grid successfully filed the program to provide

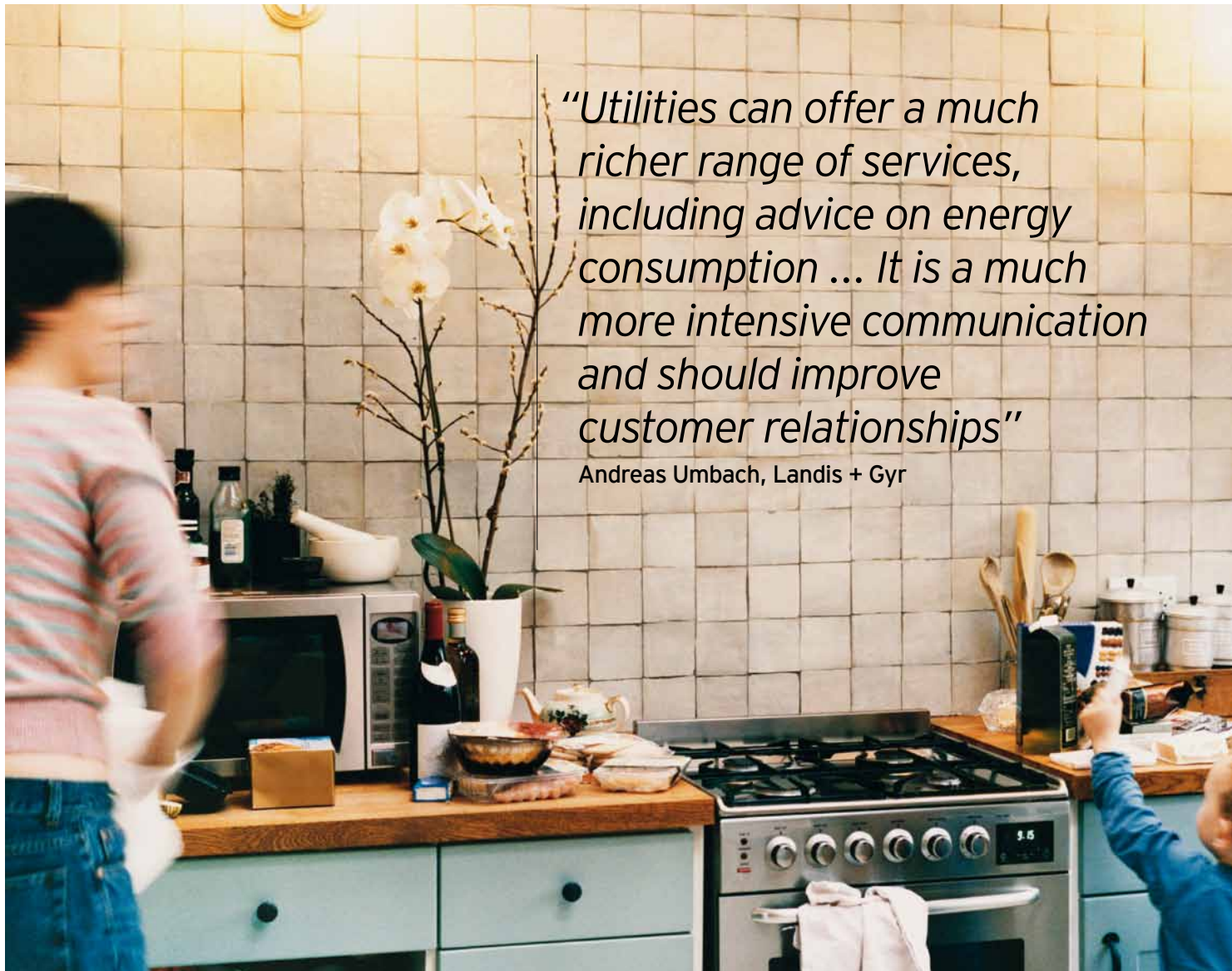
24% of its energy efficiency portfolio over the next three years



*Ogi Kavazovic,
Senior Director,
Marketing &
Strategy, OPOWER*

Ogi began his career in management consulting, advising

Texan and other US utilities on wholesale and retail strategy. Recently, he has been heavily involved in the smart grid deployment strategy for competitive utilities in Texas. At OPOWER, he is responsible for market positioning and product strategy.



“Utilities can offer a much richer range of services, including advice on energy consumption ... It is a much more intensive communication and should improve customer relationships”

Andreas Umbach, Landis + Gyr

→ first, smart meter later” approach. They believe that smart metering has little value without dynamic pricing, so it makes sense to start simply.

The group is installing programmable home thermostats that communicate directly with the network. This allows utilities to control demand directly during peak periods by precooling or overheating the desired settings by two degrees.

This is a much more consumer-friendly approach than traditional load control, when air-conditioning is simply turned off for several minutes in each hour of peak load. In addition, the thermostats can be programmed to take advantage of TOU rates.

Iowa is clearly taking a very different approach from ComEd and Boulder; it will be fascinating to see how the energy-saving results compare.

Smart meter manufacturers gear up

Landis+Gyr is the largest global player in electricity metering (see panel opposite). Its largest US smart metering project to date, with Texas utility Oncor, went live in March 2010.

President and Chief Operating Officer Andreas Umbach’s perspective as a partner in many smart metering projects is that utilities generally manage the rollout well but, he says, they significantly underestimate how their business will need to change afterward: “Following deployment, there is almost no process in the utility that should not be changed, particularly business processes related to customers. We observe a lot of IT and consulting companies moving in to work with utilities on this aspect of change, once the metering project is completed.”



Pace of change varies by region

Umbach has firsthand experience of the wide variation in smart markets around the world. The US is most advanced, propelled forward by ARRA¹ funding and the fact that there is a rate-recovery model in place that makes it attractive for utilities to invest. By comparison, European progress is patchy.

“There’s a strong EU mandate for smart meters. But now that’s being transposed into national law, there is a big debate about who pays. European utilities are finding it harder to justify a rate case that will enable them to invest,” says Umbach.

Developments in the Asia Pacific region are mainly being triggered by regulatory change. Landis+Gyr has a strong presence in both China and India. “There’s currently no mandate for smart metering in China, but energy use continues to soar,” Umbach says. “We are working with individual commercial consumers and on projects associated with the tremendous need for growth in generation and distribution. In India, we’re working on introducing first-time metering incorporating a lot of anti-tampering functionality.”

Umbach says that he has seen evidence that simply displaying energy consumption in the home can reduce energy use by 2-3%.

¹ American Recovery and Reinvestment Act of 2009, the US economic stimulus package enacted in February 2009

He also notes the effectiveness of smart meters on shifting patterns of energy use away from peak times. But he stresses that to achieve lasting changes in behavior, customers need a significant financial incentive: “Add dynamic pricing to the mix and the results could be impressive.”

New smart partnerships can strengthen customer relations

Landis+Gyr collaborates with domestic appliance manufacturers to design products to individual specifications – although this interface is mainly indirect through industry groups such as the ZigBee Alliance (see page 20), rather than in direct partnership. From this experience, Umbach comments on the growing trend for new specialist consultancies (such as OPOWER and Tendril) to collaborate with utilities. He feels positive about the new entrants and the potential competitive stimulus they represent. However, he feels strongly that utilities should maintain direct customer contact wherever possible.

“The smart market provides an opportunity for utilities to get closer to consumers. Traditional contact between the utility and the customer has been based on the monthly bill and I wouldn’t call that a particularly positive interaction. Now, they can offer a much richer range of →

Landis+Gyr – facts and figures

- World-leading smart metering solutions company
- Operates in 30 countries
- Philosophy: energy efficiency and the smart grid are the “fifth fuel”
- Offers advanced metering infrastructure (AMI), demand response and metering products for electricity and gas
- Provides outsourced metering services for utilities, including 13 million US customers

Andreas Umbach, President and COO, Landis+Gyr

Andreas brought together several



companies to create Landis+Gyr, a world-leading name in smart metering solutions. He led the business through sale to a private

equity investor in 2002, acquisition by Australian Bayard Group in 2004 and further acquisitions of Bayard businesses in the US and Europe. In 2008, Bayard rebranded itself as Landis+Gyr Holdings with Andreas as President and Chief Operating Officer.

Contrasting approaches outside the US

Smart developments are receiving a strong stimulus from ARRA funding in the US. Elsewhere in the world, funding models are different and the business case for smart developments is potentially harder to justify.

View from Europe – patchy progress toward smart meters for all

There is no international standard definition of what a smart meter is, and no shared view of what smart meters should be aiming to achieve in terms of dynamic pricing or communication with intelligent devices. Europe is lagging behind the US in terms of determining communication standards for meters and other appliances. Nevertheless, in Europe, a functional smart grid is seen as a prerequisite for the EU to achieve its demanding climate and energy targets for 2020. The EU has mandated rollout of smart meters in all member states by 2022.

Individual countries are in the process of deciding how to achieve this. Progress so far is patchy. Scandinavia is a long way ahead and Italy is also in a leading position, followed by an intermediate group of countries, including the UK and Spain, that are committed to fulfilling the requirements. However, the EU mandate is weak and includes an opt-out clause, so

some countries may not fulfill the EU goal as stated. With no government funding for the smart meter initiative, European utilities are concerned about how they will pay for it – and possibly worried about investing in visionary technology without a clear idea of how they will make money from it.

India – pragmatism rules

The primary concern in India is first-time electrification, to get power to more of the 1.1 billion population – especially the large rural population that has no access at present. A relatively small proportion of households use power intensively, so there is no economic advantage in following the European example and introducing sophisticated metering on a universal basis.

Utilities are therefore concentrating on improving bill collection through better automation of metering processes, targeting higher energy users.² Metering innovations include GSM-based meter reading systems, mobile technology that enables bulk reading of meters from a mobile unit and handheld devices that enable door-to-door operators to issue electricity bills and collect payment on the spot. This avoids meter reading, billing and bill delivery inaccuracies and improves the prospects of revenue realization.

² Highly populated areas have electric metering, covering about 65% to 70% of customers. Many consumers in urban and rural areas still use too little power to justify metering. Farmers pay subsidized rates for electric supply; revenue from these customers doesn't justify installation of a meter, so they are often charged a flat rate

→ services, including advice on energy consumption. Whether you outsource that or do it yourself, it is a much more intensive communication and should improve utilities' customer relationships," says Umbach.

Smarter generation and delivery assets will improve reliability

Smart grid technology is also being deployed to optimize grid reliability from the meter back to the array of generation sources. However, this aspect of "smartening up" is widely viewed as a simple technical upgrade to the network, rather than a catalyst that will revolutionize the energy supply business model.

ComEd's Michael Meehan comments: "We're looking at smart substations on a small scale as part of our pilot – particularly getting more accurate data about voltage regulation and control. Making sure the voltage is not unnecessarily high will cut costs for our customers. It will also reduce wear and tear and help our engineers with load studies and long-range design."

Upgrading will be funded in a traditional way through grants and rate increases. The benefit will be increased reliability and resilience of supply. For example, PJM – a regional transmission operator with 56,000 miles of transmission lines covering 13 northeastern US states – is investing some US\$30m of ARRA funding to install new synchrophasors. The new technology will provide time-stamped, location-stamped voltage and current information up to 100 times a second, compared with existing systems that provide information every four or five seconds.

In 2003, there were severe energy blackouts in PJM's northeastern territory. The company believes that information from the synchrophasors could have helped to prevent these blackouts.

Winning in the smart world

Many of the people interviewed for this article stressed that installing the new technology was just the start: dealing with everything that comes after is the bigger challenge.

Examples of how revolutionary change can sneak up on an industry following new technology are all around us. Music downloads, for example, totally transformed the music industry business model. It's possible that smart grids and the innovations they bring could change the energy industry model in a similar way. So, if utilities want to finish on the winning side, what changes will they have to prepare for?

As things stand, energy efficiency is inherently against the business interest of utilities, because cutting consumption reduces revenue. But smart grids are bound to have an impact on consumption. We can therefore expect to see a major change in regulatory and business models to motivate utilities to invest in technology that promotes efficient energy use.

Another big revolution is likely to occur at the consumer end of the business. Increasingly sophisticated energy management, distributed generation and smart devices that communicate with one another and with the network will totally change the interaction between suppliers and consumers. The ability to understand customers, manage relationships with them and influence their behavior will become a key capability.

Ernst & Young's experience of helping businesses deal with major transformations in other sectors has shown us the importance of agility and fresh thinking. Whether they need to share risk, analyze huge volumes of customer data or target new services at consumers, utilities will have to think imaginatively about the new partnerships, joint ventures and product/service collaborations that will enable them to succeed in the smart world. ■

How will utilities transform in the new smart world?

- ▶ For Ernst & Young's latest insights on how smart technology will revolutionize the power and utilities sector, visit ey.com/smart
- ▶ *Seeing energy differently*, our new report about the impact of smart technology on utilities, is available from ey.com/smart



The smart home breakthrough

Smart home appliances are triggering a major revolution in energy use – so utilities must adapt to survive, says Adrian Tuck, Vice Chairman of the ZigBee Alliance and CEO of Tendril



Smart home appliances will make life a great deal easier and cheaper for householders in the future. Hooked up to the utility through a centralized computer system, programmed with individual preferences on energy use and controlled by a smart meter, these devices will help householders manage their heating, lighting and the entire domestic environment in an intelligent, energy-saving way. Add remote control functionality and we will be able to control the system from our mobile phones.

To achieve all this, these devices need to talk a common language. The ZigBee Alliance is working to support the development of the automated, energy-efficient home. It is one of a handful of bodies creating common communications standards that allow the appliances, meters, utilities, manufacturers and other suppliers to talk to each other. The alliance has a strong membership among major appliance manufacturers and its platform has already been widely adopted in the US.

Vice Chairman Adrian Tuck thinks the rise of smart, interoperable devices will have a big impact on utilities. He explains: "Energy efficiency at a residential level is going to be a vitally important component of energy policy going forward. We deal with many utilities that are working hard to understand how they can play and benefit in this new world. But we also know energy companies that are in denial that change is ever going to happen – and that is dangerous."

Momentum gathers for new market

The pace of change will become even faster over the coming 12 months. General Electric, for example, is launching a family of ZigBee-enabled smart appliances this year, including electric water heaters, washing machines, dryers, microwaves, ovens and fridges. This technology could dramatically change consumption patterns and costs, as Tuck explains:

"If a utility offers TOU pricing, for example, your new fridge will find the cheapest time to use power. As a consumer, you won't see any difference: you'll still have cold food and ice. But the fact that the fridge made the ice at 3a.m. rather than 3p.m. will be transparent to the system, saving you money. Your washing machine will give you the option to dry your clothes on a slightly longer cycle that will use half the power, costing you much less."

Customers need options and education, not pushing

Of course, not everyone will respond to the offer of home automation and energy efficiency in the same way. Tuck believes that the key to success in the new smart market is to ensure that product design and IT take this into account.

"You can't expect everyone to embrace the new technology immediately," he says. "Some consumers care passionately about energy conservation and want to be actively involved in energy management choices in the home. They will seek out the new smart technology and educate themselves enthusiastically about its use. But for every early adopter, there are many others who are either neutral and potentially willing to be persuaded of the benefits, or else totally uninterested."

To accommodate the range of consumer attitudes, Tuck feels that manufacturers and →



"Energy efficiency at a residential level is going to be a vitally important component of energy policy going forward"

Adrian Tuck



“We need to be humble about our ability to predict the future ‘killer apps’ of the smart home... and adopt open, extensible standards”

Adrian Tuck

→ utilities need to offer a wide range of options. Manufacturers need to build appliances that look “normal” and cost the same as traditional products. Utilities have to ensure that making smarter energy choices is an opt-in process, where decisions are as easy to make as possible.

Tuck explains: “You have to start gently, offer options and let people experience the benefits. The ‘indifferent’ consumers will only be willing to participate if the systems are seamless and transparent – and give them the option to override any automatic ‘eco’ settings offered by utilities.”

Currently, Tuck says, many people know that their thermostat can be programmed, but in practice they rarely touch it. “We’re on the brink of a breakthrough to make the thermostat smarter, simpler and more intuitive to use. Not everyone wants to change their lifestyle dramatically. But if, for example, we can give people a smart application that they can use on their phone, the web or internet-enabled television, allowing them to control their thermostat remotely, or change their consumption according to the price of electricity, we will start to see them participate.”

Smarter, more flexible rates needed

Tuck feels there is an urgent need for innovation around charging mechanisms. Smarter rates are essential to the success of the new grid for two reasons, he explains. First, change is required to accommodate the fluctuation of renewables. Utilities need to be able to use prices and send appropriate control signals that enable appliances to make decisions about consumption, based on real-time knowledge about the availability of renewables on the grid or the carbon intensity of electricity.

Second, if electric vehicles (EVs) prove as popular as expected, they will create a significant new load on the grid. Within a single household, for example, charging a car and using air-conditioning at the same time could exceed domestic capacity.

“You therefore need a smarter charging system to manage demand – probably using different types of tariff for different types of home appliance. For EVs, utilities could create new charging mechanisms, possibly based on some sort of initial minimum charge followed by a clean energy or cheap top-up. And you can’t have all the cars on a street charging at once. It will be important for utilities to be able to manage relationships between houses and the transformer to ensure they can meet demand,” says Tuck.

No more limiting the customer

To date, utilities have been able to build in a certain level of predictability in terms of load on the grid by, as Tuck puts it, limiting the consumer’s options. In the US, for example,

householders can sign up for a saver rate that allows the utility to control their air-conditioning, but the only option is on or off, with no override option for customers.

“That model is going to become redundant in this new phase. Utilities will still need predictable, reliable, verifiable usage, but that will come from an intelligent system that knows that Mrs Smith is likely to override her thermostat on Saturday if the temperature rises above 83 degrees. We’ll be able to predict this and the utility will then be able to manage it. Systems will have audit-grade settlement data that can capture those complex transactions and bill accurately,” comments Tuck.

Dealing with data security issues

The need to network home appliances and monitor consumption raises the question of data security, and there are certainly complex issues here. Tuck understands that consumers don’t want to feel vulnerable or “spied on”. As he explains: “Once the appliance is in use, utilities obviously need access to energy consumption information. But they only need aggregate data for billing and settlement. They don’t need to know how many times a month you take a pizza out of your fridge. To make householders feel secure, we can gear the system to provide them with a rich set of information about their own consumption and how it compares with that of their neighbors, while utilities just get the high-level information they need to bill accurately.”

The new smart devices will need to be registered at point of sale to join a utility network. Retailers will therefore need access to software and common protocols that will enable devices to meet the cybersecurity requirements of various utilities.

Finding the “killer apps” of the smart home

Tuck concludes that the smart grid and smart home could usher in disruptive change that will displace incumbents in favor of new players.

“I believe we are about to go through a revolution in the energy space every bit as big as the telecoms revolution. Businesses that we may think they are currently unassailable will go out of business if they don’t react wisely in the transition,” he says.

He points to thermostat manufacturers as an example of the impact of encroaching change: “We work with companies that have been producing thermostats through 100 years of changing technology. But if the future of the thermostat is as a networked device communicating with a house full of other intelligent equipment, then your ability to build the device is less important than your ability to manage that intelligence.”

Companies will need to be very humble, he says, about their ability to predict what the “killer applications” of the smart home will be: “Any new systems will have to be open and extensible, allowing users to ‘plug in and play’ new applications at multiple points without disrupting the existing structure.” ■

Tendril connects utilities and the smart home

Adrian Tuck’s energy management technology company, Tendril, facilitates communication among energy consumers and suppliers. It provides an IT platform – the Tendril Residential Energy Ecosystem – that connects in-home devices (such as thermostats) to the utility back office. Using this platform, Tendril can preconfigure the home’s energy profile (for example, based on peak times and demand response signals) and provide settlement-quality feedback to the utility, allowing it to reward customers for taking action and meet their regulatory conservation commitments.




Adrian Tuck, Vice Chairman, ZigBee Alliance; President & CEO, Tendril

As CEO of Tendril, Adrian Tuck focuses on expanding Tendril’s customer base through multiple sales and marketing channels, including alliances with leading companies. He is also the Vice Chairman of the ZigBee Alliance, an association of companies working together to enable reliable, cost-effective, wirelessly networked monitoring and control products based on an open global standard.



Back on the agenda: Working capital management





Other industries
have successfully
tackled working
capital management
to keep cash flowing
into the business.
So what's holding up
power and utilities?
Peter Kingma and
Robert Smid propose
an overhaul

For the past decade, working capital management has received little attention from power and utility companies. Now, as the recession translates into bad debts and rising customer insolvencies, cash management is once again climbing their agenda.

The need for cash

Peter Kingma, who leads Ernst & Young's working capital advisory practice in the Midwest region of the US, helps corporations to improve their management of accounts receivable, accounts payable and inventory. In the past year, he has seen utilities focusing more on improving working capital performance.

"In the current financial climate, US power and utility companies are more cash-conscious than ever before. They are bracing themselves for less-than-favorable rate cases by regulators. They also have a number of strategic initiatives to fund – not least the smart grid rollout. So money is tight and they are looking to achieve economies of scale," he explains.

As the industry looks to consolidate, maintaining strong balance sheets is critical to preserving the quality debt ratings necessary to complete acquisitions successfully. Kingma cites the US\$8.5b merger announced by FirstEnergy and Allegheny in February 2010 as an indication of resurging industry consolidation. He expects more deals to follow as companies seek economies from mergers.

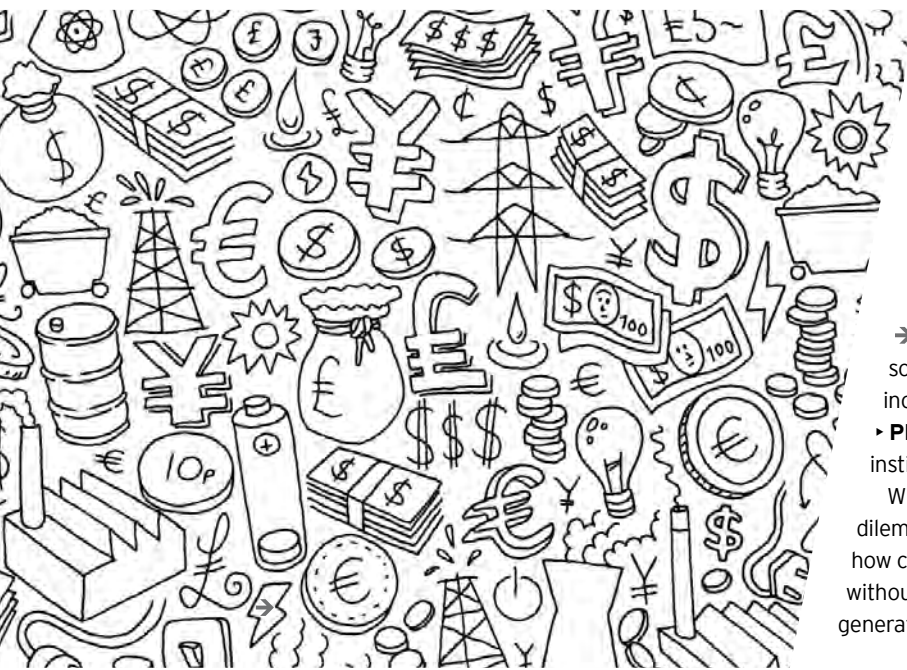
Robert Smid, Head of Working Capital Advisory Services at Ernst & Young in Austria, Belgium, Germany, Switzerland and the Netherlands, brings more than 16 years' experience to his clients in sectors including power, water and telecoms. He believes that utilities that focus on working capital may have much to gain.

"Research¹ by Ernst & Young in 2009 found that European utilities could release between €6b (US\$8b) and €14b (US\$19b) by improving their working capital performance," he explains. "In today's credit-tight environment, this would equip them better to manage volatility in energy prices, to roll out network improvements and to meet regulatory and investor demands."

Although there is plenty of impetus for change, companies on both sides of the Atlantic are reticent about aggressive recovery tactics. This is due to:

- **Regulation:** many countries do not permit utilities to cut off →

1 Cash on the meter – electricity and gas utility receivables: performance and leading practice, Ernst & Young 2009



→ essential supply when customers fall into debt. In some countries, utilities must provide assistance to low-income residential users

► **PR:** utilities fear a media and public backlash if they instigate more forceful collection policies.

With companies caught in a commercial and moral dilemma, cash is being left on the table. The question is, how can utilities recover costs from delinquent consumers without contravening regulations on customer care or generating bad publicity?

“European utilities could release between €6b and €14b by improving their working capital performance”

Robert Smid

Receivables: lessons from telecoms

Power and utility companies need look no further than the telecoms industry for an education in how to reduce credit risk. Less of its liquidity is tied up in receivables – sums due from customers – because providers observe customer payment behaviors and adapt their revenue collection strategies to match.

“When introducing new products, telecoms providers entice customers to sign up to new terms, such as payment by direct debit. Customers benefit from lower tariffs. And the provider has a more reliable and timely income flow, as payments are debited directly from customers’ bank accounts on the due date in a form of credit that is cheaper to service,” explains Smid. “It’s a win-win.”

Interestingly, telecoms providers are now so in tune with customer behavior that many are making the transition from variable- to fixed-pricing models. Bills are charged in advance. They offer call plans at a fixed price, with a variable element for cell, premium rate and some international calls. The larger proportion of the bill now goes on extras such as fixed-rate broadband connections and satellite or cable TV. Mobile operators are also finding pre-pay a massive draw.

Smid finds it fascinating that customers are happy to pay a fixed amount upfront and for overpayments to be reimbursed at a later date. “They perceive it as something of a windfall. Utilities need to work out how to deliver that perceived ‘happiness’ to customers by better understanding their psyche.”

Influencing customer behavior

Other utilities, Kingma notes, successfully use green agendas to entice customers into changing their payment behaviors. He says: “They encourage customers to pay by direct debit ‘to reduce billing and paper statements’. This has a very positive impact on receivables performance and cash flow for the utility.”

The gas industry has already caught on to apportioning bills over the year so that income is not affected during low-usage months. Electronic invoicing or online billing are also gaining popularity, saving utilities up to two days in revenue collection.

“There are many other ways to remedy your receivables portfolio before you resort to aggressive collection strategies and before you

face insurmountable bad debt,” says Kingma. These include:

- Billing customers in advance rather than in arrears
- Minimizing the gap between service delivery and bill issuance
- Stipulating strict due dates for payment
- Aligning billing to customer behavior so that bills reach customers at the point in the month when payment is most likely
- More effective credit rating of new customers at the outset rather than chasing non-payment after default
- Determining how many payment installments to collect for customers on direct debit.

However, it is equally important to segment the customer base and to target people appropriately. Costs are likely to be recovered only from customers who can afford to pay and who value their credit ratings. Time spent on unlikely recoveries is time wasted.

Better inventory management

Power and utility companies tightly control and manage their fuel inventories. But maintenance, repairs and operations do not tend to attract the same level of supervision.

Operating across large sites, companies have fallen into bad habits. Engineers set unique specifications for equipment, resulting in non-standard parts, wastage and redundancy across the business. Procurement is often handled locally rather than centrally, leading to a proliferation of vendors and terms. Additionally, there are costs for handling, storing and transporting stock between locations. The net result is inefficiency and bloated, high-cost inventories.

Utilities need to become better at consolidating and rationalizing the inventory if they are to operate more efficient plants and to reduce financial risk and borrowings.

Making payables pay

To keep cash flowing, monies due in receivables and out to creditors need to operate in harmony. Improving policies for paying creditors, without negatively affecting the supply chain, can help utilities with overall working capital management.

“Utilities in Europe are waking up to the possibility of consolidating services and payments across the business to achieve economies. The poor payment performance of their customers has given them a much-needed jolt,” says Smid.

Indirect buying programs for inventory tend to result in a culture of authorizing early payment. Utilities have opportunities to achieve quick wins by centralizing and standardizing procurement and by tightening payment policies. To make informed cash-flow decisions, they need to give thought to:

- How they process payments
- How they structure payment terms – keep suppliers to terms of 60 days or more and negotiate discounts for early settlement

- How to consolidate spending (including non-core items) to achieve economies of scale.

A reform program

The faster you recover receivables and shift stock, the sooner cash is released to the business. The slower you recover cash owed by debtors or turnover stock, the more working capital is soaked up in running the business.

In the current financial climate, better working capital management is essential to keep money flowing within the system. Companies need to slim down inventories, improve financial practices and create a sleeker and more efficient operation. Transformation cannot happen without the backing and buy-in of senior management.

“Where individuals in disparate locations exert influence on inventory and payables, senior management needs to play an active role in implementing better working capital management. If too much responsibility is delegated to a functional level, the meaningful results that most utilities are looking for will not materialize, because operating units often have conflicting agendas,” explains Kingma.

The reality is that with competing priorities for management time – including integration of acquisitions and new product rollout – cash is being left on the table. According to Smid, companies are quick to blame IT for their failure to instigate change. “IT drives the order-to-cash process for millions of utility customers,” he says. “They argue that it is too costly or complex to change and so they stick with what they’ve got – despite the fact that it’s leaky and unintegrated across acquisitions. They fail to recognize that they could unleash significant amounts of liquidity by improving and fine-tuning the collection process.”

By acting on this cash opportunity, managers will have more capital to play with, reduced financial exposure and opportunities to outperform the competition. Benefits from working capital programs can be seen within 12 to 24 months.

“Other industries have done it,” sums up Kingma, “and there’s nothing to stop power and utilities from doing it too.” ■

Cash on the meter – Electricity and gas utility receivables: performance and leading practice

Ernst & Young surveyed leading European electric and gas utilities, exploring the effectiveness of their receivables management practices. To download the survey in PDF format, please go to ey.com/powerandutilities



Toronto Hydro: smart approaches to smart metering

Toronto Hydro is wrapping up its smart meter rollout and is the first North American utility to begin mass-billing using time-of-use (TOU) rates. President and CEO Anthony Haines talks about the challenges involved





As one of Canada's largest electricity utilities, Toronto Hydro-Electric System Limited (Toronto Hydro) distributes power to the City of Toronto.

Toronto Hydro is not a typical utility because it is government-owned. When the Ontario Government ordered the company to install smart meters province-wide, it could have bypassed the traditional 'business' case. It prepared one anyway, to guide the smart meter rollout and customer response process through web-based tools, and to support the project on a cost/benefit basis. Although not motivated by profits, the company has a duty to spend prudently and cost savings were a key motivator on the project. Under provincial law, savings go into a public account for future customers.

"Smart meters bring huge operational benefits," explains Haines. "They're really network points sitting on the wall of every home and business. Now we can begin to move data both ways through a network to automate things inside the home. This is very economical because past communications barriers, or traditional communications networks, largely disappear and are replaced by new channels linking the customers and Toronto Hydro."

As a first step, the company created a paperless inventory management process with handheld devices issued to each engineer to fast-track a complex procurement and installation logistics exercise. At an aggressive installation rate of eight meters an hour, the project came in under cost – and benefits surpassed the company's forecast. Roughly 90% of smart meters are now "live". An impressive 500,000 of its total 625,000 customer meters are read daily through an automated metering system and billed based on TOU rates.

Behind the meter

Coupled with conservation incentives and education programs that help customers cut costs, Toronto Hydro is breaking new ground. Its peaksaver central air conditioner control program has been particularly successful at informing customers and involving them in making

"Toronto has a 'peaky' system. We hope to move consumption off peak periods and reduce them through conservation, demand management and load shifting"

Anthony Haines, Toronto Hydro

prudent load reduction choices when the grid is stressed.

Toronto Hydro also offers a "set it and forget it" incentive program called 'peaksaver plus', which pays a nominal standby fee for the option to power down air-conditioning units remotely over peak periods. The incentive appears on the summer bill.

"Our role behind the meter is helping customers use energy more efficiently," explains Haines. "About 70,000 customers have turned their air-conditioning operations over to us. So we can instantly cycle them down and bring approximately 50 megawatts off the grid. That's a new kind of customer relationship."

Stumbling blocks

Not surprisingly, the company faced some initial challenges. They included workforce retention issues amid the switch to automated metering, high customer care costs, and overly optimistic consumer expectations that bills for all would be reduced. This is not the case, however, and better conservation education may be required by some. The initial flood of incoming calls – eight times previous levels – suggests that one-size or web-based communication does not fit all. That said, call volumes have since dropped to about a 20% increase.

"Ours is a highly complex rate structure to communicate. On average, customers are paying about 8% more under TOU. The TOU peak price is higher and rates are designed to encourage customers to manage their consumption and shift to lower-priced off-peak periods. We tie

our conservation and demand response programs to the customers' behavior, to help them manage the new bill reality," comments Haines.

Benefits already

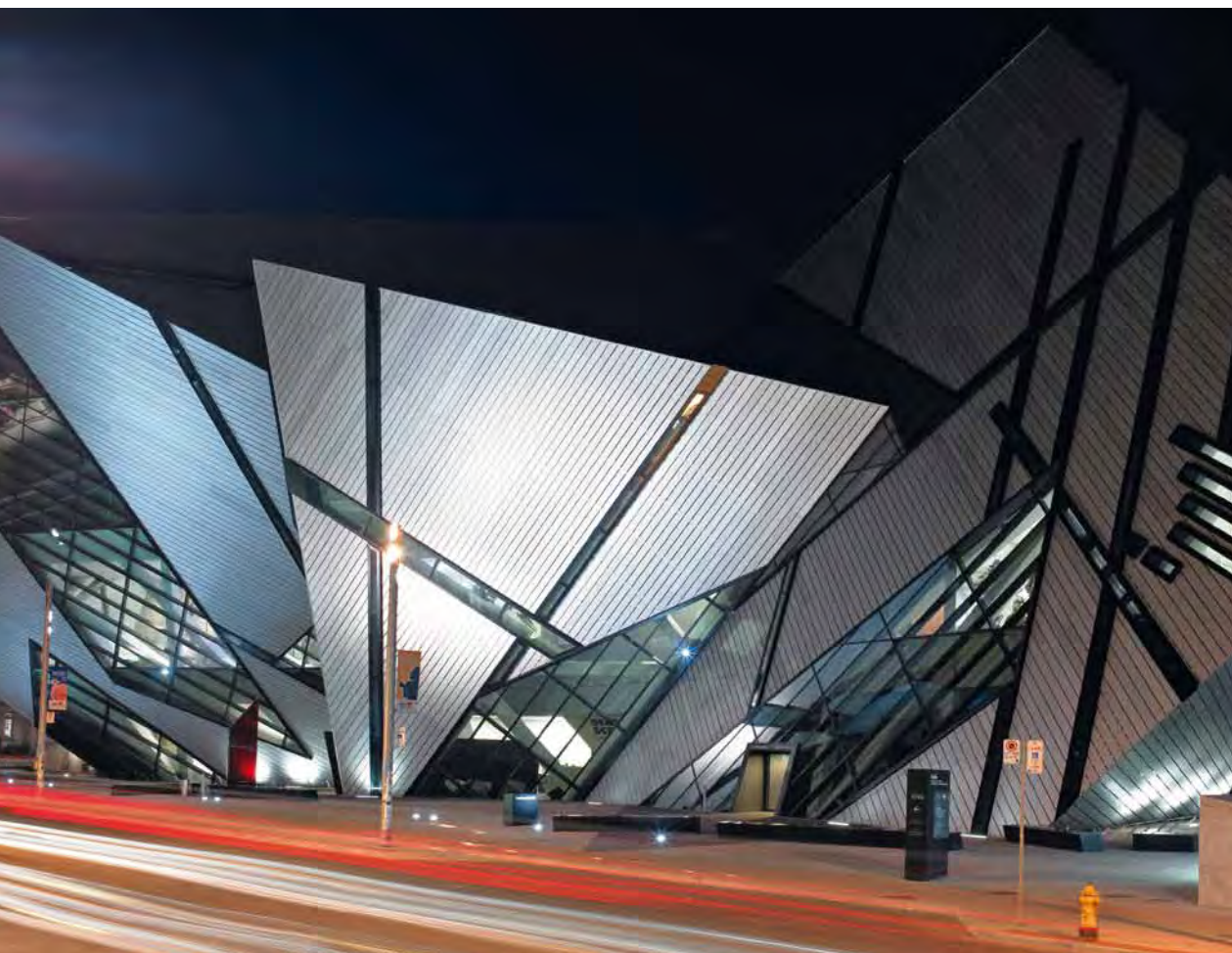
The company is already seeing payback. Smart meter installation costs have been reduced by 50% due to the scale of demand. And a workforce that has acquired new skills is motivated by a very different technological future.

"It's the perfect storm between an aging workforce and the need to bring on higher skills. We had to increase the quality of personnel – from meter readers going from house to house to people who could add more value in supporting the metering technology. Younger people saw it as a great opportunity to be retrained and to be exposed to a more exciting job," observes Haines.

Most importantly, early market research is indicating that many consumers do react positively to price signals, provided that they can quickly access their energy usage information and learn how to avoid peak pricing periods of the day. Toronto Hydro provides a web portal that allows customers to review their daily energy usage and access energy efficiency programs online or by phone.

"Conservation and price elasticity are predicated upon sending good information to customers to enable them to make informed decisions. So for three years, we built strategic communications processes. Generally, Torontonians are responding positively," says Haines.

"And by buying new and smarter →



*Anthony Haines,
President and
CEO, Toronto
Hydro*

Anthony Haines oversees the activities of Toronto Hydro Corporation and its wholly owned subsidiaries, including Toronto Hydro-Electric System Limited and Toronto Hydro Energy Services Inc. The latter owns Toronto's street and expressway lighting assets. Haines spearheaded efforts to modernize the company's distribution system, renew its workforce and improve customer service.

→ systems for our aging infrastructure, we are building a much more sophisticated distribution plant," he adds. "We can make instantaneous operational decisions and improve our efficiency. We're also looking at renewable distributed generation, such as solar photovoltaic (PV) and wind power, to supplement traditional generating sources and to help address climate change concerns."

The road ahead

With much data to examine, Toronto Hydro sees potential for partnerships with appliance and electric vehicle (EV) makers, to maximize efficiencies and prepare for drastic changes before EVs hit the road.

Electric vehicles will disrupt the distribution plant immediately and cause stress to the grid over summer months when air conditioners are running, because vehicle charging and building cooling systems will run simultaneously. A quarter of homes may plug EVs in at

once and Toronto Hydro will need to serve this market.

"Previously, the distribution company had no say over when and how you connected your new range or freezer," explains Haines. "But you need some control over the terms and conditions of charging EVs to avoid stressing the plant. We have to stay ahead of demand. This will redefine the relationship between the customer and the electric company.

"We are addressing these operational challenges with the electricity and automotive industries. Options include plugs that are energized only at certain times to manage demand. For mobile charging, we're working with filling stations that will offer quick charges or battery change-out systems. And we're working with appliance makers to build smart chips into devices that send customers data about energy use. This helps customers lower their bills. We need innovative solutions such as our peaksaver program to bring the load on in a strategic way." ■



As smart meters roll out across the US, investors are eyeing developments with great interest. *Utilities unbundled* spoke to Moody's and Credit Suisse for the Wall Street perspective

Smart grids: the investors' verdict

Weighing in were Moody's analysts AJ Sabatelle and Laura Schumacher.

As members of an international team of 21, they shared valuable insights on current capital spending and costs. Moody's rates company debt.

Supplying the sell-side perspective was Patrick Jobin, a cleantech analyst at Credit Suisse. He focused on future growth opportunities. Credit Suisse is an international investment bank.

Putting a value on the smart grid

In Moody's view, smart grids are a small and safe bet for utilities, because the sums involved are relatively small. Cost savings from efficiency gains generally offset initial investments. Smart meters improve usage measures, customer communications and outage handling. Stimulus money and job creation possibilities make them an easier sell. →

→ And the public utilities commissions, companies and consumers are usually on board. Even without funding, many projects may go forward.

But these aren't one-size-fits-all projects. Regional approaches to smart metering vary, based on their strategies and what Washington, the commission and customers want. Some are more cautious. Projects in states such as California and Colorado are ahead because meeting green mandates is a priority. Local needs determine the pace and route.

"We evaluate smart meter rollouts just as we evaluate all utility investments – based on cost recovery and return on investment. Most utilities are experimenting with pilot projects because investments are likely to reduce operating costs or improve reliability without raising rates. That's why most commissioners give their blessing. Today, we look at customer communications, the regulator relationship and the planning process," says Schumacher.

Smart grid activities are generally off the radar for utility investors because it's early in the game, says Credit Suisse, although there are a handful of specialized vendors, including smart meter companies, that foresee tremendous growth. Utility investors will pay attention when major demand drivers, such as electric vehicles and more renewables, take hold.

"Even advanced deployments offer only a few rate tiers and a web portal to track previous consumption. Despite much talk about automating home appliances, in-home displays, connecting electric vehicles, automatically adjusting thermostats and optimizing voltage, these functionalities are still a few years away. Investors will only see meaningful consumer behavioral changes once smart grid systems that go beyond the meter, such as in-home portals and TOU rates, are implemented. Until then, these are largely capital deployment projects for utilities," says Jobin.

Importance of government backing

Government backing for development is critical now, but won't be as we move



"Investors will only see meaningful consumer behavioral changes once smart grid systems that go beyond the meter, such as in-home portals and TOU rates, are implemented"

Patrick Jobin



forward. In fact, the analysts think that it could slow progress. Smart grid projects stand alone based on the economics and business case. That's different from capital-intensive renewable energy projects such as wind or solar, where subsidies are critical, says Credit Suisse.

"Strings are attached to stimulus funds. So far, funds have only caused delays. Before awards were announced, most utilities put projects on hold because they were waiting for grants. If they didn't receive funds, they saw no need to move first. Picking a vendor early is also difficult. Even those that received funds hesitated because of tax implications. They worried that investments would be classified as income, not capital contributions. But that's now behind us," says Jobin.

Will customers push back?

The real test in implementing smart meters, says Moody's, will be customer interaction. In the US, roughly 3.4% of a household's disposable income goes toward utility bills.¹ Utilities usually try to appease consumers by raising rates a few percentage points at a time, rather than a double-digit increase in one chunk.

"Affordability is important, more so in a recession, and it can affect our ratings. When are price hikes problematic? Anecdotally, double-digit increases make headlines. Increases below that may fall under the radar screen. These strategies help manage customer and regulatory relationships.

"Customers will protest about paying for malfunctioning meters. That's not really happened because of cautious implementation. We watch this in the context of large investments in generation, distribution, transmission lines and other ancillary services including smart grids. But smart meters are a lesser concern," believes Sabatelle.

"Most Americans don't know how much power costs to produce and deliver. Involving consumers more in energy

management requires education," Jobin says. "Also, someone who does nothing will pay more. That's the idea. When consumers see opportunities to save or make money, behaviors change. Until then, there'll be resistance. Still, advanced systems aren't for everyone."

Potential for smart meters to reduce revenues

So could smart grids reduce revenues substantially? It's possible. But decoupling, or eliminating the link between volumes sold and revenue earned, should allow utilities to mitigate this risk. Utilities work with regulators to pay for these major infrastructure developments. As costs rise, commissions may become more cautious, according to Moody's.

Finding an appropriate structure is important so that revenue losses can be offset by efficiency gains. California is a good example of the credit benefits of decoupling, because the revenues of its big utilities did not deteriorate during the recession.

"Decoupling can incentivize utilities to support programs that decrease usage because they are not harmed by declining volumes," says Schumacher.

Bigger impact from smart grids in a few years

The analysts think that the major impact of smart grids is unlikely to be felt for a few years. As program costs rise, utilities must communicate the costs and benefits carefully to regulators, investors and consumers. Commissions may become more discerning in their allowances. Then, returns and their impact on credit quality may take center stage, says Moody's.

"This is likely to happen gradually. How much will bills increase in California? With current rates at 15 to 17 cents per kWh, smart grids may not increase rates much, particularly in a populated state with low customer usage. Within two years, we'll probably know more about functionality,

Our interviewees:

- ▶ Angelo J Sabatelle, Senior Vice President, Power/Utilities Americas, Moody's
- ▶ Laura Schumacher, Vice President – Senior Analyst, Power/Utilities Americas, Moody's
- ▶ Patrick Jobin, Cleantech Analyst, Credit Suisse

usage and how far customers will take the technology," says Sabatelle.

Move into energy services unlikely, but business model will change

The analysts see little likelihood that utilities will move into new services such as heating, cooling and home energy management. Their view is that a working regulatory compact encourages utilities to invest in their systems to assure an affordable and reliable service, so that the commission allows the utility to earn reasonable returns while protecting it from competition.

This often discourages utilities from pursuing additional revenue streams. Many software and services companies are happy to step in and customers may want to choose alternative providers, says Moody's.

"Utilities' track record in businesses outside their skill set is not good. They'd probably be happy if others moved down that path," says Sabatelle.

Utilities will still "own" the customer, says Credit Suisse, but as new offerings and revenue streams emerge, the business model will shift to accommodate these new entrants.

"The model will undoubtedly change. New technologies offer a massive opportunity to shift business models and create new industries. For an idea of how, look to the telecoms industry 20 years ago. Phone companies still own the customer, but the number of features, rate plans and delivery systems has radically changed. I foresee a similar transformation in the energy business," says Jobin. ■

¹ US Regulated Utilities Industry Outlook, *Moody's Global Infrastructure*, July 2009. Moody's analysis shows that customers may object to rising rates when electricity bills reach between 5% and 10% of a household's disposable income, as is expected to happen in the current decade

Italian multi-utility A2A is using IT to transform the business – focusing on “spending to save.”
Andrea Paliani reports from Milan



A2A drives change from IT



Italy's A2A SpA was created when Milan-based AEM incorporated ASM from Brescia and the smaller AMSA. Three years on, the group comprises about 100 companies (in electricity, gas, heat, water and waste) and faces tough market conditions. Its sales fell in 2009, and the Italian market, though powering ahead of other European countries in rolling out smart meters, is fraught with regulatory uncertainty about the unbundling of distribution and supply.

For Stefano Perfetti, who heads up the Corporate ICT service line at A2A, integration ought to have been a daunting task. Yet his cautious but focused approach – using IT to drive standardization where there is a clear business case and potential for return on investment, while tolerating diversity where there is not – is paying off.

"It's a question of return on investment. We only spend where we can save. It means compromises – choosing between what reforms are essential and what can wait," Perfetti explains.

Focused IT investment for maximum impact

The smart meter rollout is the biggest non-negotiable goal for A2A. "We have 97% coverage in Brescia right now. And more than 85% in Milan," says Perfetti. Remote connect and disconnect and automatic meter readings generate significant cost savings, efficiency improvements and reductions in fraud. This is clearly a case where the benefits outweigh the costs of investment.

A document management system is an integration must-have. It will move all customer information and billing onto a common platform across the business. "This will help to reduce fraud, improve cash and credit management performance and speed up the invoice-to-collection process," says Perfetti. Content that is not currently available on electronic systems is being compiled from scratch and loaded on to the platform.

Also pressing is a business intelligence system, identified by ICT as a means of gathering reliable information for more

informed decision-making by the business. "Instead of cutting costs, ICT is buying in new products and licenses. The return on this investment is really high. Imagine how business intelligence will inform our investment decisions, risk management, customer knowledge, service development ... We simply can't afford not to invest," asserts Perfetti.

The utility's SAP implementation, though relatively quick, has been harder to achieve. Within eight months, it managed to move core processes over to the new central system. Time constraints forced it to transition other less urgent processes in the following few months.

Less of a priority is utility maintenance, which is currently managed on disparate systems across Italy, France, Montenegro, Spain and the UK. The cost-benefit gap is currently too wide. Funding for the software that will bring maintenance onto one common platform will have to wait and the company will have to cope with diversity. "Different equipment will continue to be managed separately, as the cost of centralization is more costly than the potential savings," explains Perfetti.

Using IT to instigate change

Compounding the complexities of integration is a hiatus in the evolving regulation of Italy's utility industry. While the company waits to hear what the "open" utilities market – and A2A's role in it – will look like, Perfetti is working to ensure that its IT architecture is sufficiently dexterous to adapt quickly to new rules as they emerge.

From an IT perspective, the biggest challenge for Perfetti is "finding the best way to integrate market solutions to deliver cost savings to A2A quickly." From a business perspective, "it's changing hearts and minds. Re-engineering isn't about a bit of refurbishment here and there: it's about delivering the right level of change," he explains.

"There are big opportunities for a shake-up in network management and the supply chain. The ICT function needs to enable that to happen by demonstrating



*Stefano Perfetti,
Head of Service
Line Corporate ICT
Department,
A2A Group*

Stefano Perfetti is responsible for ICT governance of corporate processes at A2A. With more than 11 years' experience in business process reengineering, change management and IT organizational development, he develops and implements IT strategies to resolve business problems.

that we can deliver efficiency, cost savings, supplier rationalization and service quality improvements. This will give our internal customers better applications and solutions to do their jobs. And that makes them more receptive to change."

In the three years since the two network management companies and 50 smaller businesses came together under the A2A banner, the ICT function has been an instigator and enabler of change. It has helped to save money and improve organizational efficiency, while supporting operational lines within the corporate function and improving the capabilities of its 9,000 people.

The notion of IT driving change in the business, rather than the business dictating the IT, won't sit comfortably with some in the power and utilities sector. But, as Perfetti points out, the function is making business decisions based on critical need and cost benefits. Operating at the crux of the business, IT is translating what is desirable into what is actionable, informed by technical knowledge and industry understanding. And for that, says Perfetti, "A2A has many reasons to feel very positive about its future." ■



When Swedish state-owned energy group Vattenfall acquired Dutch utility Nuon in 2009, Chief Information Officer Claes Wallnér took on a significant challenge: capturing 15% of the total value of the integration through IT. How did he do it?

M&A prompts IT transformation at Vattenfall



Vattenfall has grown rapidly by acquisition over the past 10 years. Today, it is Europe's fifth-largest electricity generator and the largest heat producer. Headquartered in Sweden, its main operations cover Belgium, Denmark, Germany, Finland, Poland, the Netherlands and the UK. The group operates right across the electricity value chain – power generation, transmission, distribution and sales. The acquisition of Nuon was a strategic maneuver to secure its foothold in the Dutch and Belgian markets and to build an even stronger position in the gas market.

Acquiring Nuon brought Vattenfall's total IT legacy to more than 2,000 applications. The IT team was charged with capturing 15% of the total value of the integration and reducing the overall IT architecture by 5% year on year. It was a significant challenge.

Chief Information Officer Claes Wallnér brings years of experience from previous and current roles to IT integration following mergers. A structured and phased approach ensured that the Nuon integration ran smoothly. "IT integration ran parallel with five other workstreams, beginning in April last year, to get the merged entity up and running and ready for business as one company on 1 July 2009. Our key driver was to identify synergies and deliver value."

Lessons from integration

Every integration brings the challenge of uniting autonomous IT systems and shedding those that are superfluous to the merged organization.

One of Wallnér's key tactics for managing the IT workstream was to bring in a business sponsor – the head of power generation in Benelux – to sit alongside him on the steering committee. The leadership of the team, he says, always had "one foot in the business camp and the other in IT," which made

"Online feedback on energy consumption is a big opportunity for us. We need to be making investments today to handle the wider IT implications of a fully developed smart market"

Claes Wallnér, Vattenfall

it easier to align the IT integration with business requirements.

The Nuon merger saw IT headcount at Vattenfall increase by one-third. For Wallnér, team building is a top priority if IT development is to progress under the banner of the merged business. He warns that it is important to build new teams out of previously disparate organizations quickly, otherwise "you end up with a merger that never ends." He also seeks to exploit the big bonus of acquisition: growth in the knowledge base.

"Bonding two sides of a merged company is never easy," says Wallnér. He focused on nurturing team spirit, emphasizing that Vattenfall, as the buying company, wasn't about to impose its IT solutions on Nuon. By identifying where Nuon's existing systems surpassed Vattenfall's own, he defined what was potentially best for the new group as a whole "in terms of serving business value, customers and cost performance."

His approach paid off. The initial phases of integration have been completed and the task now is to move the enlarged business on to common platforms for IT applications and infrastructure. That's quite an undertaking, especially since, as Wallnér explains, "IT has to capture about 15% of the total value of the integration."

National regulation compromises consolidation

The task of standardizing and consolidating

systems to drive more value out of IT is ongoing. However, cross-border consolidation efforts are compromised by the traditional geographic setup of utility companies and the country-by-country regulation of heat and electricity prices.

The EU will undoubtedly continue to push for common rules. But in the meantime, individual countries will pursue their own agendas, which largely dictate where utility companies invest. This is bound to have an impact on Wallnér's targets for IT synergy. He explains: "We plan a 5% net reduction in the number of applications we run each year. But when regulation is country-based and Vattenfall is largely organized by geography, it's harder to deliver synergies from cross-border initiatives."

The problem is especially acute in the nuclear energy industry, where consolidation is hampered by differing national regulations. However, trading and engineering already offer opportunities to implement common IT solutions, and the group is making steady progress in finding synergies across borders in functions that include sales, billing and customer relationship management.

"The transition has been successful, and now we see the potential to improve even further," Wallnér says. He sees opportunities in the wider business context: "It's much more than consolidating applications," he explains. "I'm talking about harmonization of →

the underlying business processes and simplification of the whole information architecture. We are using standardization as the tool to make sure our base processes are more efficient.”

Transformation continues

In addition to the integration, the challenge ahead is to get Vattenfall's technology ready for the new opportunities that smart metering will create.

Wallnér points to the mobile phone industry, with its real-time usage measurement, rate structures and efficient billing, to highlight the future potential of smart meters. For example, in the longer term, hourly or by-the-minute energy readings will encourage consumers to use energy when prices are most favorable. Right now, however, the battle is on to adapt IT to new Swedish and Finnish regulations for monthly billing based on real usage.

“Obviously, there's a lead time to adapt our IT to these new requirements – we're in the process of tackling that. But this is just the beginning. Ultimately, online feedback on energy consumption is a big opportunity for us. But it's also a big challenge in terms of how we will store, handle and take advantage of all the new information,” he explains. “We need to be making investments today to handle the

wider IT implications of a fully developed smart market.”

Inevitably, a smart future will increase competition between utility companies and give consumers the upper hand, Wallnér believes. Investment will be needed in the technology that underpins the smart meter rollout, but consumers cannot be expected to bear the costs. IT functions will have to become better at simplification and standardization if businesses are to remain competitive.

Here, Wallnér expects to take some inspiration from other industries that have already been through transformation programs, as well as from Vattenfall's smart experiences in the Nordic region. He points out, however, that “you can't just copy; you need to understand the local setup and requirements fully” to meet country-driven regulation.

Of course, investment in smart technology is essential to satisfy business and regulatory expectations, but it coincides with a push to reduce the company's IT cost performance by 15% to 20% to meet industry benchmarks. The group currently runs about 500 IT projects a year, with one-third of IT spend devoted to investment. So the big challenge is to reduce and simplify existing applications to achieve the overall cuts.

Wallnér is ready for that challenge. ■



*Claes Wallnér,
Group CIO and
Vice President
for IT,
Vattenfall*

A total of 2,000 employees take care of IT at Vattenfall, serving the business and all users in the group, which has about 39,000 employees. Claes Wallnér is located in Stockholm and has held his current position with Vattenfall since July 2005. Prior to joining Vattenfall, Claes was CIO at Outokumpu OY, Finland from 2002, and previously held the role of Group CIO for AvestaPolarit OY and AvestaSheffield AB.





In the UK, energy suppliers will shoulder the task of rolling out smart meters. This approach is unique in the EU – so what are the challenges? Report by Bill Easton

UK meter rollout opens doors for energy suppliers

Smart meters will be rolled out through energy suppliers in the UK by the end of 2020 as part of efforts to cut energy consumption and CO₂ emissions. Replacing 47m “dumb” domestic meters will be the biggest UK home energy technology change since the 1970s conversion to natural gas.

Energy suppliers will be responsible for installing meters and energy displays. However, communications from the meter to the distribution networks will be coordinated centrally to ensure that customers can still switch suppliers easily. →



→ The UK Government has chosen this unique¹ route for three key reasons. It believes that:

- ▶ Suppliers have the closest relationship with customers and should therefore be able to help them use the information provided by smart meters to unlock energy savings
- ▶ Suppliers are more likely to innovate and control costs than network companies
- ▶ This is a pragmatic solution to speed up deployment, because any other mass rollout model would require the UK to reverse its previous decision to deregulate metering services.

Centrica gears up

UK suppliers are keen to make an early start: 10 years is a relatively short timeframe for deployment. Centrica² subsidiary British Gas has already made a significant move. The company has announced a contract with Landis+Gyr³ to buy two million smart meters and will recruit 2,600 more engineers in preparation for rollout. The intention to seize an early market initiative was made clear by a Landis+Gyr spokesman, who said: "Together we will pioneer the technical and practical standards that we hope will see every home and business in the country switch to smart metering in the next decade."

British Gas and Landis+Gyr say that the deployment could save their customers up to £200m (US\$304m) in energy bills by the time the main UK rollout is completed in 2020. This initiative is a good example of the market springing into action exactly as the Government hopes.

Facing practical and commercial challenges

The UK's Department of Energy and Climate Change (DECC) is working with UK regulator Ofgem to create the scope and detailed plan for the rollout. There are still some practical and commercial challenges to work through, including:

- ▶ **Rollout logistics:** Many different suppliers will need to coordinate upgrades across the country and there is the potential for considerable inefficiency. The DECC will probably need to sanction some form of reciprocal arrangement between suppliers to ensure that installations run efficiently and to manage the situation when a customer buys gas and electricity from different suppliers
- ▶ **Workforce recruitment/retraining:** The rollout of tens of millions of smart meters requires a huge effort from engineers installing both gas and electricity meters – which, in turn, require different skill sets and accreditations
- ▶ **Switching arrangements:** It should be easy for customers to switch suppliers because meters will be technically interoperable and information flows centrally coordinated. But there are still questions about commercial interoperability – for example, what happens to the asset value of the meter when customers switch?
- ▶ **Pricing and competitiveness:** Customers will expect the new meters to help reduce energy bills. But suppliers are likely to have to claw back the cost of installation through their rates, which will push bills up. Suppliers who decide to install ahead of their competitors risk looking comparatively expensive. They will have to create attractive customer propositions to safeguard loyalty
- ▶ **Impact on smart grid operation:** There is a big difference between monitoring individual energy use and controlling the entire smart grid to beneficial effect. The question of who should be responsible for the latter

needs to be decided. The distribution companies will need to be given access to the meter (and smart appliances too) to allow them to manage demand

▶ **Impact on network investment:**

If meters succeed in reducing peak demand, network and generating companies can reduce spending on expanding the energy infrastructure. This may leave UK suppliers feeling that they have paid for something that benefits distribution companies. Should some of these benefits be passed back to the supplier in reduced transportation charges?

UK solution focuses on the customer

The supplier-led approach undoubtedly creates some challenges that other EU countries may find it easier to work around, or may avoid completely. However, the DECC is clearly hoping that, in meeting these challenges, the market will find innovative commercial solutions.

Leaving the job to the suppliers could prove an interesting way to achieve real energy benefits from the new meters. It emphasizes the developing role of suppliers as energy advisers, opening the way for them to influence customer behavior and encourage people to make their homes more energy-efficient.

Centrica's early decision to buy meters and recruit staff – even though DECC is only at scoping stage – shows that these market forces are already at work. The convergence of energy services, supply and metering could be a tempting business model for those bold enough to take it on. ■

¹ This approach is unique among EU member states. In most other European countries, Distribution Network Operators (DNOs) will install and own smart meters – see Status Review on Regulatory Aspects of Smart Metering (Electricity and Gas) as of May 2009, ERGEG, 19 October 2009

² Centrica is one of the UK's "Big Six" suppliers; the other five are EDF, E.ON, RWE, Scottish and Southern and Scottish Power Press announcement, 29 March 2010: <http://www.centrica.co.uk/index.asp?pageid=39&newsid=1970> and http://www.landisgyr.com/en/pub/media/press_releases.cfm?news_ID=4845

³ Press announcement, 29 March 2010: <http://www.centrica.co.uk/index.asp?pageid=39&newsid=1970> and http://www.landisgyr.com/en/pub/media/press_releases.cfm?news_ID=4845



India's power ambitions

India is a fast-emerging economic power, but its infrastructure lags behind. The Government has ambitious plans to expand the generation base and modernize T&D activities to stimulate sustained growth. Report by Arun Srivastava →

Despite being one of the largest global power producers, India has one of the lowest per capita rates of consumption at about 750kWh per year. The penetration and utilization levels, particularly in rural areas, continue to be low, primarily due to socio-economic conditions.

Lack of energy supply is compounded by loss of supply. Each year, about a third of India's total electricity generation is lost through technical leakage or power theft. While some loss is inevitable, India compares unfavorably with average losses of between 10% and 15% elsewhere in the world. This poses huge financial burdens on utilities, leaving them unable to maintain, upgrade and modernize their operations. Safeguarding the viability of the sector is a concern for many utilities and requires government support.

A mismatch between the country's generation and transmission and distribution (T&D) capabilities is also to blame for the power problems facing India. Over the years, investments have been more focused on generation. This has resulted in excess loading on T&D systems, causing grid fragility and high technical losses.

India: land of opportunity

India has an installed power generation capacity of nearly 160GW with utilities and about 20GW with independent generators. However, power supply falls short of demand by about 15% to 18% in some regions. Given the economic upsurge, electricity demands are likely to grow steadily in the coming decades. The country has outlined ambitious plans to double its present capacity in the next eight years.

India has considerable energy options in both fossil fuels and renewable resources. However, both the fuel and manufacturing sectors have failed to keep pace with power requirements, resulting in a significant capacity mismatch.

The Indian Government has initiated ambitious plans, such as "Power for All by 2012" and the Restructured-Accelerated Power Development Reforms Program (RAPDRP). The former focuses on universal access to power for the entire population. The latter focuses

"India's power reform is driven by a political and economic agenda – to compete with the world's most powerful nations, it must be seen to be socially responsible and to have an infrastructure that can deliver"

on strengthening the T&D system and enhancing its operational efficiency.

India clearly intends to widen the energy generation mix – including nuclear power and the recently announced National Solar Mission, which aims to generate 20,000MW by 2022. The country is also encouraging investment from the private sector, offering attractive assured terms – up to 16% post-tax return on equity – to enhance private participation. It is also offering mature projects for investments. The private sector is gradually, but decisively, emerging as a potent player in India's power pursuit.

Seven actions to boost power

So what can be done to help India catch up with the developed economies of the world and improve the reliability of its power infrastructure? Aside from reform and private sector investment, Ernst & Young believes there are other long-term solutions to tackling India's power problems.

Action 1: Reduce losses to improve energy efficiency

India's high aggregate technical and commercial (AT&C) losses are its biggest challenge and represent a huge financial and environmental burden. Ways to reduce the losses include:

► Extensive energy audit and system strengthening

- Essential metering at all consumption points and key nodes in the network such as transformers, feeders and substations

- Identify areas of high losses for corrective action

► Use of energy-efficient equipment and infrastructure

- High-voltage, direct current (HVDC) and extra-high-voltage alternating current (EHV AC) transmission systems, which can transmit bulk power over long distances to reduce capital costs and technical losses
- High-voltage distribution systems (HVDS) to reduce line losses in the distribution network and to control pilferage
- High-efficiency transformers and all-aluminum alloy conductors (AAACs) to reduce heat and magnetic loss by 8% to 12%

► Encouraging demand-side management

- Switch to energy-efficient appliances such as compact fluorescent lamps and LEDs
- Introduce time-of-day metering to shift peak demand; offer lower nighttime rates to industry
- Introduce different time zones in the country to shift peaks across regions

► Smart meters

- Target high-end users where the biggest impact can be achieved on collection and billing; benefits include reduced manpower requirements and reduced theft
- Use smart technology for system reliability in substations

► Distribution automation

- Monitor and manage the flow of electricity in T&D networks to ensure efficient operations and early fault detection.



Action 2: Open up the fuel sector

Indigenous coal is likely to be the mainstay of India's energy strategy until next-generation technologies take over. For power sector growth, the coal industry would need restructuring to attract investments:

- ▶ **Coal mining**
 - ▶ Allow the private sector to participate in mining
 - ▶ Facilitate growth of the indigenous coal market by allowing coal traders
- ▶ **Coal imports**
 - ▶ Facilitate long-term coal imports
 - ▶ Develop import, storage and inland transportation infrastructure.

Action 3: Encourage conservation and end-use efficiency

The traditional approaches to securing energy supplies may not work for India in the long term, given the shortage of both indigenous energy resources and water in the country and the unpredictability of global fuel markets. India needs to focus on optimizing its energy needs:

- ▶ **Promote efficiency**
 - ▶ Offer incentive structures for energy-efficient gadgets and equipment
 - ▶ Create infrastructure for energy efficiency product labeling
 - ▶ Design electricity rates to promote user efficiency.

Action 4: Implement open access in distribution and retail supply

In India, open access is recognized as a means to manage the demand-supply gap, increase the reach and quality of power supply, attract greater private sector participation and reduce power rates. To facilitate implementation of open-access provisions, changes need to be made to:

- ▶ **Improve transmission capacity**
 - ▶ Strengthen T&D networks to facilitate the effective transfer of power between the states and regions
- ▶ **Revise regulation**
 - ▶ Enable generators and other licensees to sell power to retail customers without imposing rate barriers
- ▶ **Improve market structure**
 - ▶ Unify regional power grids to reduce cost of delivered power across the country.

Action 5: Strengthen the national grid

Integrate the Southern Region power grid with the unified NEW (North-Northeast-East-West) grid and develop a more robust unified load dispatch system for the entire country. This will facilitate the flow of any surplus power to deficient parts of the country.

Action 6: More sector reform

India's Electricity Act 2003 and rate regulations have already driven substantial reform. The momentum needs to be maintained to remove barriers to private sector investment and build on best practices from developed nations.

Action 7: Participate in the environmental debate

The transmission sector in India has opportunities to improve its technical efficiency, to reduce energy loss and

to promote the use of renewables. Low carbon emission is an essential driver of future sector growth in India.

India's win-win

India's power reform is largely driven by a political and economic agenda. If India wants to compete with the world's most powerful nations, it must be seen to be socially responsible and to have an infrastructure that can deliver.

If successful, this agenda could tick many boxes. It will potentially mean that all Indian households will have access to energy by 2012. It will enable India to reduce power losses and consequently increase industrial output per unit of carbon emitted, which will have benefits for exports. And it will allow India to marry its conflicting commitment to the green agenda with its need to grow the power sector. ■



Lessons from Australia's smart meter pioneers

The Australian state of Victoria is ahead of the game when it comes to the smart meter rollout. But local energy distributors face formidable targets, as Charles Popple of SP AusNet explains





SP AusNet is one of Australia's largest energy distributors, with some 670,000 customers in the state of Victoria. By 2013, all of its manually read meters will be replaced with remotely read smart meters. This is an important development in a country where maximum demand is growing twice as fast as energy growth due to longer peak energy usage times and the heavy toll from air-conditioning in the summer months.

The Victorian Government wants all customers to have smart meters by the end of 2013. It has mandated Victorian distributors to roll out the meters according to a defined time schedule. Following this timetable, SP AusNet started roll out toward the end of 2009. Charles Popple, SP AusNet's Group General Manager of Networks Strategy and Development, has played a key role in setting the rollout strategy and is confident that progress is being made.

The timetable is admittedly tight, but SP AusNet is on track to achieving 5% of the total rollout by June 2010. It has phased targets leading up to 2013. The next milestone is 10% coverage by the end of this year.

Popple, who also chairs the industry body Smart Grid Australia, feels that smart meters are a win-win for distributors and customers. "Smart grids provide an opportunity for energy distributors to transform their networks to deliver energy more efficiently by improving network reliability, delivering energy savings to customers, minimizing transmission loss and enabling networks to deliver increasing amounts of renewable energy," he says.

Challenges of pioneering: tariffs and IT program management

Any pioneering activity typically comes with a host of unforeseen challenges. For example, the proposed introduction of time-of-use (TOU) tariffs attracted adverse publicity. "In hindsight, not enough consultation was carried out on introducing the new tariffs," says Popple, "and there's been an outcry that certain consumers will be disadvantaged by

them. So although the energy regulator approved initial TOU tariffs, SP AusNet has agreed with the Government's request to defer implementation, pending an industry review."

Ironically, had TOU been implemented as planned, consumers would soon see where energy savings could be made. And that would accelerate changes in consumption behavior, resulting in lower energy bills.

Controversially, bills have gone up as consumers are charged for their meters and associated infrastructure now – in many cases up to three years in advance of installation – before any energy consumption benefits are realized. Pitfalls such as this underline the dangers of any dislocation between the state, regulators and industry players in rolling out the smart meter initiative.

Popple also recognizes that being an energy pioneer carries the risk of unanticipated costs and time overruns because the technology is untried and untested. Integrating the meters with the communication and back-office processes is proving to be a major issue. In an ideal world, this would have been ironed out in advance. Instead, SP AusNet is having to work in parallel with technology deployment to meet its June targets.

"Rolling out the meters is the easy bit. But utilities aren't used to running major IT programs. Implementation challenges with the new WiMAX communication technology and the advanced functionality required to meet the Victorian Government's specification have put some pressure on," Popple says.

Better communication on benefits needed

Popple is clear that the biggest lesson emerging from implementation is the need for greater collaboration and consistency across the industry on the messages and PR surrounding smart metering. This might have helped to quell accusatory claims along the distribution chain.

Furthermore, he believes that better engagement and consultation with consumers would mean greater understanding of what smart metering is,

how they can manage their own energy profiles and usage, the effect of tariffs and the potential of smart grids.

"As an industry, we could articulate the longer-term benefits better," he explains. "We need to get inside consumers' shoes and see it from their perspective."

Tomorrow's challenge beyond the meter

Above the meter, SP AusNet is already making progress. "We've successfully developed the ability to remedy faults very quickly and to restore supply automatically by switching around the fault. That's important for us, as we have a large rural network," says Popple.

The utility is also considering opportunities to provide below-the-meter solutions. It can capitalize on its engineering field force to install photovoltaic cells (solar panels), home energy management systems and, potentially, off-grid or micro-grid solutions that are well suited to the rural Australian environment. This will inevitably mean more competition within the industry, which can only be good for consumers. That, however, is tomorrow's story.

Today, as the political and regulatory debate rumbles on in the state of Victoria, SP AusNet is pressing ahead. After all, there are 35,000 smart meters to get up and running by June. ■



Charles Popple, Group General Manager, Networks Strategy and Development, SP AusNet

Charles has 34 years' experience in the energy industry. He originally trained and worked as an electrical engineer, before moving on to take up a series of senior management roles in the Victorian electric power sector. He also spent two years as a consultant with Ernst & Young, specializing in energy market reform and regulation. He has worked for SP AusNet since 2001.

Desertec: an energy oasis

Could solar energy one day replace coal, oil and gas? It sounds futuristic – but Desertec Chief Executive Paul van Son's vision is grounded in the practicalities of the present. Interview by Alexis Gazzo

In just six hours, deserts are bombarded by more energy from the sun than the human race consumes in a year. If we can capture and transport that energy for use around the world, we could do away with dirty fossil fuels in 40 years' time and rely on concentrated solar power (CSP) instead.

That's the vision.

Getting there is the challenge facing the Desertec Industrial Initiative (Dii), founded in July 2009. Made up of a consortium of 16 companies – renewable energy leaders such as E.ON, SCHOTT Solar and Siemens, and banking and insurance industry giants such as Munich Re and Deutsche Bank – Dii is paving the way to the implementation of large-scale, low-carbon power supply from the deserts of the Middle East and North Africa (MENA).

Paul van Son is Dii's Chief Executive who, during his three-year tenure to 2012, will assess realistic medium- to long-term measures. His is a rational approach: "I have one eye on our future vision and the other on what is achievable now," he says. "The reality is that what we're trying to achieve is 40 years off, but we need to engage people and commerce now."

To bring the future into the present, Dii identifies reference projects. "These are small-scale initiatives to pilot technology, satisfy legal and regulatory conditions, interconnect national grids and the like – so we can begin generating CSP and creating a model for future programs."

Dii reference projects are imminent in Morocco and Tunisia. Further down the line, projects could roll out in Algeria, Libya, Egypt and Jordan.

Massive investment and local buy-in essential

While the technology side of Desertec is already viable¹, the commercial viability of constructing high-voltage direct current networks across vast terrains and linking grids in North Africa, the Middle East and Europe remains unresolved. Van Son's task is to create the conditions that will make Desertec possible.

A priority is to build a favorable investment climate for renewables from MENA. This is a challenge – the bill to achieve Desertec's vision by 2050 is likely to top €400b (US\$540b) yet there is currently no strong business case to encourage participation in financing projects. Governments' adoption of renewable energy legislation will get the wheels turning, but must be backed by a favorable investment framework and innovative business models. "Reference projects – sufficiently large to reach economies of scale – will help to translate the Desertec vision into something more tangible for investment purposes," van Son believes.

European impetus comes from Article 9 of the Renewables Directive, which could see EU member states import "green" electricity to meet average 20% renewables targets by 2020. But host countries – "the owners of this energy" – want a share of the low-carbon electricity generated in their territories, too. Winning political support also rests on a commitment to the emergence of local renewable industries.

"In the Middle East, North Africa and the Sahara region, growing populations have growing energy needs. They want to build a local industry around renewables and are looking to companies from Europe to help develop the technologies and industry platforms and to transfer research and training. Desertec, as a concept, can only 'fly' if we can create long-term industry strategies from which the host nations can profit."

Van Son stresses that nothing is possible

¹ Concentrated Solar Power (CSP), solar photovoltaic (PV), wind power and HVDC transmission lines are the main lines of technology and are already in operation across the world.

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Paul van Son, Dii

in MENA without robust relationships. "You need to understand the cultures. Companies commonly make mistakes by being too hasty or too focused on financial returns. First you build the relationships; then together you set out the approach. That limits risk."

Vision into reality

Futuristic as it sounds, other agency endeavors support the Desertec vision.

- ▶ The Mediterranean Solar Plan (MSP) aims to generate 20GW of energy each year from solar and other renewable sources around the Mediterranean Sea by 2020.
- ▶ Research by the German Aerospace Center suggests that solar and wind plants in MENA could make a substantial contribution to host countries' power needs, as well as supplying about 15% of Europe's electricity requirements.
- ▶ TransGreen Energy aims to reinforce grid interconnections between the southern and northern shores of the Mediterranean and Europe for more effective transmission of renewable energy.

Meanwhile, Jordan and Morocco have ratified renewable energy legislation. And solar initiatives in Morocco, Tunisia and Egypt have overcome legal and regulatory hurdles to secure the go-ahead from their respective governments. Encouragingly, these miniature versions of Desertec are now attracting private investor interest in renewables.

"These projects and initiatives are feasible; they are real," says van Son. "And they hint at how Desertec could irrevocably change the energy mix for industrialized countries in the future." ■



Paul van Son, Chief Executive Officer, Desertec Industrial Initiative

With more than 30 years' experience in the international renewable electricity and gas industry, and several successful green power initiatives behind him, Paul van Son became Desertec's CEO in 2009. He is also Chairman of the Energy4All Foundation, a non-profit organization promoting decentralized energy in Africa, and President of the European Federation of Energy Traders.



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More information

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Key characteristics of a winner in the new smart market

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