

strategy&

2019 Digital Operations study for energy

Power and utilities



About the authors

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FOREWORD

Digitization and other technological advances, such as new sources of renewable energy and improvements in battery storage capacity, are disrupting the energy, utilities, and resources (EU&R) industry. Significant opportunities for transformation appear when these technologies are combined. And the emergence of these technologies is changing the EU&R competitive landscape, providing cost advantages for competitors as well as an opening for new entrants from outside the sector. As a result, many EU&R companies are grappling with a mix of challenges that can't be satisfied with tactical responses.

Recently we explored the building blocks for a successful transformation of the EU&R industry by detailing how the Global Top 40 power and utilities companies are positioning themselves for long-term growth through a rethinking of their business models and the more effective deployment of capital. In this report, we focus on another key aspect of dealing with change: namely, how power and utilities firms are adopting (or not adopting) key aspects of digitization that are essential to improving their ability to ride the wave of transformation well into the future. Our findings, in brief: Power and utilities companies have not been aggressive enough in digitizing their businesses and are potentially falling behind in their ability to keep up with stakeholder demands and competitive challenges.

I am grateful that my colleagues Marcus Eul, Folker Trepte, and Pascale Jean have initiated this survey of digital operations in the power and utilities sector. This report will be supplemented soon by similar data-driven studies examining digitization in the oil and gas sector and the chemicals sector.

Norbert Schwieters

*Global Leader, Energy, Utilities, and Resources
Partner, PwC Germany*

EXECUTIVE SUMMARY

The challenges facing global utilities are in many ways existential: volatile power prices, the need to invest in new generation models to deliver distributive energy on decentralized grids to a wider group of commercial and residential consumers, growing competition from technology-oriented startups that are biting off bits of their traditional businesses, and the need to reorient their sources and focus from fossil fuels to renewables.

If utilities are to confront these new business imperatives and threats, their strategies must include new technologies and smart implementation of digital systems and processes. (To explore more deeply how the megatrends of decarbonization, decentralization, and digitization are compelling power utility companies to evolve faster than ever before, see [Global power strategies: The future of the utilities industry and the players that are driving market success.](#))

Yet although some utilities are aware of the importance of digitization, only a few of them have taken significant steps toward transforming their business operations with these new tools. According to the 2019 Digital Operations study for energy from Strategy&, PwC's strategy consulting business, only 2 percent of utilities in the EMEA region (Europe, the Middle East, and Africa) could be ranked as Digital Champions (leaders in digitization), and 45 percent lag behind as Digital Novices. This outcome falls well below the results among EMEA chemicals companies and global oil and gas firms, which were also studied in the survey.

On the whole, utilities are only at the beginning of the digitization journey, and except for the relatively small number of Digital Champions, their technology initiatives tend to be limited, unadventurous, and risk averse. Functions most commonly digitized are support processes such as finance, distribution, and marketing. Less frequently targeted are core activities that could translate into real improvements in profit margins and efficiency, such as transmission, generation, trading, and sales.

The same high level of caution among utilities can be seen in the specific advanced and advancing technologies they are willing to try. Although about half of surveyed utilities said that they were adopting such basic and relatively widespread technologies as energy analytics, manufacturing execution systems, and cloud computing, only 5 percent said that they had actually implemented artificial intelligence applications, and another 9 percent were piloting such programs. That compares with 20 percent and 6 percent, respectively, for chemicals companies. Perhaps more telling, only a few utilities answering the survey said that they had considered some of the more innovative new technologies, such as blockchain, 3D printing, and virtual reality.

Perhaps the primary reason that utilities have fallen behind other industries is that until recently they have not had to focus on efficiency and process improvements. As a mostly protected, well regulated, and often monopolistic industry, utilities have in some cases benefited from not having to be overly responsive to performance demands from consumers or shareholders. Consequently, their corporate cultures have been leery of new technology and not receptive to the notions of organizational creativity and flexibility. Only 27 percent of utilities executives participating in Strategy&'s survey described their business as innovative, and a mere 34 percent said that their organization had flat hierarchies to facilitate agile working and quick decision making. As the power industry changes and demands more agility from successful companies, utilities will likely have to adopt more technologically friendly corporate cultures.

Utilities gird for multiple threats

Global utilities are facing a make-or-break period with an array of complex challenges. In both regulated and deregulated markets, their business model is eroding, and they are confronting significant cost and profitability pressures. Chief among those pressures: Power prices are volatile, yet expensive grid and distribution channel upgrades are required if utilities are to refocus the energy generation mix over the coming years to lean more heavily on renewables and less on fossil fuel (see [The narrowing window for energy transformation](#)).

This shift in energy resources is upending the traditional utilities landscape. Power companies used to produce and sell energy to a reliable group of consumers clustered in the company's geographic region. Competition was rare, and customers were dependent on the utilities for power. No more. Now some consumers generate their own energy through photovoltaic systems. And particularly in deregulated regions, a raft of new rivals, often technology-oriented startups, are spearheading advances in battery storage, smart homes, and energy management devices to provide potentially less costly and more convenient distributed energy services. That is hastening development of digital products and services and the adoption of digital tools in the once relatively staid utilities sector. In concert, people are using energy for an ever-wider range of purposes, fostering innovative urban living ideas and new options for getting from one place to another. Some new companies focus only on generation; others only on buying and selling power. All of them, though, represent threats to incumbent utilities.

“Digital is the key to create value in new services related to the energy transition, such as smart cities, decentralized energy, or electric mobility,” says Olivier Renvoisé, who is head of digital operations at Engie Digital. “However, power and utilities companies will now have to beat disintermediation from startups and data players to do so.”

The presence of these more nimble and idea-centric companies in their midst should be an urgent reminder to utilities that as their landscape transforms, technology will play a big role in deciding who owns the power generation market in the future. Yet in the face of this reality — the need for action in adopting new digital advances to transform their threatened business models — except for a small percentage of digitally forward-thinking utilities, most power companies have remained on the sidelines.



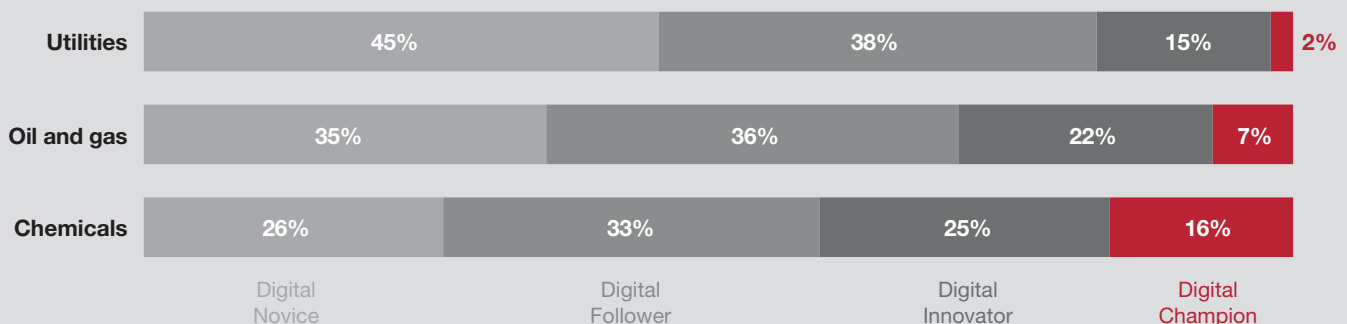
As utilities companies' landscape transforms, technology will play a big role in deciding who owns the power generation market in the future.”

That conclusion rings out loud and clear in the 2019 Digital Operations study for energy from Strategy&. In this research, three energy-related industries were examined for their levels of digital maturity: utilities in the EMEA region (Europe, the Middle East, and Africa), chemicals in EMEA, and global oil and gas. The results were troubling for the power and utilities industry: Only 2 percent of these companies could be ranked as Digital Champions (leaders in digitization), and 45 percent were categorized as Digital Novices (for details of how the digital maturity index was compiled, see “2019 Digital Operations study for energy from Strategy&,” page 6). That contrasts sharply with chemicals (16 percent, 26 percent) and oil and gas (7 percent, 35 percent) (see *Exhibit 1*).

Intriguingly, it appears that a company’s size may be a critical factor in determining its difficulty in achieving digital maturity (see *Exhibit 2, next page*). Across the energy survey, large companies (more than 5,000 employees) and midsized companies (between 1,000 and 5,000 employees) produced the most Digital Champions, well above small businesses with fewer than 1,000 employees.

The likely explanation for this is that large and midsized companies have the financial and staffing resources to afford a full-on digitization campaign and are under more pressure from investors to respond to industry change and stay ahead of the competition. On the other hand, smaller businesses may be less able to spend on expensive initiatives without a clear return on investment. Nevertheless, no matter what size a company is, executives must make a convincing business case for a digital campaign before it can be funded. Damien Terrié, who leads Engie Digital’s Darwin platform (Engie’s platform for renewable assets), told PwC: “The ability to demonstrate the value created by the new digital platforms and services is important. A new economic model often has to be created to defend digital platforms’ business cases in front of the board.”

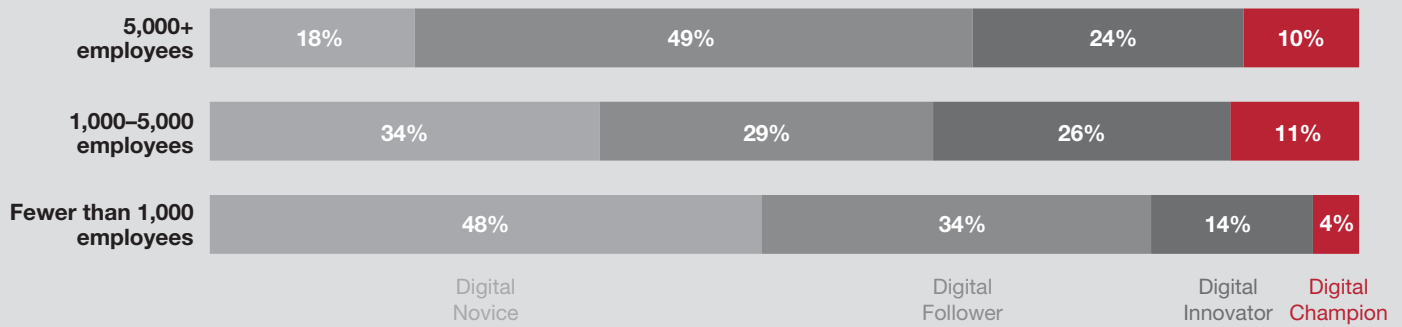
EXHIBIT 1
Digital operations maturity, by industry



Note: Index group distribution in percent. Base: 509 companies.
Source: PwC’s Strategy& 2019 Digital Operations study for energy

EXHIBIT 2

Digital operations maturity, by business size



Note: Index group distribution in percent. Base: 509 companies. Sums may not total 100 due to rounding.

Source: PwC's Strategy& 2019 Digital Operations study for energy



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2019 Digital Operations study for energy from Strategy&

This survey was intended to determine the digital operations maturity of companies in three energy-related industries: utilities in EMEA, chemicals in EMEA, and global oil and gas. More than 500 interviews of C-suite and just below C-suite executives at these companies were conducted between February and April 2019.

To calculate digital maturity, Strategy& separated potential digital traits of an organization into three categories: implementation of new technologies, digital ecosystem maturity, and digital culture (see *Exhibit A*).

Companies could score as many as 40 points toward digital maturity in each of the first two categories and 20 points in the third category. In order to reach the top score, at least 70 percent of all activities in a category had to be implemented. Digital Champions scored 75–100 points; Digital Innovators, 50–74; Digital Followers, 25–49; and Digital Novices, 0–24.

In the Strategy& survey, only one in 14 companies (7 percent) ranked as a Digital Champion (see *Exhibit B, next page*). The average company scored 36 points (making it a Digital Follower), and the largest group (37 percent) was made up of Digital Novices.

EXHIBIT A

The traits of a Digital Champion

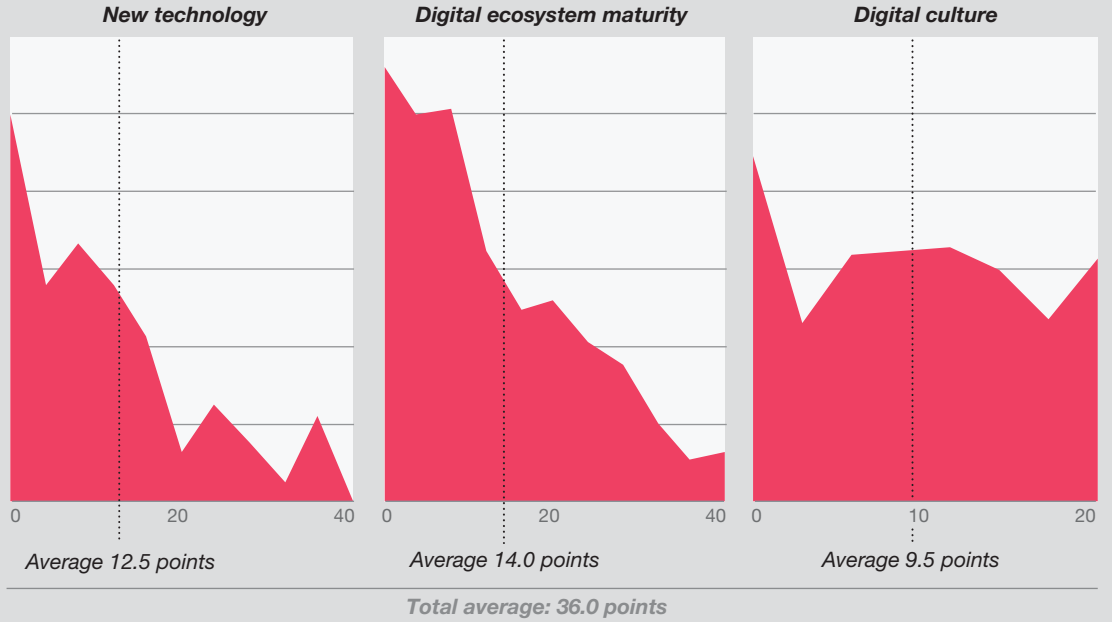
Implementation of new technologies	Digital ecosystem maturity	Digital culture
AI/machine learning	Digital revenue share	Leadership vision and role model
Industrial Internet of Things	Digital ecosystem progress	Digital customer experience
Manufacturing execution system	Ecosystem platform	Employee qualifications
Collaborative robots/robotic process automation	Horizontal integration	Training investments
Virtual/augmented reality	Vertical integration	Flat hierarchies and agile working
Digital twin of products		Tandems or learning groups
Energy analytics		Innovation and multidisciplinary teams
3D printing		“Fail fast” culture
Blockchain technology		External expert partners
Track and trace		
Cloud computing		

Source: PwC

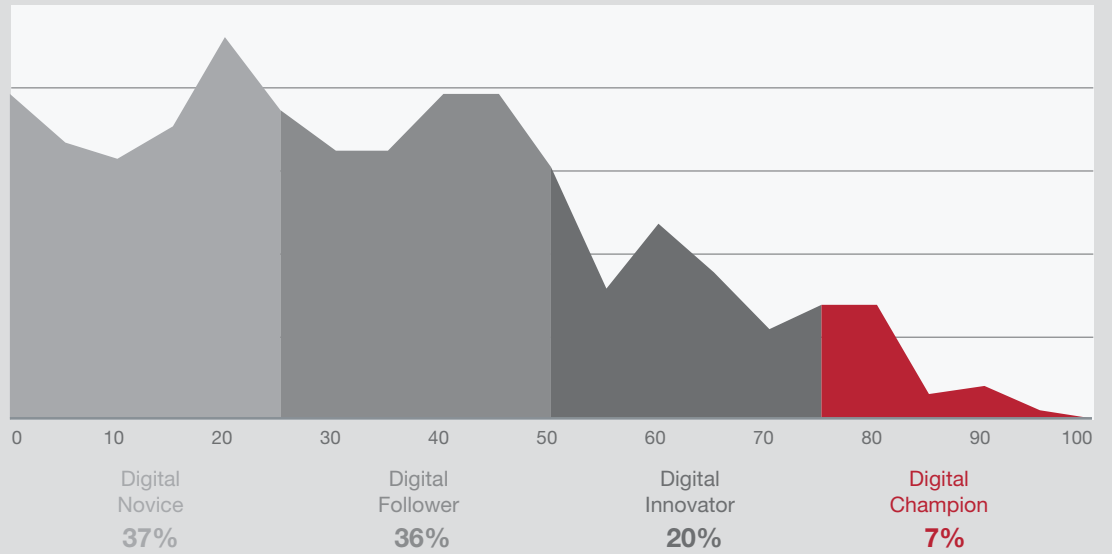
EXHIBIT B

Digital operations maturity of survey participants

Component distribution and average scores



Global index distribution



Base: 509 companies.

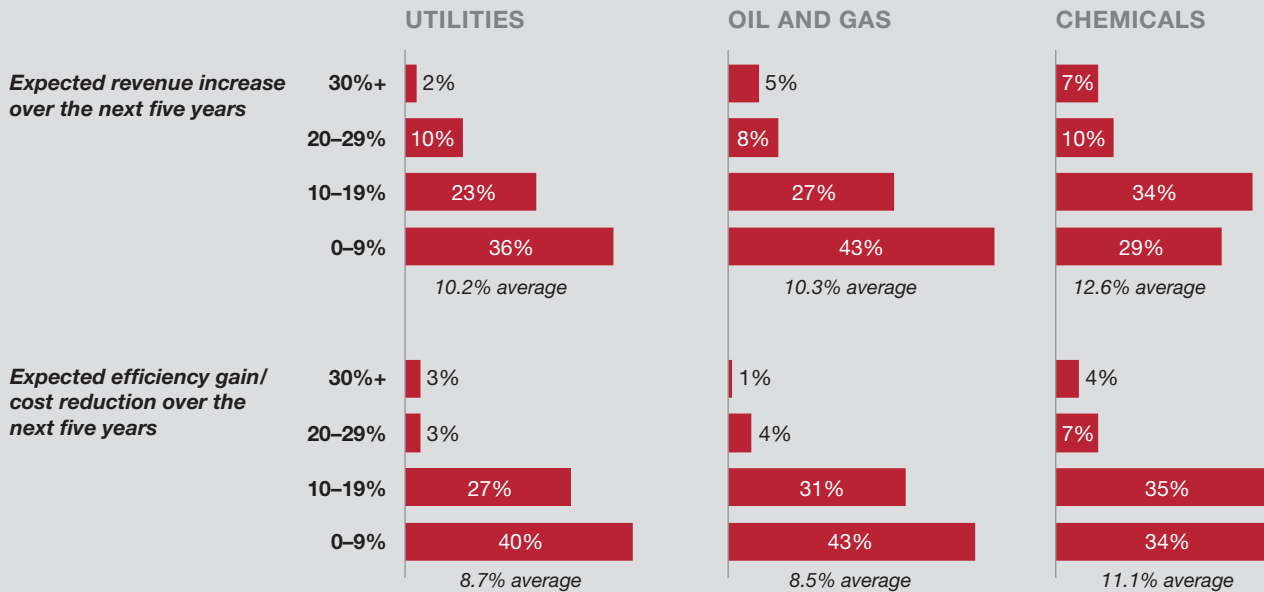
Source: PwC's Strategy& 2019 Digital Operations study

Limited returns expected, limited steps taken

Indeed, the skepticism about the benefits of digitization among utilities runs so deep that it stokes uncertainty about implementing new technologies and progressing much beyond proven digital tools. On average, utilities said that they expected only 10.2 percent cumulative revenue gains and 8.7 percent cost reductions from digital investments over the next five years (see *Exhibit 3*). Chemicals companies were more bullish than the utilities in both categories, by more than 2 percentage points.

Perhaps most troubling about these results is that thus far, even the more technologically advanced companies among utilities are less than adventurous in their digitization efforts. They have mostly concentrated on the low-hanging fruit, applying relatively mature technologies to grid management and business process optimization in finance and product distribution efforts. The most commonly implemented digital tools have been cloud computing, energy analytics, and manufacturing execution systems — and even those have been used at rates well below the chemicals sector and oil and gas sector (see *Exhibit 4, next page*).

EXHIBIT 3
Benefits of investing in digital technologies

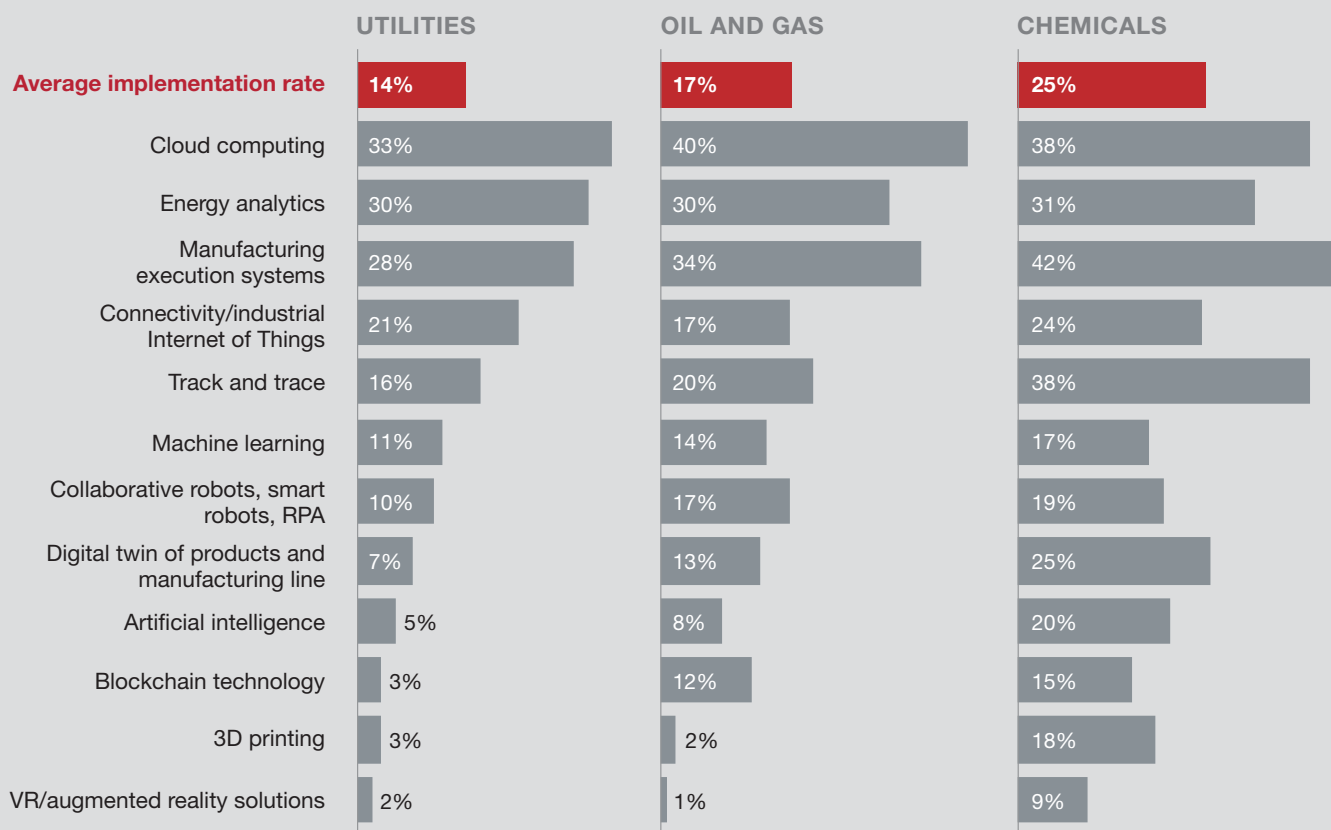


Question: What benefits do you expect from your investments in digital technologies cumulatively over the next five years? Please compare your expected situation in five years with your situation now. Base: 509 companies.

Source: PwC's Strategy& 2019 Digital Operations study for energy

EXHIBIT 4

Implemented technologies



Question: To what extent have you implemented the following digital technologies within your company? Base: 509 companies.

Source: PwC's Strategy& 2019 Digital Operations study for energy

Few utilities (indeed, only Digital Champions) have adopted such advanced and rapidly progressing — and potentially transforming — technologies as artificial intelligence (AI), blockchain, 3D printing, and virtual reality (VR) systems. Moreover, complex functions such as predictive maintenance, which depends on the availability of real-time data about the activity and performance of the power distribution system for a long period of time, have generally not been attempted in a holistic way. Part of the challenge is obtaining and cataloging this vast amount of data through cloud-based systems and then developing sophisticated analytical tools to assess the data. “We are working towards a world where our clients will be able to determine themselves if there is space in our grid to connect,” says Daan Schut, chief transition officer at Alliander. “This means that AI will be used to make fast analyses of loads on the grid based in part on historical performance. However, grid data from the past is not well recorded, and building this capability is an ongoing task that has already taken three years.”

Indeed, many utilities are “right at the beginning of the digitization journey,” as Evgeny Miroshnichenko, Inter RAO chief financial officer, put it. Describing his company’s efforts in more detail, Miroshnichenko says, “Some of the technologies are currently being investigated. Up to now, only the basic technologies are being looked at. For instance, the power plants — with old and outdated technology — are being modernized and upgraded, even as far as adding new sensor technology. Here we are driven mostly by operational needs. At the same time, we are actively investigating, and investing in, digital opportunities in retail. Retail customers require flexibility and convenience — only digitization can answer these needs.”



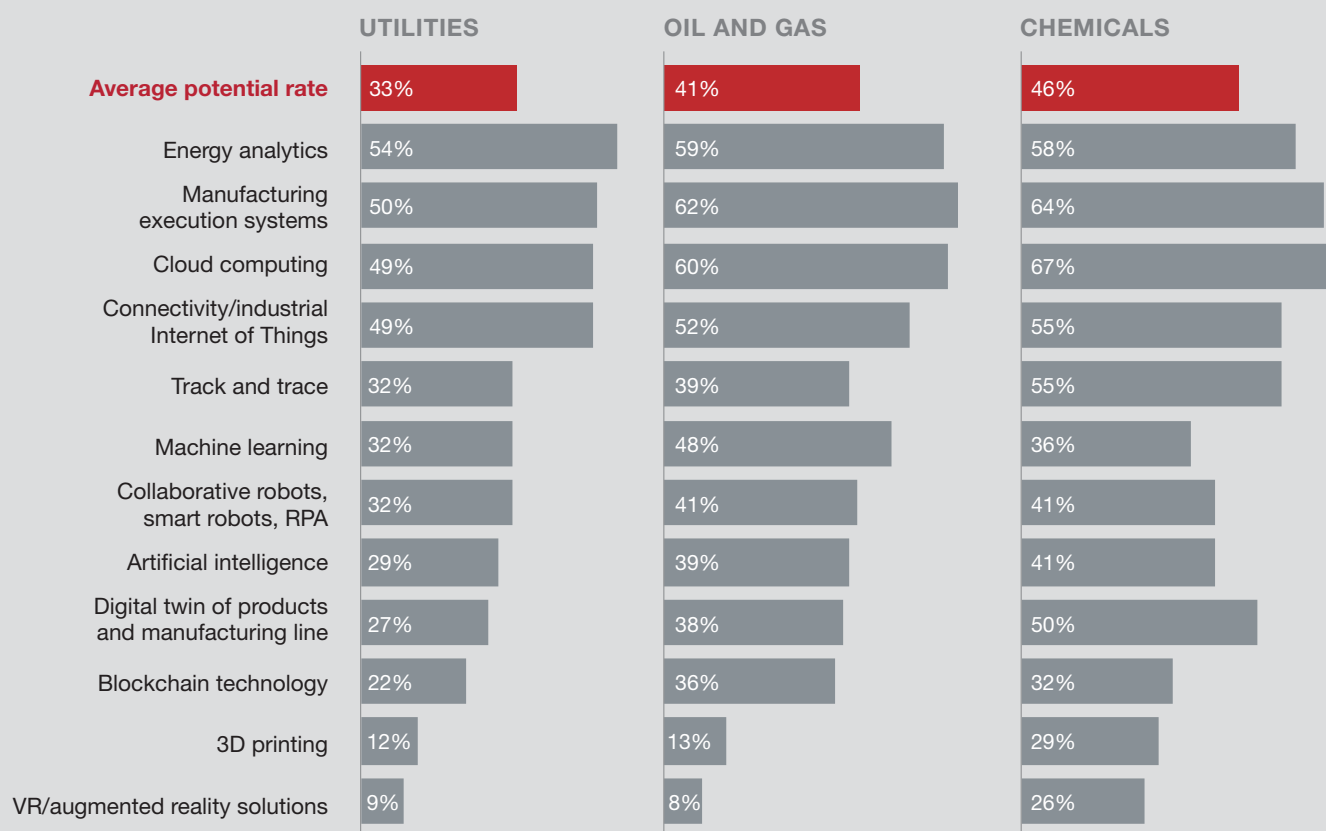
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Peering into the future

The situation is in flux, though. Looking ahead to the next five years, the picture improves somewhat and offers more hope for the utilities sector. For instance, of the EMEA utilities surveyed by Strategy&, 5 percent said they had already implemented AI applications and another 9 percent said they had piloted such programs. That compares with 20 percent and 6 percent, respectively, for chemicals companies. But through 2024, including planned technologies, AI adoption in the utilities sector may increase by another 15 percent, according to the survey, and that would be on par with chemicals companies and just below oil and gas AI implementation (see Exhibit 5).

EXHIBIT 5
Implementation potential of new technologies

Planned, piloted, or implemented



Question: To what extent have you planned, piloted, or implemented the following digital technologies within your company? Base: 509 companies.

Source: PwC's Strategy& 2019 Digital Operations study for energy

Among the many possible areas in which AI could improve utility operations are (1) automating efficient and cost-effective ways to integrate renewables into the energy generation mix and (2) implementing real-time management of the power network. “Digital offers new perspectives on customer service for a grid operator and creates a world of opportunities to implement new flexibility mechanisms to optimize electricity demand response management,” Antoine Jourdain, Enedis board member and chief technology officer, tells PwC.

Other Digital Champions certainly echo this sentiment and will adopt AI applications in the near term. But considering utilities’ widespread skepticism about the returns from digitization in the survey, we believe it is unlikely that all the five-year technology plans for increasing the use of AI will actually pan out.

Moreover, though AI will have a big impact on industrial transformation writ large over the next few years, other new digitization areas were much less prevalent in utility technology plans for the same span — even though some of them already hold real promise for the more innovative players in the power industry. For instance, blockchain could be used to set up peer-to-peer distributed energy networks with customers, essentially to efficiently share energy usage data and grid supply and demand. Utilities could use 3D printing to slash manufacturing costs for power network equipment and energy storage devices. And VR equipment could be a powerful maintenance tool; for example, field workers might don video goggles to connect with the home office and share details about downed lines, then be guided through repairs via videoconference. (For a description of how some utilities are successfully tackling digitization, see “How to reach digital maturity,” page 15.)

The corporate functions that are most commonly digitized at utilities today tend to be commodity processes such as finance, distribution, and marketing (see *Exhibit 6, next page*). To be sure, some utilities are taking this process seriously and, at the very least, remaking their routine operations with an aggressive digital mind-set. For example, E.ON has created what it calls a digital attacker that involves completely rethinking its products and processes in order to optimize and enhance the customer experience. New digital interfaces and new data and energy usage access platforms are hallmarks of this approach. And on the grid, E.ON offers improved predictive maintenance and reliability features.

But, although this is important, the core activities that could translate into real improvements in profit margins and efficiency, such as transmission, generation, trading, and sales, rank surprisingly low on the list of utilities’ digital efforts. However, as is the case with AI, utilities executives are mindful that they are lagging in digitization of critical functions, and they offer rosy forecasts for fixing this shortcoming within the next five years.

Unfortunately, except for Digital Champions, the majority of utilities need to support much bigger and more numerous technological efforts than they are expecting if they are to catch up with the other industries that the Strategy& survey examined — and make a real difference in their performance. For instance, in all three industries, digital process optimization and digitized predictive maintenance are viewed as primary targets for adopting new technologies. But even taking into account planned efforts in these categories, only about half of the utilities will have implemented digitization programs focused on these areas, whereas in the chemicals sector, 64 percent of respondents expect to have applications managing digital process optimization and 69 percent anticipate having applications that manage digital predictive maintenance programs in the next five years.



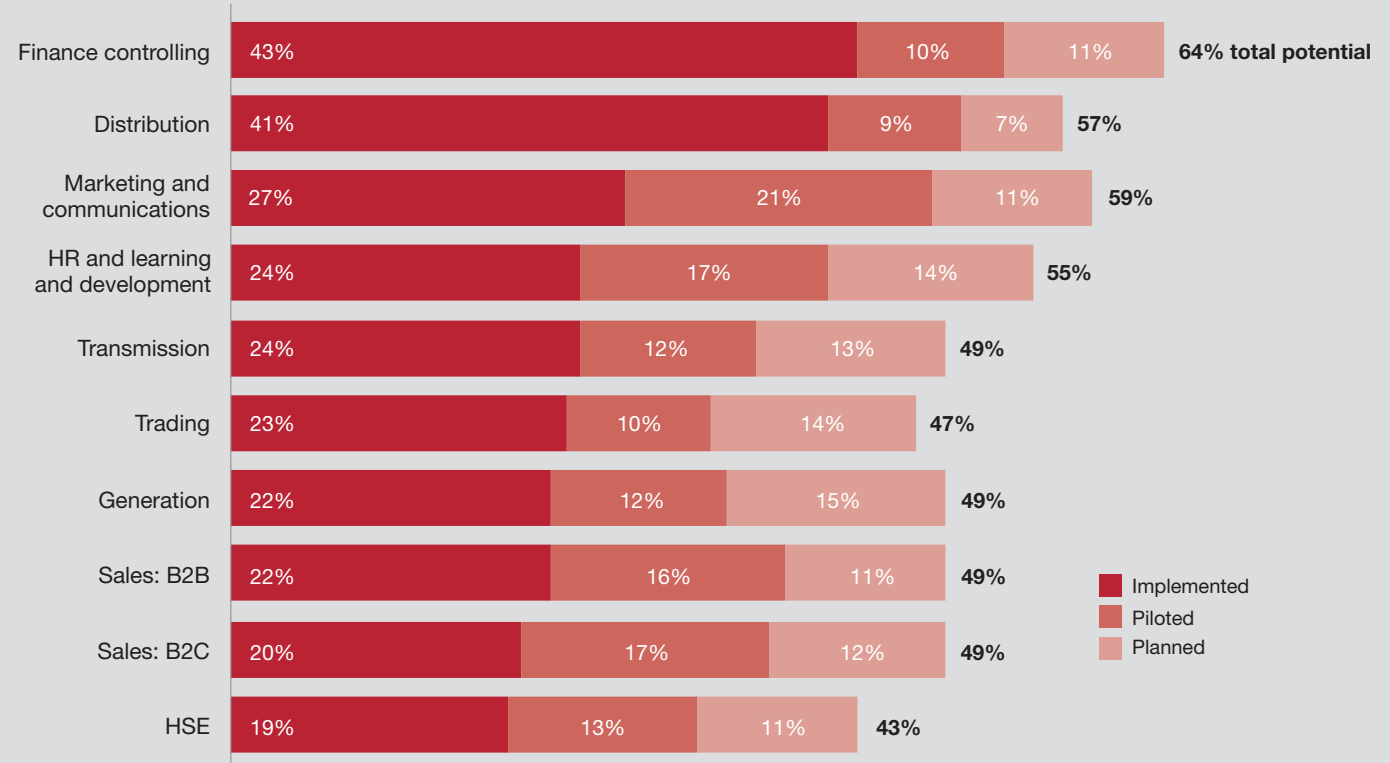
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EXHIBIT 6

Implementation potential of new technologies

Implementation status per company function



Question (Q3): To what extent have you implemented digital technology in the following company functions? Base: 202 utilities companies.

Source: PwC's Strategy& 2019 Digital Operations study for energy

How to reach digital maturity

Although most utilities are far from digital maturity, a few have been able to attain that goal — an achievement that ultimately means being able to better compete against newcomers in a changing industry, enjoy a more profitable revenue stream, and create a sustainable organization prepared for long-term survival. Observing these digitally successful companies, Strategy& has identified five steps for digital transformation in the utilities sector.

1. Define your end-to-end digital transformation strategy on the basis of strategic business pillars, differentiating capabilities, and (future) customer needs. For instance, an AI system may be designed to oversee an efficient mix of 50 percent renewables and 50 percent fossil fuels by 2030, and to monitor a program to distribute this energy to the most likely and lucrative customer base depending on volume usage, geographic region, and primary energy use.
2. Develop capabilities to support the adoption of new digital technologies and new business channels driven by these technologies, and consider small-scale digital service offerings to face unique customer challenges. An example of the latter in the B2C segment could be to add value by enriching price-competitive pure power products with digital services that support improved energy efficiency and smart home features.
3. Identify the digital technologies required to propel diverse new business models and integrate required processes and systems to enable seamless customer interactions. For instance, some utilities in Germany and the Netherlands are targeting blockchain applications to drive innovations in energy trading — thus providing customers with the best prices — and to improve the performance of the distributed grid.
4. Choose and integrate partners into operations to help think outside the box and further develop preferred digital technologies. Especially at the beginning of the digitization process, when several technologies and ideas are being tested and considered, utility companies should work closely with startups, universities, or research institutes and organize innovation campuses in order to generate fresh ideas or accelerate the development of existing ones. Once the digitization concepts have matured, the power company must decide whether these technologies are best provided by partners or are strategically critical and should be developed internally as proprietary capabilities.
5. Create an agile team responsible for updating and developing new digital processes and driving innovation. This team should be nimble and flexible, creative and autonomous, and initially relatively free from having to generate instant returns on investment. Most importantly, it should emulate the agile way of working: try, fail, get up again, retry, or move on and try something else. As it matures, the agile team should build a portfolio of digital tools, products, and services that have a convincing business case or that are strategically essential and likely to pay off over time.

The cultural conundrum

A variety of reasons explain utilities' lagging of other industries. Perhaps the most obvious: They simply have not had to focus on efficiency and process improvements until very recently. As a mostly protected, well regulated, and often monopolistic industry, utilities have in the past benefited from not having to be overly responsive to performance demands from consumers. They have similarly benefited from heavily controlled price and profit levels and from not having to compete for customers. Utilities are used to a very stable business model based on long-term developments such as building a new power plant, not speedy decision making. The types of disruption that have roiled chemicals firms and oil and gas companies for some time — whether from more nimble startups entering their markets, volatile shifts in supply and demand, or shareholder angst — have historically not been an issue in the utilities sector.

But as the ground shifts, utilities can no longer avoid this challenge. “In many cases, it is more a cultural issue than a technical capabilities problem,” says Rene Kerkmeester, digital transformation program chief at Tennet. “It is about company behavior and changing company behavior, making nimble choices, and living with failing.”

These cultural shortcomings at utilities are evident in the data. Only 27 percent of utilities executives described their business as innovative, and just 34 percent said that their organization had “flat hierarchies that facilitate agile working and quick decision making.” Perhaps most significant, only 31 percent of the respondents said “our leadership has a clear vision for the digital future and acts as a role model.” Among chemicals companies, that figure was a much higher 46 percent. “Digital competence building takes a long time,” says Jasper Koch, head of digital for energy networks at E.ON. “People have to learn to work in an agile way, and there has to be some consensus on what digitization is, because people view it differently. Decisions have to be made on how it is financed, and changes in the corporate culture have to be accepted.” Although utilities may struggle to change the culture, nearly 50 percent expect to hire a great many new workers with more skills in the next five years and expect that these employees will contribute to digitization efforts.

To overcome cultural obstacles, some utilities are adopting these tactics:

- **Nurture change agents.** Embracing transformation and innovation is often a simultaneous bottom-up and top-down effort. Top management has to encourage new ideas throughout the organization, and the most creative digital solutions proposed by employees must be welcomed.
- **Form investment committees.** To fund digital efforts, technology-oriented, board-level committees can be created with the twin goals of developing a transparent business case and overcoming company reluctance to invest in the future when the business case is not foolproof.
- **Ignore ROI in the short term.** Because it is not always easy to measure the benefits of a digitization effort, at least one utility has chosen to avoid measuring the gains from a technology effort in the first three years. In this company's view, some digitization efforts are simply a strategic necessity, and waiting for a business case can be foolhardy and ultimately harmful to the organization.

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- **Start small and scale up.** Focusing on commodity functions is not enough and keeps utilities from becoming Digital Champions. Nonetheless, for many utilities cultural timidity demands that new technology be implemented in small bites and then scaled up throughout the organization and its geographic reach.
 - **Adopt an agile approach.** Organizational entities with high visibility to top management, staffed with interdisciplinary teams, separated from line organization, and embedded in an innovative environment can be designed to lead digitization efforts. These teams should stress cross-functional capability building, encourage collaboration and entrepreneurship, and frequently showcase results. This will help successful digitization implementations spawn additional ones.



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An obvious lack of urgency

The distance between utilities and other sectors with respect to their urgency in addressing digitization is reflected in responses to the Strategy& survey questions about how digital applications have been handled across the organization. For example, in supply chain integration, the largest cohort of utilities said they had implemented digital applications only in isolated ways, as one-off solutions. And a mere 4 percent could call their efforts “near real-time end-to-end integration and planning platforms across an external network.” By contrast, 11 percent of chemicals companies and 6 percent of oil and gas outfits described their supply chain management programs as holistic across an ecosystem of companies. And strikingly different from utilities, the biggest subset of companies in those two industries said that their supply chain management programs involved integration and collaboration among internal functions.

The same pattern can be seen in examining automation and connectivity within company operations. Thirty-six percent of utilities said that these digital features were implemented only selectively, compared with 27 percent of chemicals and 25 percent of oil and gas companies. The largest group of chemicals companies and oil and gas firms (around one-third of these businesses) said that they had seamless automation and connectivity capabilities across multiple plants and beyond manufacturing. Fewer than one in five utilities could make that claim.

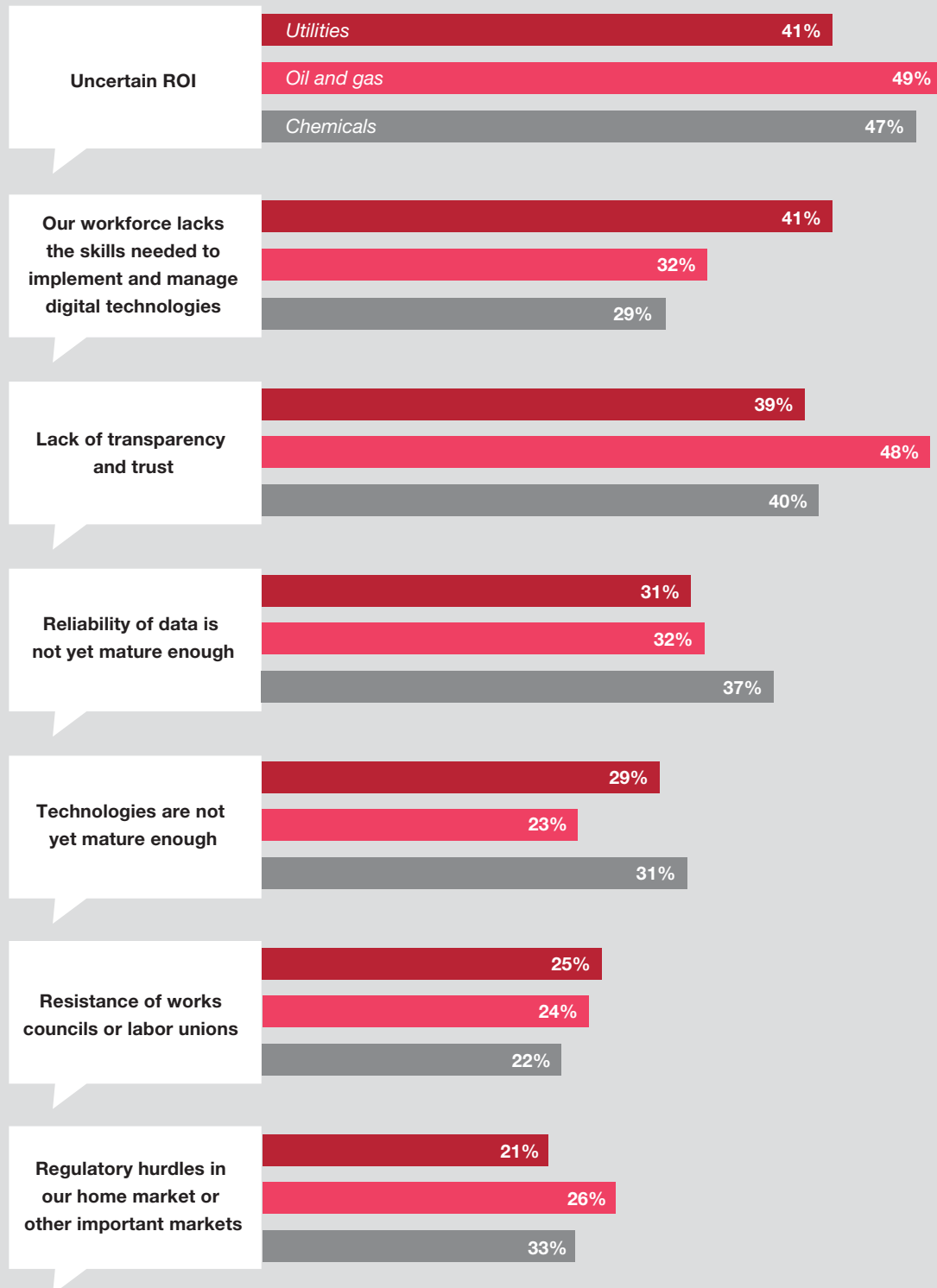
As utilities markets deregulate, power companies no longer have the excuse that digitization isn't necessary for their business prospects. But embracing it may not be a straightforward matter for them. In the survey, utilities executives raised digitization concerns about the new business environment they find themselves in today. The first was that they are uncertain about the return on investment from adopting new technology (see *Exhibit 7, next page*). That concern is actually less of an issue for utilities than for the other industries surveyed, however. This perhaps indicates that because the utilities have been slower to embrace digital investments, they simply do not have as much at stake in this area. Instead, the area that utilities are most worried about, well above the worry levels indicated in the other industries, is the lack of skills in their workforce vis-à-vis digital technologies.

Because they are starting behind other industries, utilities have a difficult path ahead if they intend to catch up on digitization. And with the newer, more technologically savvy competitors in their own industries, incumbent power companies cannot wait much longer to take active steps toward becoming Digital Champions. To begin moving in that direction, they should consider three approaches:

- **Prioritize and focus.** Digitization covers a number of areas: digital communication (social media, websites, and marketing); digital processes; digital analytics; and new digital business models. Many utilities make the mistake of trying to implement too many ambitious digital strategies at the same time and end up spreading their financial and staff resources, as well as their capabilities, too thin. A better approach is to define the three to five critical digitization efforts that are strategically essential to defending and expanding competitive advantage among startups and established power companies. These so-called lighthouse projects, which could lead to follow-up digital campaigns, should cross business units and ideally cross geographical regions; have board-level support and get regular reviews from management; and be equipped with sufficient resources and staff.

EXHIBIT 7

Challenges associated with digital technologies



Question: In your opinion, what are the top three challenges associated with digital technologies? Base: 509 companies.

Source: PwC's Strategy& 2019 Digital Operations study for energy

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- **Adopt distinctive digital capabilities.** Single, one-off, nonstrategic digital projects will make little difference in a utility's competitiveness. The target should be a holistic series of digital implementations that can be updated over the long term. To reach this target, companies must identify critical capabilities needed to maintain an ongoing digitization program. This includes not only technical capabilities (expertise in a varied group of digital platforms), but also functional capabilities (an understanding of agile development), and managerial capabilities (the ability to scale up entrepreneurial businesses). To identify capabilities gaps, utilities should benchmark the maturity and extent of their digital capabilities against those of their competition.
 - **Form partnerships and joint ventures when needed.** Not all capabilities gaps can be closed organically. Doing so can take too much time, particularly when the utilities landscape is changing so quickly and competition is growing. Moreover, developing internal capabilities comes with its own risks, as the new capabilities still need to be integrated and embedded in power company processes and structures (think of the disconnect that can exist between agile developers in a traditional corporate environment). On the other hand, partnering with or acquiring companies that offer complementary and much-needed digital capabilities can be a good approach to overcoming these difficulties, especially for smaller power companies that lack resources. The startup environment is rife with opportunities to gain access to talent, new technologies, and innovative solutions or business models. An intelligent partnership strategy requires a well-developed internal scouting team that can identify potential targets with the best portfolio of digital advances.

ADDITIONAL RESOURCES

This report is part of a series of publications by PwC and Strategy&, PwC's strategy consulting business, about energy transformation. We began our assessment with [The road ahead: Gaining momentum from energy transformation](#), which discussed the various market and business models that could emerge. [Customer engagement in an era of energy transformation](#) examined how the energy ecosystem was evolving and the implications for customer strategy. [Capturing value from disruption: Technology and innovation in an era of transformation](#) looked at scenarios that could arise from technology evolution and specific technology attractiveness, sketched out how five possible future scenarios could unfold, and defined what it would take to win in tomorrow's markets.

As the transformation of the energy sector gathers momentum, many companies find themselves at a strategic crossroads, where they have to make tough choices on which direction to take. These strategic choices were the focus of a comprehensive May 2019 Strategy& report, [Global power strategies: The future of the utilities industry and the players that are driving success](#), which examined how the world's 40 largest listed power utilities (the Global Top 40, or GT40) are embracing change.

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