Crafting the Utility of the Future

Challenged on every front, the industry must fully embrace digital business change to power next-level organizational readiness and agility.

Executive Summary

Even before COVID-19 struck, utilities found themselves facing profound changes due to environmental, economic, societal and regulatory pressures.

Those pressures included shifting legislative and regulatory mandates; consumers becoming energy producers with increased expectations around hyper-personalized customer experiences, omnichannel digital access and payment options, green energy choices and tailored services; energy loads becoming more interactive, dynamic and difficult to manage; transmission and distribution methods needing to be ever more controllable and resilient; a need to use data to maximize field assets; and the introduction of innovative and disruptive technology challenging the ways this mature industry has been doing business for more than a century.

Indeed, it's not too strong to say that pre-pandemic, the three Ds of disruption were already breaking the traditional utility business model:

- **Decarbonization,** as renewable energy proliferates and the regulatory environment grows stricter

- **Decentralization,** due to the growth of distributed energy resources (DERs) and additional capacity provided by "prosumers"

- **Digitization,** in the form of evolving smart-grid technologies, the Internet of Things (IoT), advances in battery technology, and convergence of the grid and transportation

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This already-urgent situation didn't need a wildcard — but that's exactly what utilities were presented, in the form of a pandemic that fundamentally transformed both energy demand trends and business operations. On the demand side, millions of consumers began working at home almost overnight. Loads once predictably distributed to office buildings and retail centers were now fragmented.

Meanwhile, utilities contended with operational challenges as they tried to staff facilities while protecting the safety of their employees. Early in the crisis, utilities faced unforeseen nightmare scenarios — like being forced to shut down a plant because it could not be adequately, and safely, staffed. Prior to the pandemic, utilities had begun to consider contingency plans to enable remote operation of critical infrastructure, such as power generation facilities, and business processes. But COVID-19 dialed up the pressure, making it an absolute must to have multiple levels of redundancy for times when plans A and B fail because utilities cannot send people to the office or give them access to the systems they need.

As utilities grapple with industry disruption and COVID's aftermath, they will face additional obstacles around budget, institutional stasis and a shortage of employees with needed skills. In this paper, we'll explore both the challenges and their solutions, highlighted by real-world examples. Industry players that shy away from the battle will fade, we believe, while those that take action will position themselves to join the elite — the utilities of the future.

Past tense tensions

Before exploring the utility of the future, it's helpful to study the unique pressures the industry faces by looking at the past. In addition to an onerous regulatory environment, shifting customer demands and a splintering power-generation picture, the venerable industry has to deal with the reality that it's often perceived as stodgy, with limited advancement opportunities. Utilities face an uphill battle in hiring the younger workers needed for digital transformation — especially because they'll be competing with other, sexier industries. That's a significant problem for an industry hiring at a rate of 6% to 7% per year, according to the nonprofit Center for Energy Workforce Development.[1]

The best way to address this, we believe, is to act boldly while aggressively publicizing those actions. Hiring initiatives focused on cutting-edge skills, diversity and the opportunity to make a difference in the world will, if publicized appropriately, sway the opinions of millennials, Gen Zs and those who follow. Utility leaders we speak with are increasing their presence in universities with leading STEM programs, and stressing that employees will get to work with advanced tech while creating a greener future.

Speaking of industry challenges, let's not forget the very recent past. Utilities can never stop performing, even when a natural disaster is piled atop a pandemic. Such was the case in both 2020 and 2021 in geographies spanning the US. The problems highlighted the need for the utility of the future.

During major storms and other disasters, utilities typically put dispatchers, outage coordinators and other personnel in centralized control rooms equipped with backup generators. During recent storms in California, Texas, New York and elsewhere, utility employees were pulled from their day jobs and assigned a storm role. Additionally, it's typical — or used to be — to have field crews, many of whom drove hundreds of miles, to report to large parking lots for onboarding and meals.

During COVID-19, with headquarters a no-go zone and social distancing required for outdoor meetings, these deeply ingrained habits did not work. Employees working from home often lacked proper systems and network access — and may very well have lost power themselves. Business continuity, employee backups and succession planning were all put to the test throughout the pandemic. The bottom-line message was that the more digitally mature a utility is, the better it can respond to inevitable disasters.

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The digital imperative

It is clear, then, that utilities are ripe for change. The shift will not be an easy one. Our research shows, as depicted in Figure 1, that where digital maturity is concerned, the industry lags well behind others (for more, see "Energy & Utilities Under Pressure").

However, we do see industry leaders starting to place their bets in the right places as they progress.

For example, Figure 2, next page, shows that leading companies in the space are looking to democratize their data and make it usable across their organizations, to enhance their customer experiences via investments in mobile technology and apps and to deploy cloud technology to address siloed business operations caused by data residing in on-premises legacy systems. As we'll see, these are some key attributes of the utility of the future.

Utilities lag in all measures of digital maturity but one

Respondents were asked to rate their maturity in each area of our digital maturity framework. (Pecent of respondents in the maturing or advanced stage)
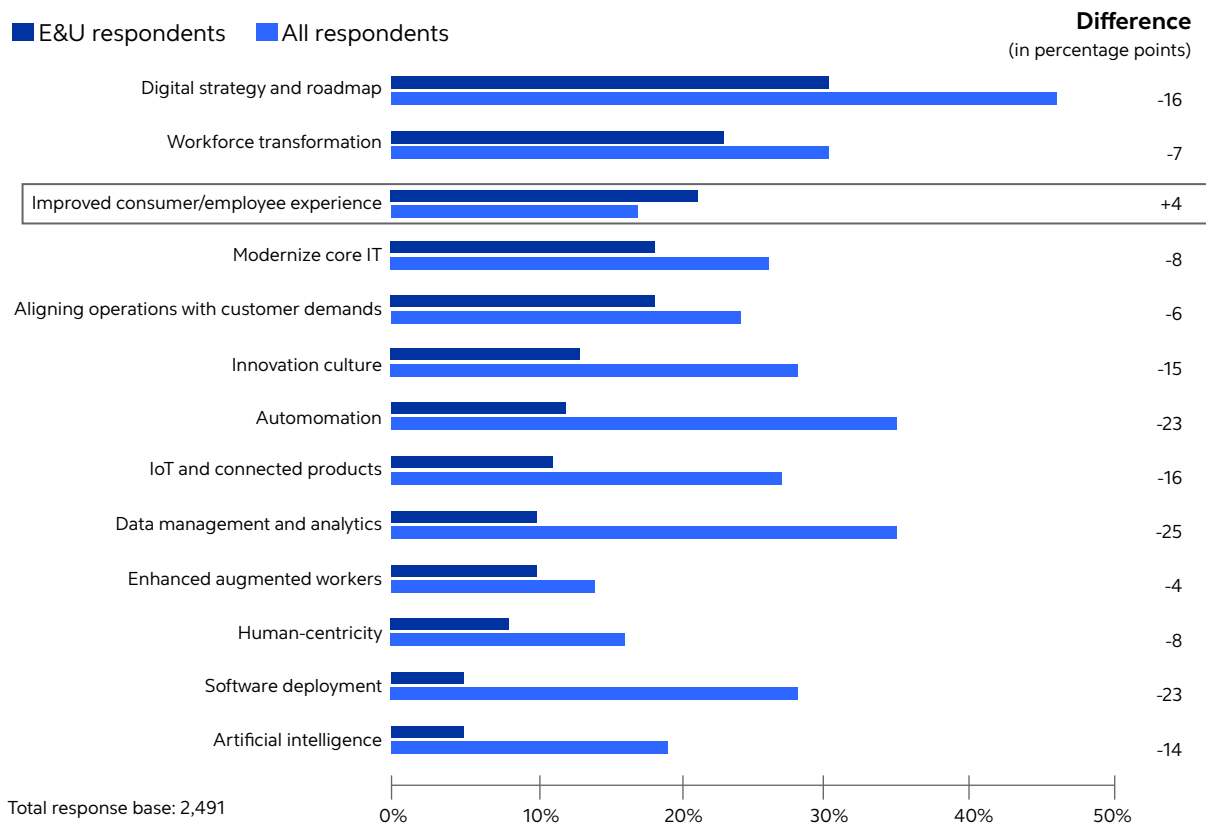

Total response base: 2,491
E&U response base: 191
Source: Cognizant/ESI ThoughtLab, 2019 study

Figure 1

Investment gulf between leaders and laggards

Respondents were asked their level of investment in each technology in the last two years. (Percent of respondents who made a significant investment)

■ E&U beginners   ■ E&U leaders

Technology	Percent of leaders who saw a significant ROI
Mobile/technology apps	92%
Cloud technology	82%
Cybersecurity technology	77%
IoT	68%
Robotic process automation	58%
Artificial intelligence	44%
Digital assistants	44%
Data management	29%
Open platforms/API	34%
Drones	34%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

E&U response base: 191
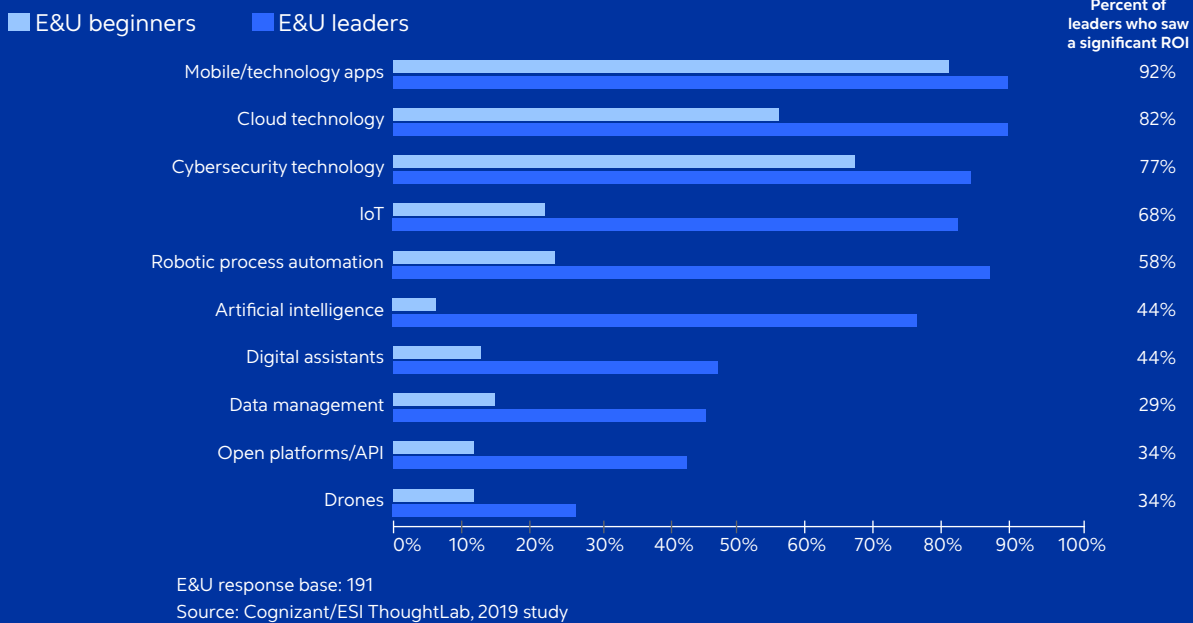Source: Cognizant/ESI ThoughtLab, 2019 study

Figure 2

As utility leaders grapple with how to handle the many factors driving a shift in the industry, we have advised clients to address these critical areas of focus, examples of which we'll explore below:

▌ Updating business models

▌ Discovering value through data

▌ Integrating DERs

▌ Delivering on the customer promise

▌ Grid modernization

▌ Cloud migration

Updating business models

In the US, utilities face a unique compensation challenge; typically, they're governed by state public utilities commissions that set their funding and compensation as a percentage of capital expenses. This arrangement makes large-scale purchases of equipment and services a safe bet for utilities, but also leads to highly structured environments that are short on flexibility and agility. The utility CEOs we speak with understand, universally, that this must change — but how to do so is a moving target for enterprises that are incented to maximize capital expenditures, rather than leverage the more flexible operating model at the core of digital transformation.

We believe utilities have an opportunity to leverage an approach that uses operating expenditures as a vehicle for investments in technology and process improvement; this approach is more responsive to shifting customer expectations than the traditionally long and arduous process of funding these efforts through capital expenditure. As of now, there is no easy answer where state commissions are concerned. We believe they must and can be educated regarding the greater good of more flexible business models, but there's no reason to expect rapid change. The utility of the future must walk a tightrope, embracing an operating-driven model while masking it as a classic capital model.

Data is the new renewable

In a world that held an estimated 2.7 zettabytes[2] of data in 2018 and in which 1.7 megabytes are added per second, per person, it's no surprise that utilities are gathering data at an unprecedented level due to advances in technology. They must leverage that data to improve operations, and monetize it where feasible. Data can either be the heartbeat of a utility or its weakness, holding back potential innovation. Without data modernization, a modern architecture, strong management and a data governance foundation, utilities will struggle to layer on advanced capabilities or implement emerging technology.

For too many utilities, data is a weakness, not a heartbeat. It's impossible to overemphasize how important it is to clean up, normalize and standardize enterprise data. This is more difficult for the utility industry than for others. For decades (at least!), utilities have been gathering data in siloed, typically homegrown systems, never intending it to interact with information from other sources. Today, this is hobbling the transition to digital. It's common for utilities to invest millions in customer information systems (CIS) or other enterprise software, only to fail to realize expected benefits. A deeper examination often reveals that the CIS is working as intended; it's the data that is useless in its present condition.

There is no glamorous or easy way to address the data problem. Even after they have tamed it, utilities may be overwhelmed at the question of how to extract the maximum value from the information. We advise a top-down, business-driven, analytics-based approach that focuses on identifying the key business decisions that are core to a utility's operations and strategic investments and can be improved with the support of data analytics.

By developing key performance indicators (KPIs) and automated dashboards, often with assistance from a third party, utilities can and must undergo a cultural transformation and become metrics-driven organizations. In our experience, utilities do a solid job on the CIS side by, for example, tracking customer wait times. But they fall down when it comes to tracking the performance of assets in the field. Most utilities started off by buying the cheapest gear available; then they don't sufficiently track failure rates and maintenance. Predictive or even preventative maintenance too often goes unperformed, so equipment may be replaced before its time (which ties in with the previously mentioned incentive to fall back on capital expenditures), and total cost of ownership is a mystery.

The utility of the future must move from a preventative maintenance model to a condition-based model by transforming data into tangible value, ultimately reducing operating and maintenance costs. Employing these best practices will allow utilities to implement more sophisticated asset performance-management processes and systems to maximize the efficiency of their asset network as more and more devices are connected and managed remotely.

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Integrating DERs

DERs are poised to grow rapidly, transforming energy markets and affecting utility operations. Utilities are taking steps toward a decentralized energy future but are not always proactively developing and investing in the services and digital systems needed to accommodate the increasing penetration of DERs.

It is imperative to plan for and invest in the digital systems, workforce and business processes required to accommodate a large amount of new DERs. Only by keeping up with or staying ahead of DER penetration can utilities, regulators and customers reap the full range of benefits available through a more distributed energy system. If they fail to accommodate this growing demand, utilities risk having customers completely bypass the grid in favor of self-generation, with or without utility backup service.

To succeed, utilities may have to rethink business models — and they have a choice to make. They can either watch customers bypass the grid and move into self-generation (solar, battery, etc.), or they can become the provider that finances, installs and maintains these self-generation assets. The Quick Take on page 8 shows how we helped a utility in this arena.

In many cases, consumers cannot or don't want to spend $15,000 to $30,000 on such systems, and they certainly don't want the headache of maintaining them. If a utility offered them the option to add self-generation assets to their energy ecosystem with flexible payment and leasing plans, many customers would consider keeping their utility provider as a partner.

Consumers increasingly demand the ability to own their own generation and be more green/sustainable (66% of millennial and Gen Z consumers are willing to pay more for eco-friendly products).[3] If their utility can help them achieve this goal without major up-front expense (and perhaps even with a reduction in their total energy costs through the sale of excess energy back to the utility), there is a path forward for them to keep their relationship with their power company. Utilities that are innovative and flexible in this regard, acting as a potential partner rather than a mere supplier, will be well positioned for the future.

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Quick Take

Creating an Energy Exchange

In one case, we worked with a European utility to create the world's first independent energy trading platform, allowing "prosumers" to both use and sell energy.

Collaborating with regulators and network operators, the utility defined the roadmap and piloted a platform we helped develop using cloud technologies and platform as a service (PaaS) capabilities. The platform has been successfully piloted in Germany and Norway and is being used throughout Europe as a model for similar programs.

Manage demand and distributed generation through local energy market

Challenge

- Decentralization of energy has created a change in energy flows, forcing utilities to look at new market models
- Rapid advancements in localized generation, access to renewables and energy storage compels grid operators to look at alternatives to costly grid infrastructure reinforcements
- Rise of prosumers needs new market designs to facilitate profitable energy traders across multiple market levels

Approach

- Consulting took the lead in driving the market design group
- Collaborations with industry groups, regulators and network operators
- Jointly defined the roadmap and developed completely new market concepts
- Pilot version of platform developed entirely using cloud technologies and PaaS

Outcome

- **World's 1st** independent energy flexibility trading platform
- Successful pilot runs of the platform in Germany and Norway
- Received three research grants for platform from Norwegian regulator, while two applications in Germany and UK are in progress
- Nodes Market design[4] and platform is being used by regulators across Europe for defining next generation of local energy trade regulations

Figure 3

Delivering on the customer promise

In spite of the many challenges facing utilities, make no mistake: This is their game to lose. Having been the sole provider of energy for most customers for a century or more, utilities hold massive amounts of brand equity. But as alternative providers crop up, utilities must continue to improve customer experience and satisfaction if they don't want to see attrition and lose their advantage.

Utilities are being required to adapt to increasing customer demands for information and transparency and an evolving energy marketplace while operating on technologies that are aged, limited, siloed or no longer supported. Legacy systems are typically in need of significant improvement if they are to support now-critical customer and regulatory options, such as new rate structures and channels of communication.

We believe utilities must modernize customer engagement more quickly and with less risk by deploying a front-end CRM system that integrates with the CIS and other data sources through an application programming interface. This solution offers a comprehensive view of customer activity, including marketing, communications and field services. These platforms are very flexible and can readily integrate with other utility applications that use customer data, such as work orders; outage information; DERs; efficiency and load-management programs; and customer communication preferences. Figure 4 illustrates an outage management support system we created for a leading utility in North America to improve customer experience.

Overview of outage management support system

Client engagement

Client is a leading utility in North America

- 7.6 million retail customers
- 49,500 megawatts of electric generating capacity
- Five NAM location offices covering six different NAM states
- Fortune 125 company

Customer's ask:

- The client was looking for solutions that will provide application support during critical weather events, improve responsiveness, reduce the enhancement request backlog, and offer improved application availability
- The client was looking for support engagement for three different towers comprising three different vendor products and six different states
- Total number of applications to be supported : 61

Guiding principles from client:

Cognizant to provide end-to-end managed service for outage management system (OMS), including:

- **Operational:**
  1. Known error resolution
  2. Standard service request
  3. Outage support and mediator service
- **L2 & L3:**
  1. Incident resolution
  2. Application problem management
  3. Minor enhancement
  4. On demand /ad hoc requests
  5. Compliance and regulatory updates
- **Governance:** Service level management
- **Sustainability efforts**

Support Activites

- 24*7 support – 16*5 desk support (onshore + offshore), the rest on-call support
- Along with 180 incidents per month, we also work on sustainability, enhancement from storms and business requests of 600 hours per month

- Response to critical incidents is 30 minutes, with a high of 60 minutes, and restoration time is 60 minutes and 120 minutes, respectively
- Track and report application availability for the critical applications

Figure 4

Grid modernization

Prompted by storms, fires and outages, regulators have put pressure on utilities to address reliability and resilience concerns. Recent months alone have seen headline-making supply disasters in California and Texas, and we believe such black-swan events will grow more common in the future. Grid modernization efforts are shifting, replacing and adding infrastructure (such as advanced metering infrastructure (AMI) and distribution automation (DA) — the family of technologies that automate power distribution) to make the grid interactive and agile. New technologies, dubbed grid-edge resources, are being embraced, fueled by reduced battery storage costs that allow cheaper renewable energy to be stored for later use. This facilitates new demand-management opportunities.

It's abundantly clear that digital enables many utility-of-the-future, grid-modernization, and market-transformation initiatives, though implementation may vary based on local factors. Specifically, investment in advanced distributed-system automation and smart-grid technologies alone makes the grid more responsive and resilient. Grid-modernization investments lower operating costs by providing a cost take-out opportunity — and because these investments contribute to the asset base, they are entitled to cost recovery and a return on assets. Figure 5 illustrates how we helped a North American utility in its grid-modernization journey.

Smart grid/AMI transformation

Helped a leading North American utility team to achieve its goals in their smart grid/AMI journey since the start of the program
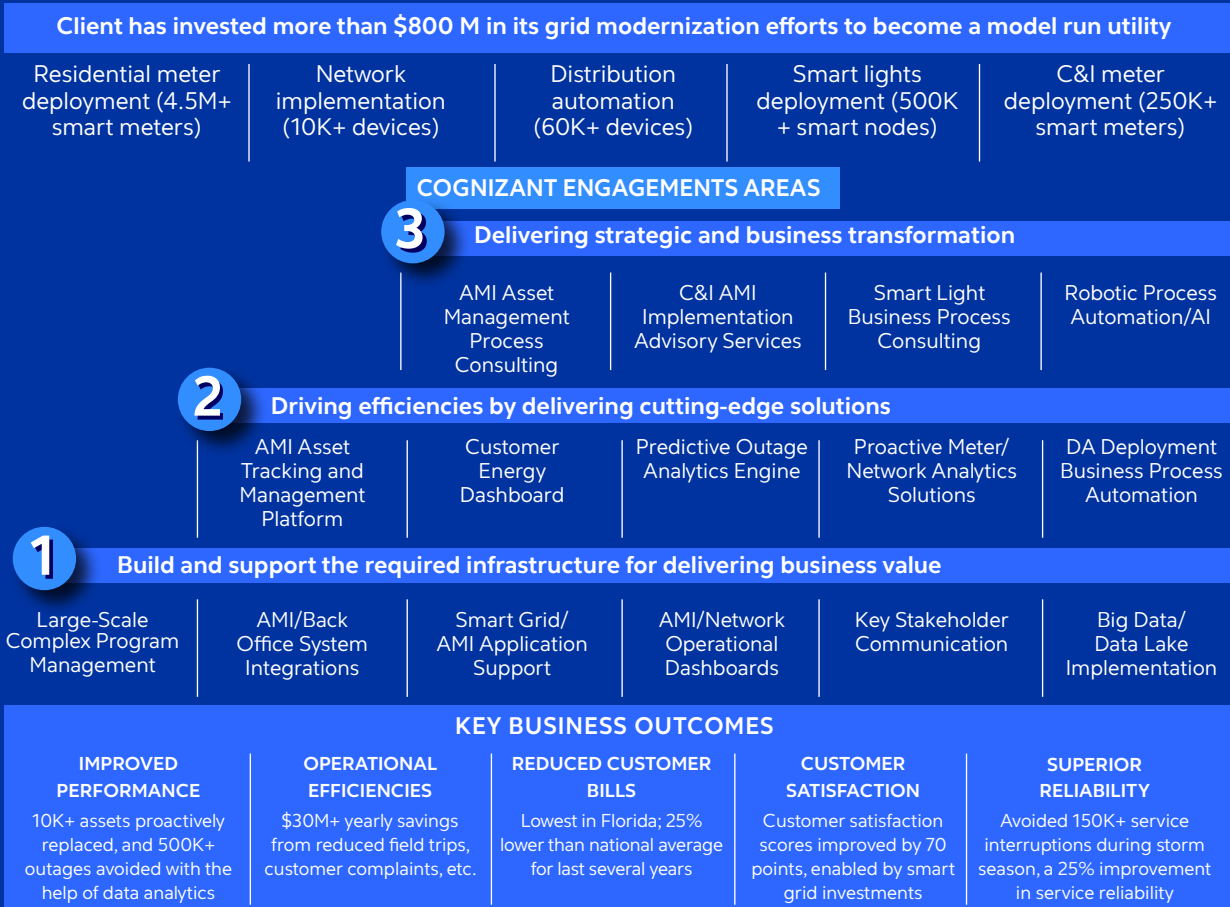
Client has invested more than $800 M in its grid modernization efforts to become a model run utility

Residential meter deployment (4.5M+ smart meters)	Network implementation (10K+ devices)	Distribution automation (60K+ devices)	Smart lights deployment (500K + smart nodes)	C&I meter deployment (250K+ smart meters)

COGNIZANT ENGAGEMENTS AREAS

③ Delivering strategic and business transformation

	AMI Asset Management Process Consulting	C&I AMI Implementation Advisory Services	Smart Light Business Process Consulting	Robotic Process Automation/AI

② Driving efficiencies by delivering cutting-edge solutions

AMI Asset Tracking and Management Platform	Customer Energy Dashboard	Predictive Outage Analytics Engine	Proactive Meter/ Network Analytics Solutions	DA Deployment Business Process Automation

① Build and support the required infrastructure for delivering business value

Large-Scale Complex Program Management	AMI/Back Office System Integrations	Smart Grid/ AMI Application Support	AMI/Network Operational Dashboards	Key Stakeholder Communication	Big Data/ Data Lake Implementation

KEY BUSINESS OUTCOMES

IMPROVED PERFORMANCE	OPERATIONAL EFFICIENCIES	REDUCED CUSTOMER BILLS	CUSTOMER SATISFACTION	SUPERIOR RELIABILITY
10K+ assets proactively replaced, and 500K+ outages avoided with the help of data analytics	$30M+ yearly savings from reduced field trips, customer complaints, etc.	Lowest in Florida; 25% lower than national average for last several years	Customer satisfaction scores improved by 70 points, enabled by smart grid investments	Avoided 150K+ service interruptions during storm season, a 25% improvement in service reliability

Figure 5

Cloud migration

When it comes to the cloud, utilities at the earlier stages of digital maturity are particularly cautious about considering migration, as they view the cloud as a double-edged sword. Even with the agility it offers, many are concerned about the introduction of unknown cybersecurity risk. For these organizations, we advise taking a selective approach to cloud deployment that slowly but surely increases organizational agility and transparency while minimizing risk. A good cloud start would be to focus on applications with the lowest-risk workloads, or those with minimal customer data or sensitive information — internal financial apps often fit the bill.

The focus areas we've explored are underpinned by the extent to which utilities can address the overall transition to digital — which includes cloud migration, of course, in addition to remote performance centers; 5G; securing systems and data; managing human and digital workers; and improving productivity/taking out cost.

In an engagement with a large European utility in one of the industry's largest-ever data ports to the cloud, we moved more than 220 business services and over eight petabytes of data to a hybrid cloud model. We developed a digital-ready hybrid cloud platform and deployed both a public and a private cloud as a fully integrated, secure technology backbone, in 20 months. An automation layer sits across the entire backbone to provide self-service capabilities. As a result of the engagement, the utility reduced infrastructure provisioning time from 12-16 weeks to one hour. The company also realized a 30% reduction in batch processing times and a significant reduction in operating costs.

It is increasingly clear that focusing on digital overhaul is the key to overcoming challenges and embracing opportunities on the way to the utility of the future.

The way forward

We believe that to thrive, utilities must take a long-term view and a modern business approach, planning holistically for the future. These conversations must happen at the executive level to ensure that investments are directed toward the focus areas that will allow the business to keep pace with change, break down organizational siloes and transition to the future.

Utilities should begin their journey by focusing on key areas mentioned here, but the path forward will vary. For some, a major component will be facilitating the upskilling and reskilling of the workforce to ensure the utility is using its talent pool efficiently. For others, organizational readiness, contingency plans and building threat matrixes may be at the forefront. The bottom line is that each utility organization will need to assess itself across these key areas to determine an optimal strategy based on its unique circumstances.

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Regardless of size, we recommend utilities start with an audit of their digitization plan (whether it exists already or is largely hypothetical) to maximize their chances of becoming a utility of the future. We recommend a digital assessment approach that begins with a comprehensive review of the company's business processes, data quality, systems and organizational performance. At the end of such an assessment, a utility should have:

❙ **A roadmap for continuous improvement and a business readiness** plan that addresses data and processes inconsistency

❙ **Performance goals and benchmarks** in an easy-to-use scorecard

❙ **Actionable quick-win opportunities,** including practical upgrades and implementation plans that enhance digital grid solutions

❙ **A strategy for systematically moving the organization through the digital maturity model** to become a utility of the future

Larger utilities likely already have plans in place, but they may need a second set of eyes to help them recalibrate their approach where needed. Many smaller utilities find themselves in a position that is, in a way, enviable: With COVID-19 somewhat easing, they must craft their roadmap for the first time. This is their opportunity to make sure they're creating a strategy that will keep them competitive for many years to come.

Endnotes

[1]   www.cewd.org.

[2]   "The Big Data Facts Update 2020," Nodegraph: https://www.nodegraph.se/big-data-facts/.

[3]   "What We Want: A Gen-Z and Millennial Plea to Utility Companies," Energy Central, https://energycentral.com/c/um/what-we-want-gen-z-and-millenial-plea-utility-companies.

[4]   https://nodesmarket.com/market-design/.

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David currently leads the Cognizant Energy and Utility Consulting Practice in North America. He is an accomplished utility industry executive with domestic and international experience helping clients in the areas of operations, engineering, asset management, digital plant technology and emerging market development. Prior to joining Cognizant, David served in executive leadership roles in the US, South Africa and Asia Pacific with Accenture. He can be reached at david.cox@cognizant.com | linkedin.com/in/davebcox.

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Matthew is an accomplished utility leader with 17 years of utility experience. He has a passion for emerging grid technologies and for using them to create value. His combination of utility and consulting experience creates unique perspectives into how utilities can use new technology to improve reliability, operational efficiency, safety and affordability. His areas of specialty include strategy and deployment of new operational technologies in both utility asset performance centers and in the field by helping operationalize new technologies such as drones, rovers and battery storage. Matthew has led many large transformations in AMI, DA and Enterprise Asset Management. He can be reached at Maciej.Panszczyk@cognizant.com | linkedin.com/in/matthew-panszczyk-1bb9619.

About Cognizant

Cognizant (Nasdaq-100: CTSH) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses. Headquartered in the U.S., Cognizant is ranked 185 on the Fortune 500 and is consistently listed among the most admired companies in the world. Learn how Cognizant helps clients lead with digital at www.cognizant.com or follow us @Cognizant.

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