New Power

REPORT

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Local business models and regulations will affect the way the energy industry extracts value

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Software systems are now in place to leverage big data to deliver new customer experiences

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Cross silo information management and data consolidation across all portfolios is key

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Successful energy companies have to become e-utilities, helping customers manage their lives as well as their power. What lies ahead for that transformation in 2018?

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We do not see any two customer business models evolving in exactly the same way

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IoT will allow utilities to quickly translate vast quantities of sensor-based information into action

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We will see a period of divergence as the technology is refined

How can countries win the race to develop and lead on E-utilities?

Expert information for all those invested in the UK's energy future

Change ahead

Successful energy companies have to become e-utilities, helping customers manage their lives as well as their power. New Power asked companies working in the sector how they saw that change coming in the year ahead - and how UK Plc can be a leader in a new industry

When mobile phones first went into use they performed much the same functions as a fixed telephone network, with the additional benefit of allowing people to make calls on the go. That all changed when Apple launched the first smart phone - just ten years ago, in 2007. Now the telecoms industry has relatively small interest in telephone calls, instead being the enabler for a digital industry that provides the consumer with everything from entertainment on demand, to fitness tracking, to remote home controls.

The telecoms revolution has happened inside a decade and it is the precursor to a similar change in the energy industry.

> "All the elements already exist to disrupt the sector

The technology is already there. In a recent research note Morgan Stanley looked at new technology - energy storage & batteries, distributed energy resources, electric vehicles, peer to peer trading and blockchain and asked how they will shape the utility sector. It concluded, "All the elements already exist to disrupt the sector". Plotting the future, it said that with a smart meter roll-out by 2020, "consumer engagement will rise, enabling ever greater home automation. Falling cost curves for solar PV and storage will see changing grid use (complicated by the roll-out of EVs). Utilities with trusted technology platforms could enable peer-to-peer trading, and aggregators could help smooth demand." It is a compelling vision, but Morgan Stanley added, "Longer term, of the current €100 billion of European utility earnings, 30% could be at risk". That is mainly in generation and supply. It is earnings that utilities have to replace with other consumer offerings. Some utilities will respond, and New Power has dubbed these responsive companies 'e-utilities'. They will become facilitators for peer-to-peer trading, prosumers and local energy managers, and for those who are not interested in energy as a sector they will offer other new services, like the 'home concierge'.

Response from an Altair spokesperson

WHAT ASPECT OF 'E-UTILITIES' WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

We believe that big data and big compute will move farthest into commercial use in the coming year.

Utilities have invested in smart metering infrastructure over the past few years, and have been collecting large volumes of data. Cloud and on-premises hardware and software systems are now in place to leverage this big data to deliver new customer experiences and streamline operations – such as predictive maintenance and prescriptions for optimising consumption and usage to minimise cost on the consumer side.

On the power generation side, there is an opportunity to forecast demand and plan accurately.

IT'S BEEN SAID THAT AT THE MOMENT E-UTILITY DEVELOPMENTS ARE STILL ABOUT THE 'PUSH' >

FROM NEW TECHNOLOGIES, RATHER THAN 'PULL' FROM COMMERCIAL TEAMS TO SOLVE A BUSINESS ISSUE. CAN YOU GIVE AN EXAMPLE WHERE IT WAS USED TO MEET A COMMERCIAL NEED?

Carriots Analytics rate schedule simulation modeling has received both push and pull requests from utilities to better understand commercial impacts such as overall revenue, fixed versus variable rate plan comparisons, dynamic tiered rate schedule analysis, impact on certain rate-class customers so as to fund long term infrastructure costs.

> Software systems are now in place to leverage big data to deliver new customer experiences

Field asset management and outage management e-utility solutions are also areas which address commercial needs including prioritisation and scheduling of service crews, capacity planning and resource planning for preventative maintenance.

WILL A DISTRIBUTED AND CONNECTED ENERGY INDUSTRY DIVERGE, IN DIFFERENT GEOGRAPHICAL AREAS THAT USE DIFFERENT LOCAL RESOURCES? OR WILL A HIGHLY CONNECTED INDUSTRY, SHARING RESOURCES, MEAN SOLUTIONS TEND TO CONVERGE?

We believe with 'cloud' and software-as-a-service, utilities will have capable choices at their finger tips, an easier path to consume, lower cost enterprise grade software and the ability to change quickly if a service doesn't live up to expectations.

This is as opposed to traditional enterprise on-premises implementations that take years to install and even longer to deliver on promises, and make it extremely difficult to change course.

WHAT ENERGY AND DIGITAL INDUSTRY FRAMEWORK MAKES A COUNTRY A GOOD PLACE TO LEAD ON E-UTILITIES, AND HOW SHOULD GOVERNMENT OR OTHER BODIES PROVIDE SUPPORT?

Industry-government collaborations and policies that accelerate infrastructure modernisation, cloud adoption and other energy efficient changes to homes and commercial buildings are clearly positive toward e-utility development. NP

Response from Shane O'Quinn, senior director strategic accounts, AutoGrid Systems

WHAT ASPECT OF 'E-UTILITIES' WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

E-utilities will focus on aggregating and monetising flexible capacity from the growing number of distributed energy resources like smart thermostats, solar systems and energy storage devices that are coming online. DER flexibility management platforms like AutoGrid Flex will help them predict availability and co-optimise large portfolios of assets in real time, while delivering new customer-centric services.

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> Local business models and regulations will affect the way the energy industry extracts value

A new gas demand response programme that was recently rolled out by National Grid in the USA exemplifies both push and pull. National Grid had been thinking about implementing demand response programs for its commercial and industrial gas customers but did not have a feasible technology solution until AutoGrid and IPKeys provided an answer.

National Grid is now using the AutoGrid Flex DER flexibility management platform and the IPKeys onsite controller to manage a gas DR pilot that allows them to curtail gas usage when needed, resulting in significant savings in operational expenses.

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While the same devices and technologies will be available in all regions, local business models and regula- >

tions will affect the way the energy industry extracts value from new distributed energy resources.

Ownership models will vary by region, but both regulated and deregulated entities will leverage increasing amounts of flexible capacity from DERs to support new value added-services and generate additional revenue for DER owners. NP

Response from David Butcher, managing consultant, Capgemini UK

WHAT ASPECT OF 'E-UTILITIES' WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

The energy Internet of Things (IoT) is arriving quickest. Globally we are using more energy each year and in different ways, and utilities have to meet this demand. Effective deployment of IoT can make energy usage more efficient, relieving some of the pressure on generators and distributors alike.

Smart meters are the fastest growing energy IoT device. Their global penetration will more than double between now and 2020 – and in this country, it will approach 100%. Their commercial impact on the energy industry is already huge. They enable homeowners to track their energy consumption and thereby affect their energy usage behaviours. They can drive consumer decision making towards actively generating and supplying their own energy. In addition, smart meters provide information to distribution network operators (DNOs), which enables infrastructure investment to be better targeted.

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Scottish and Southern Electricity Networks' (SSEN) ran an innovation project – New Thames Valley Vision (NTVV) - that improved understanding of electricity usage and supply, from a volume and pattern perspective, as new technologies continue to connect to the low voltage (LV) network operated by SSEN. The ability to understand these impacts is a known technical and commercial need for all DNOs as electricity flow becomes more bi-directional and less predictable. NTVV examined how future demand and generation growth could be met without the need for excessive network investment.

Over 300 LV substation monitors were installed including supporting infrastructure to gather real-time data, which allowed SSEN to better categorise its substations, and provided a method for forecasting network loads.

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Tomorrow's system will need to manage increased volatility of net demand, reverse flows from DNO to transmission operator (TO) level and aggregated energy trading and contracts at a micro level. The market must be able to aggregate and co-ordinate many supply/demand points to allow the on-going operation of the wider power system, whilst at the same time supporting the ability of the prosumer to independently interact with their local system based upon their own needs.

> "I think that we will see a period of divergence ... as the technology is refined

What is more, if DNOs fail to interact with prosumers (likely to be higher credit individuals) as they move to DSO status, they may be left with a customer base of lower credit households that cost more to maintain. The UK network is currently structured to make the most efficient use of the geographically spread resources of large power stations. If the requirement in the future is to knit together all types of distributed generation (DG), then the current industry model becomes unfit for purpose.

DNOs will continue to ensure sufficient delivery capacity in the distribution network, report faults, status and anticipated demand to the TO. However, as DG and local storage increase, requiring greater system flexibility, management information requirements will become more onerous. This will drive the TO's coordination and management of the interdependence of DSOs, supporting them through bulk supply capacity.

This will need a close working relationship between all parties to keep the system reliable and stable.

I see the industry moving towards a co-ordinated power system, with DNOs managing small independent >

DG-supplied areas and the TO shifting focus from predominantly managing supply through large assets to managing interdependence between areas. DNOs collaborate and contract with the TO to co-ordinate on a national and area basis. Independent microgrids will play a large part in regional power generation and transport, and they will contract with DNOs. I think we will also see a decline in the number of new large power generation assets in the country.

The questions for each DNO, given their own particular geographic and demographic challenges are: How far will their network become decentralised? At what point will the technology being adopted in their area (and equipment suppliers value proposal) trigger major change? What will be the dynamic and time-lines of their particular shift? To what extent will their current operating model be distorted or enhanced? Their objective will be to highlight market triggers and feed scenarios to build a vision on future DSO role, operating model, and most importantly – the pace of that change.

In terms of the technology itself, I think that we will see a period of divergence in many areas (PV, EVs, storage, network monitoring/control, etc.) as the technology is refined over the coming years. Eventually when the technology reaches maturity we will likely see a convergence towards standard solutions.

WHAT ENERGY AND DIGITAL INDUSTRY FRAMEWORK MAKES A COUNTRY A GOOD PLACE TO LEAD ON E-UTILITIES, AND HOW SHOULD GOVERNMENT OR OTHER BODIES PROVIDE SUPPORT?

Taking a leadership position on e-utilities from a country perspective appears to be less about the industry framework and more about a country's clean energy policy. Of course, it helps to be an advanced society technologically as a starting point – although emerging economies are starting to catch up with western early-adopters.

France, Germany, and the USA are among the early-adopters for high technology digital plant strategy, with 50% or more of their power generators saying that they already have a digital plant strategy. One reason for this high rate of adoption is aggressive targets to move to cleaner energy over the next 5 to 10 years. France's electricity generation is heavily dependent on its aging nuclear plants, and the government wants to bring down the share of nuclear power to 50% by 2025 and increase the share of power from other renewable energy sources by 40%. Moreover, EDF's nuclear plants refurbishment programme is driving digitisation initiatives in its nuclear plants. Germany has an audacious plan to phase out nuclear power by 2022 and meet 50% of its energy demand from other renewable sources. The USA's Clean Power Plan emphasises cost-effective ways of bringing down CO2 emissions. All these policies and targets call for greater operational efficiency in both fossil fuel and renewable power generation, and it seems utilities are seeing digital plants as an effective means to meet these objectives. NP

Response from Jonas Wejdin, head of business development, utilities, DigitalRoute.

WHAT ASPECT OF 'E-UTILITIES' WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

It will certainly include the wider adaptation of artificial intelligence (AI) as a means of optimising existing business processes. I would not say it relates to 'big' data, since it is 100% about using the right data in the right time, preferably in real-time to get that extra advantage.

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DigitalRoute has, together with one of its customers, used AI or more specifically deep-learning neural networks, to predict price peaks or surges on the power balancing market, to be more effective in investing its aggregated flexibility.

The prediction is done in real-time and the incremental training of the network is done automatically. The result is a highly optimised trading process.

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I certainly think that the solutions will converge. The transformation of the utility IT landscape is, to me, an indication that this is the way forward. Cross silo information management and data consolidation across all portfolios is key for many utilities today - and with a horizontal platform strategy for digital solutions, the >

foundation for a convergent energy landscape is created.

However, there is no avoiding some form of segmentation, since all companies cannot master digital solutions in all aspects of the energy landscape; instead the segmentation may rather be based on competence hubs rather than geography. These hubs will possibly not be distributed evenly on a map but, rather, developed around educational and research centres with certain profiles, such as ETH in Switzerland, where machine learning and complex optimisation problems are top of mind.

> Cross silo information management and data consolidation across all portfolios is key

WHAT ENERGY AND DIGITAL INDUSTRY FRAMEWORK MAKES A COUNTRY A GOOD PLACE TO LEAD ON E-UTILITIES, AND HOW SHOULD GOVERNMENT OR OTHER BODIES PROVIDE SUPPORT?

In any successful digital industry, sharing and openness is important. I think success comes from the ability to have several players being able to cooperate and act in an eco-system.

In order for such an eco-system to flourish there is always the need for standardisation bodies, who can make new business processes on top of emerging technologies, such as distributed ledger (blockchain), more easily adoptable. NP

Response from Oliver Iltisberger executive vice president EMEA, Landis+Gyr

WHAT ASPECT OF 'E-UTILITIES' WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

In general, we see a fast move into commercial use for the following e-utility trends: internet of things, intelligent applications, cybersecurity and artificial intelligence. To enable IoT connectivity for example, suppliers have to be able to design an open-architecture platform that integrates countless intelligent devices supporting multiple communication protocols. An example of this is our advanced metering deployment for Japan's largest utility, Tepco, where we are building the world's largest utility IoT communications network – currently with 13 million endpoints deployed on the way to 27 million.

In light of technological advances like the introduction of IoT, intelligent applications, big data and new tools for analytics, energy utilities will need to shift their focus from data collection to data utilisation and reassess their current operational models.

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Markets and customers with a longer tradition in AMI tend to be much more advanced in accepting new services and creating business based on new technologies. An example of a commercial need we helped to serve is our solution to a prepayment program of Salt River Project in Arizona, the third-largest public power utility in the US.

When modernising their prepayment infrastructure, they partnered with us to help them deploy a communication platform that supports advanced metering, adds two-way communication to their legacy prepayment system, implements prepayment functionality at each AMI meter over the air, and supports other smart grid applications.

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The utility market is highly complex and fragmented. Electric utilities and their product and solution needs are driven by country, and at times regional, requirements. For instance, on smart meters, Germany has taken an approach that is unique in the world with the Smart Meter Gateway, which has extremely high security requirements.

The fragmentation of the utility market requires us to remain very agile to serve our customers best across >

different regions. At the same time, common regulations and standards will continue to drive the adoption of smart grid technologies. And IoT-enabled devices will play a key role in building a grid that is smarter and more efficient than today.

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Almost all European countries have enacted legislation to enable a smart meter rollout. That is a good thing, because as we have seen, there has been no country in Europe that has rolled out smart metering on a bigger scale without a political mandate. Unfortunately, regulatory regimes in the EU Member States are still skewed toward traditional grid re-enforcement, i.e. copper and steel, rather than supporting investments in smart technologies.

Intelligent network technologies have a higher OPEX relative to the capital expenditure – you not only have the investment in the technology, but it has to be operated continuously. Therefore, not only the networks need to be modernised, but regulation as well. There are a number of provisions in the Clean Energy Package, currently being debated in Brussels that could provide the needed incentives for intelligent investments in the networks. In the UK, the government has set a clear target for the completion of the smart metering roll out. In addition to this target, regular collaborative sessions are facilitated to ensure all parties are aligned with the key milestones with corrective action taken where appropriate.

> “Utilities will need to shift their focus from data collection to data utilisation

FURTHER COMMENT

The ongoing industry digitalisation means that the utilities market of the future will be vastly different to how it is today. One of the solutions that more energy utilities are embracing to support this transformation is managed services, which can add value to utilities across the entire value chain, from improving generation, transmission and distribution, to opening new revenue streams in retail and services.

While this trend is relatively new in Europe, managed services are not new territory for Landis+Gyr. We have a strong smart grid services footprint in North America and manage more than 15 million metering points under service contracts worldwide. We are now bringing our long-term experience to European customers and have recently signed several contracts with various scopes for managed services like in Finland, Denmark, and Sweden. NP

Response from Todd Nate, global vice president energy programmes, Nokia

WHAT ASPECT OF ‘E-UTILITIES’ WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

Energy cyber-security is certainly an area of significant focus for the foreseeable future, particularly in light of recent, high-profile energy hacks.

Digitisation and the significant growth of the IoT ecosystem bring huge benefits while increasing the attack surface and attack vectors. There is a market shift away from legacy, niche, point solutions to a comprehensive cybersecurity strategy that is highly automated, easier to manage, and operates at a significantly lower cost structure.

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Cyber-security solutions are a perfect example of where technological developments are resulting from a ‘pull’, rather than a ‘push’. Our clients are demanding higher levels of automation to respond to the extensive sophistication and volume of today’s cybersecurity threats. They are looking for a comprehensive, multi-vendor energy cyber-security solution that enriches pre-existing points solutions (ie increased granularity for roll-based management), while automating user behaviour anomaly detection, automating password rotations, etc, all under a single pane of glass.

This approach gives our customers the ability to move to take a leadership position in cybersecurity while leveraging pre-existing assets and significantly reducing their overall cybersecurity cost structure.

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We do not see any two customer business models evolving in exactly the same way.

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What is evident is that prolific consolidation of operations is driving pervasive connectivity and a plethora of devices in the utility ecosystem. Our clients are demanding a flexible, yet scalable cyber-security solution that permits them to change their business models without inducing risk or unnecessary costs.

For example, they are adding distributed energy resources of all types (PV, wind, VPP, battery storage, etc.) and sizes at the residential-, commercial- and utility-scale levels simultaneously, while increasing the number of players and systems with ties into the grid. These additional grid connection points can be dynamic (such as electric vehicles) and can pose significant threats to the stability of the grid if not properly secured and managed. These are dynamics we need to accommodate in addressing our customers' requirements, regardless of how they evolve.

WHAT ENERGY AND DIGITAL INDUSTRY FRAMEWORK MAKES A COUNTRY A GOOD PLACE TO LEAD ON E-UTILITIES, AND HOW SHOULD GOVERNMENT OR OTHER BODIES PROVIDE SUPPORT?

European Programme for Critical Infrastructure Protection (EPCIP) and North American Electric Reliability Corporation critical infrastructure protection (NERC CIP) are important frameworks for our customers and we are intimately familiar with them. Additionally, the EU's General Data Protection Regulation (GDPR) strengthens the obligations on companies which are processing personal data of EU individuals. There is also an additional variable of increased velocity of technology advancement.

As a result of this complexity, utilities are seeking to establish much closer long-term relationships with their technology partners, who they rely on to assist them in keeping abreast of the fast-paced cyber-security environment. As part of our commitment to addressing this need, our Threat Intelligence Center provides notifications to our customers with up-to-date global threats as they are developing, which is just one example of how the relationships with our customers are deepening. NP

Response from Martin Dunlea, global industries lead utilities, Oracle

WHAT ASPECT OF 'E-UTILITIES' WILL MOVE FARTHEST INTO COMMERCIAL USE IN THE COMING YEAR?

The utility industry is in the middle of a significant transformation, in which innovation is being embraced, particularly in those areas that assist utilities to provide new value in the ways in which they interact with their customers and operate their infrastructures. There is a need however for utilities to target business dimensions in which digital transformation is rapidly advancing: products and services, distribution, operations. Utilities should ensure digital transformations align with real customer-use cases, the impact on organisational elements and the need to significantly understand the IT requirements.

A significant part of the future e-utility environment will be about leveraging the growth of data to drive reliable and innovative performance. As utilities transition from reactive to proactive use of information as part of this digital transformation, they require new skills and strategies to relying more heavily on analytics. For utilities, the value proposition is in their ability to translate vast quantities of sensor-based information into action — the faster, the better. It's about ensuring security and data privacy are at the heart of their data management strategies and delivering new business models that analyse real-time and historical data and integrate to back-end applications.

IoT will allow utilities to quickly translate vast quantities of sensor-based information into action and will be an important step in enabling the business to deliver innovative new services faster and with less risk. During the early stages of their digital transformation, Utilities should focus on validating the business value of IoT by quickly connecting assets and monitoring them, with the focus being purely on monitoring the devices and reacting to events and exceptions/failures. As the e-utilities model matures, Utilities can start to look at ways to transform the business from the edge to the enterprise, including the control and maintenance of new generation assets.

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Electric utilities recognise the need for new distribution network technologies to accommodate sustainable growth and customers' growing interest in grid-connected, customer-owned distributed energy resources (DER) such as rooftop solar and on-site energy storage. This customer-led energy evolution is driving change for utilities in terms of the way the modern distribution grid will soon need to operate. These new grid participants want to connect with their utilities in a different manner than we have seen in the past, and become part of the electric distribution system, rather than separate from it. The real-time data these connected DER are also providing offer a means for utilities to change the way they manage the grid.

This is where modern network management systems add value. They provide utilities with dynamic, real-time data on flow conditions across the network to help better manage the integration of distributed energy sources. By more accurately modeling load profiles and forecasting where and how DER growth will impact the grid, utilities can realise several mission-critical benefits.

> IoT will allow utilities to quickly translate vast quantities of sensor-based information into action

The adoption of microgrid and distributed grid management concepts within an electric utility has the potential to revolutionise electricity distribution, permitting local renewables to substitute for higher-emitting fuels while also increasing efficiency and environmental sustainability.

Breaking the grid into distributed computing processing areas and performing analysis at the level of a microgrid is ideal, because it can be optimally decoupled from the rest of the system and treated as an independent system. It supports better accommodation for new demands of electricity by shifting the electric system paradigm away from centralised, remote generation to one in which distributed generation from local, clean resources supplements centralised generation.

Crucially, it facilitates management of the available local energy resources to serve the local demand and allows utilities to meet the growing demand without building major new infrastructure.

Finally, enabling the introduction of distributed energy into the distribution grid can be a chief enabler for bringing the promised benefits of the smart grid in areas such as self-healing, configuration and outage management.

WHAT ENERGY AND DIGITAL INDUSTRY FRAMEWORK MAKES A COUNTRY A GOOD PLACE TO LEAD ON E-UTILITIES, AND HOW SHOULD GOVERNMENT OR OTHER BODIES PROVIDE SUPPORT?

In line with transformation experiences in other industries, we know that the evolution to e-utilities is being driven by a combination of technologies from cloud, analytics, mobile and smart sensors.

Digitally connected business processes bring opportunities to uncover tremendous value in the way utilities serve customers. Utilities should be focusing on how customer-centric relationships across CIS, metering operations, field service, asset management, network and DER integration open opportunities for utilities to deliver a unified experience and clear consistent information. Real time remote control asset management and predictive maintenance that extend the operational efficiency of assets are examples of how adopting the right technologies enable utilities to develop strategic, efficient processes that deliver positive results and improve utility performance.

Successful digital energy frameworks are those that find ways to leverage advances in digital capabilities like analytics, mobility, and communications to extend the business' reach and improve performance. Utilities should define a deeper level of customer engagement and incorporate more consumer technologies into the utility technology architecture. It is also about creating an environment that helps transform the workspace and find new ways to work by leveraging improvements in access to information, process automation and integrated business processes.

With the correct regulatory and technological frameworks in place, Utilities can take advantage of the speed, scale and simplicity of technology solutions including cloud offerings. Almost as important is the realisation that going it alone is difficult and expensive. Utilities should also find ways to leverage partnerships to evolve faster and capitalise on the expertise of digital partners that have already brought value in other industries. NP

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