



REPORT

2022 ENERGY & UTILITIES OUTLOOK

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OVERVIEW: AN INCREASINGLY CONNECTED ENERGY-AND-UTILITIES ECOSYSTEM

The utility business model is changing in response to political, environmental, consumer, and cybersecurity pressures. Dozens of states have set targets for decarbonizing their economies across all sectors—and utilities will have foundational roles in these efforts. In turn, utility decarbonization goals require continued investments in several areas, including energy efficiency, demand response, and renewable energy resources; beneficial electrification; alternative transportation; and cyber protection as more technologies are added to the grid and the grid becomes more dynamic.

The electric grid is becoming more digital as utilities seek to balance clean energy goals with monitoring, controlling, and optimizing a growing number of distributed energy resources (DERs). Distribution automation—along with substation-automation and numerous other grid enhancements—requires utilities to improve the digital enterprise. Complicating matters, utilities are required to maintain safe, reliable, secure, and affordable service while contending with a greater share of electricity from retail providers and renewable energy resources, navigating increasingly frequent extreme weather events, and protecting themselves against rising cybersecurity threats.

Utilities are working to increase electrification in emissions-intensive economic sectors such as transportation and buildings. Moving toward an Advanced Distribution Management System (ADMS) can help utilities unlock the full value of grid enhancements and provide central visibility and control to a growing number of devices. This includes both front-of-meter (FTM) DERs, such as large renewable energy facilities and electricity storage, and behind-the-meter (BTM) DERs, such as customer-owned renewables, electric vehicles (EVs), and battery storage.

Increasingly frequent and extreme weather events are causing customers to think differently about how they get their energy and what products and services they're willing to pay for. Knowing what to do with the sheer volume of data being collected from customers is critical for utilities to manage and balance load and customer expectations.

More devices connected to the electric grid—and more data being collected—significantly increases exposure to cybersecurity threats. The expansion of high-speed broadband—as well as low-latency and wide-area networks—is critical to accommodate the data produced by these devices. For example, a large telecommunications network that includes an extremely complex field area network strings together vast amounts of data connected to homes, businesses, and energy service aggregators, all of which present potential risk vectors.

That said, these challenges and trends provide opportunities for utilities to build a more connected and resilient energy ecosystem. This report focuses on five major themes underpinning this ecosystem—DERs, alternative transportation fuels, broadband, analytics, and cybersecurity—and outlines key actions that utilities are taking or considering can take to ensure they stay ahead of the curve in 2022 and beyond.

◆ **CHAPTER 1**

Distributed energy resources

THE CHALLENGE

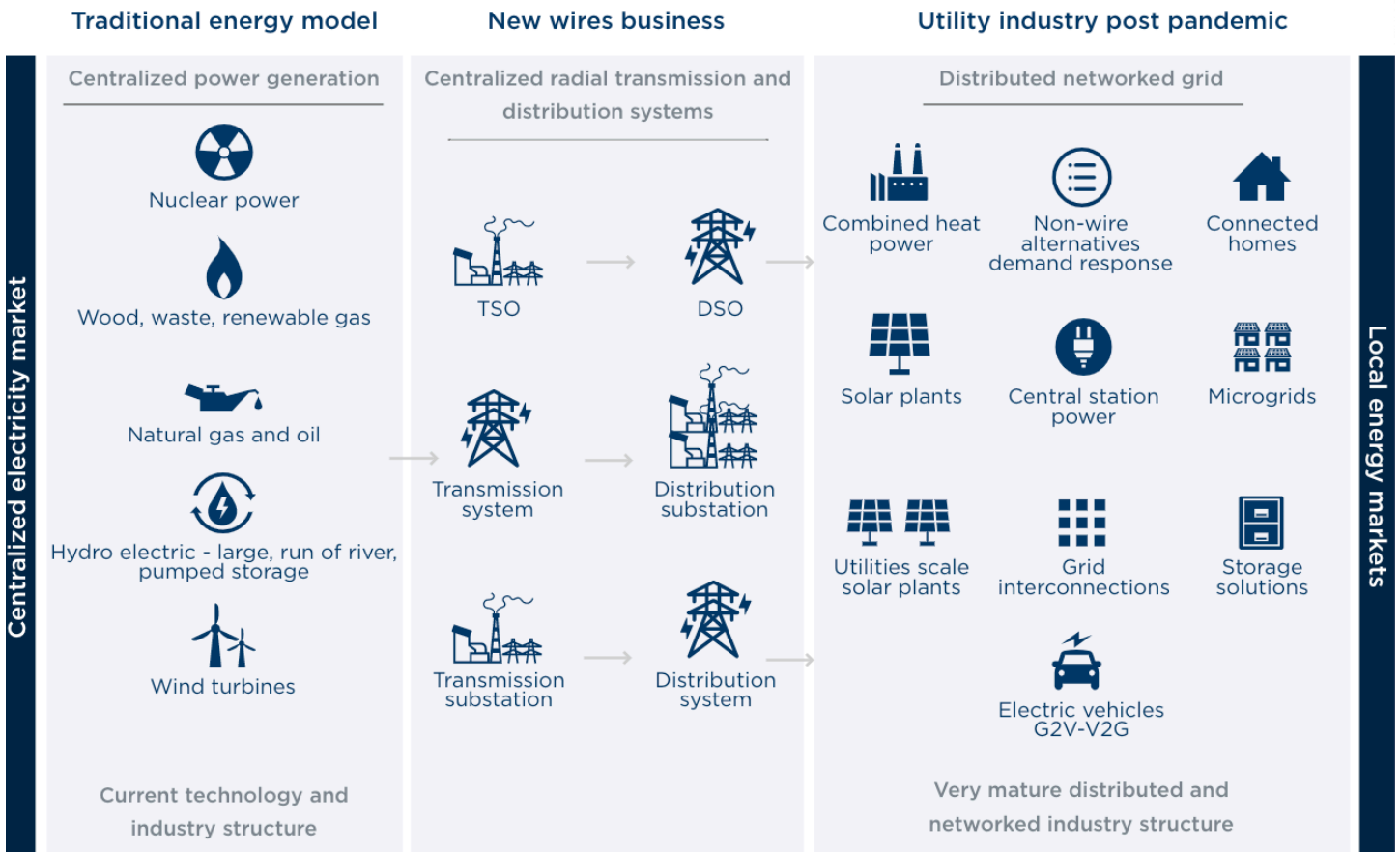
Widespread adoption of customer-owned DERs presents several challenges for utilities. The DER ecosystem is dependent on advanced software with system and data architecture and integrations necessary for operations and balancing loads. Utilities that aim to optimize grid operations need greater visibility into where DERs are adopted and how they perform.

Figure 1 illustrates the electric grid and the many changes it is undergoing, contributing to its complexity.

Utilities need better forecasting abilities to predict how solar photovoltaic (PV) systems perform when the sun doesn't shine or how much of the load might be displaced when it does. This requires highly skilled workers who understand the needs of the utilities and the tools needed for DERs to be tightly integrated into existing systems. Weather forecasting also applies to terrestrial and offshore wind, and other weather- and temperature-sensitive energy resources.

Changes to the traditional utility regulatory paradigm are needed to unleash the power of competitive

Figure 1: Flexible Electricity Model with Decentralized Grid Enabling “Utility of the Future”



Source: West Monroe | TSO: Transmissions System Operator | DSO: Distribution System Operator

TRENDS

markets and performance-based earnings incentives to spur DER technology and software innovations. DERs make the grid more complex and change the risk profiles of utilities, retail energy service and DER technology providers, and market aggregators. Changing regulations to respond to technology changes in the industry requires digital components to be added to utility systems—that also makes their business more complex. Thus, electronic equipment, broadband connections, and monitoring systems need to be secure, resilient, and reliable.

Utilities must balance capital investment and operations and maintenance (O&M) costs and adopt equipment and technologies in a manner that best serve customer needs while meeting reliability needs and regulatory objectives. Changes are expected as regulators shift from cost-of-service models to performance-based ratemaking. Utilities that previously relied on return on investment (ROI) and the full recovery of operations and maintenance (O&M) costs deemed prudently incurred by regulators will need to adjust to more competitive market and investment models for which performance is the primary driver of recovery.¹

DERs can contribute to generation requirements and be used as an alternative to traditional transmission and distribution investments in locations with service constraints. An increasing number of utilities are evaluating DERs as alternatives to traditional investment—often referred to as non-wire alternatives (NWA) or non-traditional solutions—to defer or avoid infrastructure upgrades. This is particularly prominent in states with regulatory mandates to include the identification of NWA opportunities as part of their [grid-planning processes](#).²

Only a fraction of NWAs has been implemented across the country. Proliferation of NWAs in the future can be driven by a combination of smaller localized needs where traditional investment is too large and costly, declining battery-storage costs to make storage more economical, and aggregation of energy efficiency and demand response resources.

Many utilities pursuing two-way power flows with more DER connections and net metering require greater flexibility to regulate energy flows and balance loads, ultimately saving costs for providers and customers alike.

TAKING ACTION

Progressive utilities embracing DERs as a means of achieving clean-energy and decarbonization goals are taking a more comprehensive view of the “DER lifecycle” and proactively planning to acquire the requisite capabilities necessary for dynamic grid integration. The following actions can help:

- Planning:** Utilities are undertaking comprehensive multi-perspective business case models to inform the design of customer DER programs. Such programs include DER adoption forecasts, load profiles, program pricing, use cases, benefits, costs, and revenue requirements. In addition, utilities can implement comprehensive DER enablement maturity models, which evaluate DER readiness by looking at planning, program design, customer engagement, interconnection, monitoring, dispatch, measurement, and settlement.
- Program development:** Developing DER programs entails an analysis of the DER business case model—specifically, the perspectives of adopting customers, ratepayers, society, and the utility itself—and current tariffs. Doing so enables utilities to design DER programs that optimize value for all stakeholders.
- Developer and customer engagement:** Utilities are providing web-based and standalone customer engagement tools to engage prospective customers. Such tools can help developers and customers evaluate the potential savings of adopting utility DER products and services. Our research shows that this helps spur market transformation, increases education, creates high-quality sales leads, and ultimately increases customer adoption.
- Enrollment and interconnection:** DER portfolio and program managers can monitor enrollment and interconnection through customer relationship management (CRM) and DER program application processing platforms. Such platforms are highly configurable and can be used to stay informed of industry best practices for safely interconnecting customer and third-party DERs onto the electric grid.
- Operations:** In addition to DER enablement maturity models—that can identify key capabilities necessary to monitor and control DERs—utilities are developing detailed requirements for DER management systems. Such systems offer overviews of event management and help with vendor selection. They can also provide the utility with notifications; evaluation, measurement, and verification; monitoring, control, forecasting, and reporting.

STRATEGY & PLANNING

Evaluate and plan for the integration of DERs in achieving utility goals

PROGRAM DEVELOPMENT

Develop mutually beneficial DER programs that exceed customer expectations

CUSTOMER ENGAGEMENT

Proactively engage customers with mutually beneficial DER products

DER INTERCONNECTION

Develop, evaluate, and safely interconnect customer-sited DERs

DER OPERATIONS

Harmonize customer and utility DER with electric grid to support all customers

◆ CHAPTER 2

Alternative transportation fuels

CHALLENGE

EVs will represent the largest increase in electricity sales alongside electric heat pumps for buildings as policymakers and regulators direct utilities to [support electrification of transportation and buildings](#).³ Thus, as the adoption of EVs and heat pumps increases, many utilities are concerned about their ability to influence where charging infrastructure and heat pumps are located and where and when transmission and distribution (T&D) systems require new infrastructure investment to meet increased demand.

Recent legislation, such as the [Infrastructure Investment and Jobs Act \(IIJA\)](#),⁴ has significantly increased funding for the [electrification of infrastructure](#),⁵ including \$7.5 billion for a [nationwide network for EV charging stations](#).⁶ Such investments are critical to [meet climate targets](#),⁷ and regulators have tasked many utilities with creating transportation electrification programs for customers and fleet owners alike. Electrifying transportation requires customers to adopt EVs and utilities are challenged with expanding customer outreach to demonstrate the benefits of electrification.

Hydrogen offers a transportable and storable solution to decarbonizing carbon-intensive transportation with hydrogen fuel cell EVs and hydrogen internal combustion engines for medium- to heavy-duty vehicles. The proof of concept for heavy duty fleets at scale needs to be demonstrated before refueling infrastructure is made available to service vehicles.

In addition, as new hydrogen suppliers enter the market, there will be a need for a highly flexible and integrated hydrogen transportation system to manage hydrogen across regions and support the rapid market scaling. Storage facilities can support the increased production

of green hydrogen through the generation of renewable power. Hydrogen is currently being blended with natural gas in power generation and end-use heating and cooking in some regions of the country to demonstrate its feasibility and study the impacts to the natural gas system at varying levels of blending.

TREND

Hydrogen is expected to play a key role in a net-zero future. It has significant potential to decarbonize industrial, residential, power-generation, and transport sectors. Regarding transport, several auto manufacturers are selling or leasing light duty fuel cell vehicles in select markets, primarily in California where some hydrogen fueling stations already exist. Hydrogen infrastructure is being installed in other locations around the country. For example, fueling stations are being planned or built in the Northeast and Hawaii, and fuel cell transit buses are already cruising the streets in cities such as [Boston, Massachusetts and Flint, Michigan](#).⁸ A New York utility is planning to blend green hydrogen in power generation.

We expect to see continued growth of local networks connecting green hydrogen production to industrial and transport users, particularly where compressed natural gas (CNG) networks can be easily repurposed for hydrogen use or where transport hubs can be established to decarbonize heavy transport or freight sectors. Regions with access to ports are ideally placed to pilot hydrogen refueling networks with the thousands of trucks leaving ports per day creating a ready-made hydrogen demand.

Many utilities are preparing comprehensive multi-perspective business case justifications and programs that support electrification and looking to assess fuel cell EVs.

Hydrogen fuel cell electric vehicles and the development of hydrogen internal combustion engines as an alternative to fuel cells could enable hydrogen to be used in medium- to heavy-duty vehicles. Regions near large industrial sites, large-scale gas storage, and offshore wind power will be well positioned for decarbonization through hydrogen. Hydrogen blending allows customers to familiarize themselves with hydrogen in their home as part of a transition to decarbonized heating. Multiple projects are already demonstrating the safety and equivalent customer experience of hydrogen blending and [100% hydrogen networks](#).⁹

TAKING ACTION

High-level hydrogen strategies can include programs to promote customer adoption of hydrogen EVs. Many utilities are preparing comprehensive multi-perspective business case justifications and programs that support electrification and looking to assess fuel cell EVs. For instance, many utilities are developing customer analytics capabilities to determine how EV adoption makes sense for rural, suburban, and urban customers.

Utilities can then shape transportation electrification programs. Such programs can provide guidance for fleet adoption, infrastructure costs that should be subsidized, new ownership and operational roles, qualifications for participation, what kind of data utilities need to collect and share, and which managed charging programs should be instituted. Once the program is developed to cover these points—and informed by customer feedback—the utility can account for equity concerns to ensure that people in disadvantaged communities aren't overlooked. With all these pieces in place, the utility could ensure that the program is in line with its own business model and aligned to regulatory directives.

Utilities can also work to develop “make ready” programs, which help set up operations infrastructure internally to [promote incentives for EV chargers or vehicle rebates](#).¹⁰ This is done by digitalizing the application and incentive rebate process. Utilities can leverage solutions such as Intellio® Connect, which is used to automate the application process and decision-making, maintain customer records, and integrate with asset and control systems.

◆ **CHAPTER 3**

Broadband

CHALLENGE

Utilities can help reach unserved and underserved populations with broadband by leveraging their infrastructure and data-service needs. On this point, much of the funding made available through the IIJA is directed at [providing affordable internet at scale](#).¹¹ Yet the challenge of expanding broadband in these communities is not always the lack of necessary infrastructure but rather the ability of customers within those communities to afford services. Utilities are uniquely positioned to address affordability by lowering the cost of entry for internet service providers (ISPs) to provide service into these areas through existing utility infrastructure. In addition, the IIJA includes provisions for affordability rebates for end customers, extending the [Emergency Broadband Benefit](#).¹²

Increased connectivity could also create new competitive environments for the adoption of DERs and fiber optic cables. In fact, the IIJA looks to be the first federally funded opportunity to open the door for regulated utilities to leverage the “middle mile”—the network infrastructure that connects customers to ISPs—to enable affordable broadband services through strategic partnerships with last-mile carriers. Historically,

regulatory and cross-subsidization concerns have largely kept this off the table. The IIJA will allow a regulated utility to use funds received from a middle-mile grant as a supplement to the core utility capital investment plan, with the intent of deploying into unserved and underserved areas as well as areas near anchor institutions, such as hospitals, schools, and community organizations.

As broadband connections have increased throughout the country, telecommunications companies have added increasing amounts of data, often requiring the speed offered by fiber optic cables. In this sense, utilities may be key in the expansion of broadband to underserved areas by offering excess capacity on existing networks to ISPs for meeting accessibility needs of underserved communities. Of course, the more components that are added to the internet, the more nodes created, and the more reliable it becomes as a source of data.

Accomplishing this won't be straightforward. Although the technology is largely in place to facilitate these changes—as the internet is designed to be modular—securing the necessary funding can be challenging. Regarding the IIJA specifically, funds for regulated utilities will be competitive.

For utilities, enabling high-speed broadband entails expanding communication channels to customers, including access to utility customer portals and online support, as well as the ability to offer smart in-home devices.

TRENDS

In supporting broadband expansion, previously underserved and unserved customers can leverage behind-the-meter smart devices, gain access to online utility customer portals, and participate in utility-sponsored energy-efficiency programs, helping support utility carbon-reduction initiatives. In turn, utilities can generate ancillary revenue streams that may lower customer electric rates, all while playing a critical role in driving economic development within their service territories and furthering broadband availability to unserved and underserved areas—helping to bridge the digital divide.

Regarding this divide, the COVID-19 pandemic has highlighted the needs of unserved and underserved areas. An increasing number of people have had to work and learn from home. As a result, the weaknesses of our country's broadband network have come to light. In fact, 23% of Americans without fixed broadband services at home have [fallen behind in recent years](#).¹³

The IIJA has directed \$65 billion toward the expansion of broadband services. For utilities, enabling high-speed broadband entails expanding communication channels to customers, including access to utility customer portals and online support, as well as the [ability to offer smart in-home devices](#).¹⁴ It can also help customers across

a socioeconomic range to access broadband-enabled tools, subsequently creating new communication channels for those most in need of these benefits.

The expansion of high-speed broadband, as well as low-latency and wide-area networks, is also critical to accommodate the data produced by increased DER devices. Monitoring and controlling DERs remotely occurs during short time frames for a large volume of devices. In this sense, telecommunication companies are the backbone for how utilities manage DERs.

When utilities build their operational communications networks, they can efficiently add capacity at a small and incremental cost. They can also potentially lease excess capacity as a wholesale supplier or, in some cases, run additional fiber to the home (FTTH) and provide internet and grid-based services themselves. As a result, better data speeds for unserved and underserved environments can be enabled by this increased necessary connectivity and bandwidth.

TAKING ACTION

Unique market conditions, individual utility capabilities, and current and planned utility fiber-deployment timelines range widely by utility. There is no one-size-fits-all solution to what a utility offers or how it would bring an offering to market. That said, there are a number of actions that utilities can take to clarify what a prospective utility offering might look like, or whether it can provide an offering at all.

To overcome the newness and complexities of a broadband offering, utilities should take a structured product-centric framework to build a well-defined market strategy. The existing fiber market is dominated by ISPs, carriers, and other service providers. To be successful as a new entrant, utilities should focus on areas in which they can provide the most demonstrable value, which will likely be in unserved and underserved areas and so-called broadband deserts.

A key to structuring agreements between utilities and wireless carriers is acknowledging that they have two different business models and primary service needs.

The business model for utilities by decree is that they have an obligation to serve all customers wanting electric service within a certain geographic region. Telecommunication carriers, however, are free to locate wherever they want and serve whoever they care to.

Even so, the final stage of the process—reaching customers—is the hardest part to get right. Substations located near central population hubs can help utilities provide third-party services or wholesale services to wireless carriers and they could even install wireless base stations near substations and distribute broadband to local communities.

As an example, Dominion Energy is working to create partnerships with ISPs to [provide broadband to rural areas in Virginia](#).¹⁵ The company's Rural Broadband initiative helps provide middle-mile fiber optic cable for ISPs to extend services into unserved communities, potentially reaching up to 500,000 unconnected Virginians. As a result, the company can provide ancillary services and the ability for their customers to communicate and participate in previously unavailable programs.



◆ **CHAPTER 4**

Analytics enablement

CHALLENGE

Data sits at the heart of digital products and platforms and is a critical component of every other trend discussed here. Data is essential to value creation as an asset—but not yet often treated as one.

Utilities are being buffeted with escalating demands from seemingly every stakeholder due to changing technological, regulatory, environmental, and societal factors. These compounding demands complicate traditional investment and operational decision-making, which requires more data and improved information across varying stakeholder groups. This would be challenging even if data and information were commonly understood and broadly available. For most utilities, it's not.

In response, many utilities are updating and cloud-enabling data platforms and hiring data scientists to address initial priority use cases like preventative maintenance or vegetation management. Indeed, these are important steps, and progress is being made on many fronts using a variety of technological capabilities and platforms. But these steps are insufficient for driving sustained value in a digital world.

Utilities applying advanced analytics face technological debt, years of paper field records, and inadequate processes managing data. It is commonly cited that more than 80% of “analytics” time is spent understanding (and often debating) the data itself, including its definition, quality, lineage, availability, and variance. Roles and responsibilities surrounding data stewardship are often misplaced or ill-defined. These two factors alone increase the time spent gathering, reconciling, and preparing data, which further inhibits the pace of analysis and action. The value creation opportunities range from the strategic, such as forecasting EV demand and introducing

hydrogen supply, to the operational, such as better ticket association for improved outage management and customer propensity for low income or alternative energy programs.

TRENDS

Three major trends escalate the need for enhanced utility analytics: (1) continued pace of technological advancement, (2) navigating the clean-energy transition, and (3) regulatory reporting requirements. There are trends shaping analytics across other industries as well from an analytics enablement perspective including the need for a chief data officer (CDO) or chief analytics officer (CAO) roles, need for formal data-fluency programs, and a sound and reasoned data governance structure.

Data processing and cybersecurity capabilities, combined with the capabilities inherent with today's sensors and meters, create the potential for a truly digital enterprise. Utilities are busy building the people, process, and technological capability to achieve this potential and to bridge the IT/ OT divide. But they still often approach it from a siloed traditional functional perspective, not yet treating data as an enterprise asset. As an example, meter data in the past was considered primarily for operations. Now, external third parties and internal customer experience teams are asking for it as well. From a technological and data perspective, analytic data products and accelerators are an increasing part of that landscape, from predictive analysis to consent management and disaggregation tools.

With the increase in clean energy demands, utilities have pressing needs for real-time monitoring and load balancing as well as long-term forecasting changes.

Third-party alternative energy providers are demanding more data to support their own marketing, planning, and data needs. Several states, such as New York, are mandating data exchanges whereby utilities must provide consistent data to be used by all stakeholders, from residential customers to alternative energy suppliers or regulators. They must also ensure security and proper consent management on these platforms. This is driving the need for improved data management and consistent definitions.

The newest emerging trend is with respect to regulatory demands. Pending SEC regulations call for all public firms to report their greenhouse gas impact. With other climate change regulations and the pending Build Back Better Act, the potential exists for a National Green Bank. This will create new financing vehicle opportunities, such as sustainability linked bonds. Unlike the traditional green bond, these funding vehicles require a specified level of operational performance in exchange for a lower interest rate. These regulatory trends will require reliable data with a defensible data lineage. Utilities have only begun to consider these broader future requirements that will put more pressure on their need for data savvy and data management.

Regardless of the individual driving factors, one truth is clear: Making sense of the emerging utility landscape requires a well-understood and well-managed set of data assets for the enterprise to enable analytics. Data fluency is the ability to cultivate and use data responsibly and effectively to guide decisions and actions to achieve business goals. The investments in enterprise data and analytic enablement require upskilling of employees from customer service to field operations.

In response, many utilities have formed analytics centers of excellence, though they vary in structure and approach. Many have not yet addressed the operating model and data governance components synergistically with their technology and data scientist investments to ensure sustained value creation. We have seen a four-fold increase in the number of firms requesting formal data governance program assistance with master data management across all industries. The collective requirement for creating analytics enablement is driving the rise of CDOs and CAOs. 73.7 percent of large firms across industries have designated CDOs or CAOs, both combined into one role. We expect this trend to gain [traction this year in utilities.](#)¹⁶



TAKING ACTION

Enabling analytics long term requires a concerted strategy and approach that is executive-driven, multi-disciplined, and cross-functional. Utilities can take a note from other industries and create a three-to-five-year data and analytic strategy that encompasses the business strategy based on the macroeconomic forces at play.

The diagram below highlights our view of the four components required to enable analytic maturity for sustained value creation:

We defined four key components of data and analytics maturity to support DEA's capabilities

OPERATING MODEL

- Strategy & Approach
- Culture & Leadership
- Organizing Architecture
- Capability Management
- Processes



MODERN DATA PLATFORM

- Architecture
- Integration
- Technology & Operations
- Cybersecurity



DATA GOVERNANCE

- Data Governance Foundations
- Data Quality
- Metadata Management
- Master Data Management
- Data Privacy



INSIGHT & VALUE

- Performance Management
- Advanced Analytics (Includes AI/ML, third-party sharing)
- Value Realization
- Self-Service



- **Operating model:** Consider a CDO to elevate the role of data to the status of enterprise asset. Define a data literacy or fluency program to upskill workers. At an MIT CDO event, data fluency was the most frequently raised discussion topic and most common barrier to value realization.¹⁷ Without employees' ability to understand, make sense, and work with the data, technological investments fall flat.
- **Data governance:** Formalize it. Long-term analytics enablement is not possible without significant improvement in data management so that employees can have confidence in the decision-making process.
- **Analytics and insights:** Prioritize your use cases and select a few to start that have high synergy with business strategy, create clear value, and where the data is believed to be of sufficient quality and availability to achieve success and build confidence.

- **Modern data platform:** Ensure that your platform is cloud-enabled, secure, and capable of real-time data streaming and effectively serving data at the speed required based on the use case. Mature your capabilities of serving data to third parties and ensuring they have the security controls to share data with you.

A well-defined road map with an incremental approach to enabling analytics capability is key to sustained value creation. Successful utilities recognize that the change demands enabling data as an enterprise asset at the heart of digital.

◆ CHAPTER 5

Cybersecurity

CHALLENGE

Three primary challenges affect the cybersecurity of utilities: sharing data across IT and OT functions; increasing regulatory requirements; and supply-chain security.

On these points, much of the work in the energy sector can be done remotely from a control center. The risk, of course, is that bad actors can gain access to that control center. As the Colonial Pipeline cyberattack confirmed, the ability to isolate critical infrastructure and operations from the often more vulnerable IT networks is critically important for operational resiliency.¹⁸ In fact, it's a matter of national security.¹⁹

Utilities are faced with undertaking the journey from their current organization to mature network segmentation, which divides various segments and enables compensating controls. Utilities must be able to communicate with and analyze data from OT environments. The ability to dynamically isolate and protect critical systems in the event of an attack is the defining feature of the resilient utility of the future. The challenge, however, is in balancing the business needs that require data from OT systems, with the need to protect critical infrastructure and isolate the grid and OT systems from the outside world, such as EMS, ADMS, and Gas SCADA.

As utilities continue to digitalize and explore the impacts of shifting toward the cloud, and as customers increasingly adopt EVs, the threat of cyberattacks has changed. More points of connection to the grid mean more points of entry. The industry has seen a rise in more sophisticated ransomware events targeting critical infrastructure, which has subsequently heightened regulatory compliance obligations.²⁰

Another key challenge is the number of digital components proliferating throughout the electric grid. Most of these components are manufactured and managed by several third-party vendors. These vendors can present challenges when security standards across the supply chain are disparate, which provides an exploitable weakness to the utility network.²¹

As an example, if a utility puts a device in the field, the telecom company that built the router might have 10 or even 50 component suppliers (i.e., chips, boards) that could potentially have an exploitable backdoor. Validating the supplier equipment and manufactured components is critical to ensure they meet security requirements. The challenge is further compounded when you consider third-party vendors and suppliers serve hundreds of utilities that often have disparate standards and security requirements to manage risk to the supply chain. Proper compliance requires significant investment, standard processes, and resources with high levels of technical competence.

Proper compliance requires significant investment, standard processes, and resources with high levels of technical competence.

TRENDS

Although the exact details of the Colonial Pipeline attack are still unknown, the overwhelming consensus is that hackers targeted the IT systems, which resulted in the company shutting down the pipeline for the first time in its 57-year history. If this is true, had Colonial had the capability to first isolate the IT and OT systems, the company could have kept gas flowing while continuing to triage the issues through response and recovery processes. Another example is the Oldsmar security breach, in which an out-of-date operating system and software were exploited to [allow unauthorized access to critical safety controls](#).²²

The impact of these events, among others, has led to two areas of focus: isolation enablement and third-party risk management.

Many utilities are looking to segment and isolate their systems to enable resiliency. Physically segmenting and isolating critical systems from both the outside the world and other areas of the organization improves resilience by mitigating the systemic impact of any breach. For example, if bad actors breached an aspect of a utility's control system, it would already be segmented and the threat could be immediately isolated. This approach to segmentation allows a breach to be isolated while preserving holistic system health.

On the second point, utilities can be impacted by a third-party security event that doesn't include a direct connection to the utility. For example, a construction company building a new substation for a utility could accidentally download ransomware. As a result, the construction of the substation could be delayed or even indefinitely postponed. The bottom line: if a service provided is compromised, the utility is also impacted.

TAKING ACTION

Utilities ultimately should aim for adaptive, dynamic controls of the grid and systems. This means ensuring critical systems are isolated, that they're in place to protect against the entire kill chain, and that they can be "throttled" to achieve balance between operations and security based on threat intelligence.

Some utilities adopt a zero-trust perspective (Figure 2). This perspective is based on the philosophy that utilities should not automatically trust any users or devices inside or outside its parameters.

Security is more than a check the box task. It is a culture shift that requires both technical and organization change management. To limit risk, it is crucial to:

- **Think resilient:** A major piece of a company's cybersecurity strategy and road map should be how the IT and OT departments interact. Both should strive for technical isolation yet more collaboration among the teams from a monitoring, response, and governance perspective. With the increased digitalization of the grid, the operations system is becoming less distinct from the IT system and vice-versa. In fact, many CTOs and CIOs are in the process of merging their IT and OT systems. As digitization comes to fruition and data volume proliferates, it's becoming increasingly difficult for utilities to manage solely on the OT system. They now need visibility into both systems at the same time.

Figure 2: Zero Trust Architecture Journey



- **Build resilient:** Utilities will need to create governance around third-party partnerships, secure components added to systems, and share that data with their peers. For example, if a utility validates that a certain type of phone is approved for use on its grid, then this information should be shared with other utilities so they don't have to do that for themselves, considering they all basically adhere to the same security requirements. That said, standards need to be created and shared for this to happen.

- **Practice resilience:** The next step is putting together an incident response plan. With all these disparate components and devices being connected, a security breach should be considered an inevitability. Remember, It's when you get breached, not if you get breached. When a breach does occur, utilities will need to have plans in place to isolate and operate the grid at its core capability—essentially a “safe mode.”

CONCLUSION

Utilities and the grid need to be digitized to understand, adapt, manage, protect, and provide robust, resilient, and clean energy to customers. As the broader energy ecosystem evolves, disruptions will occur across the utility with its people, process, and technology. However, utilities are synonymous with resiliency. They will take hold of this opportunity to reinvent the grid and continue providing safe, reliable, and affordable service for all.

ABOUT WEST MONROE

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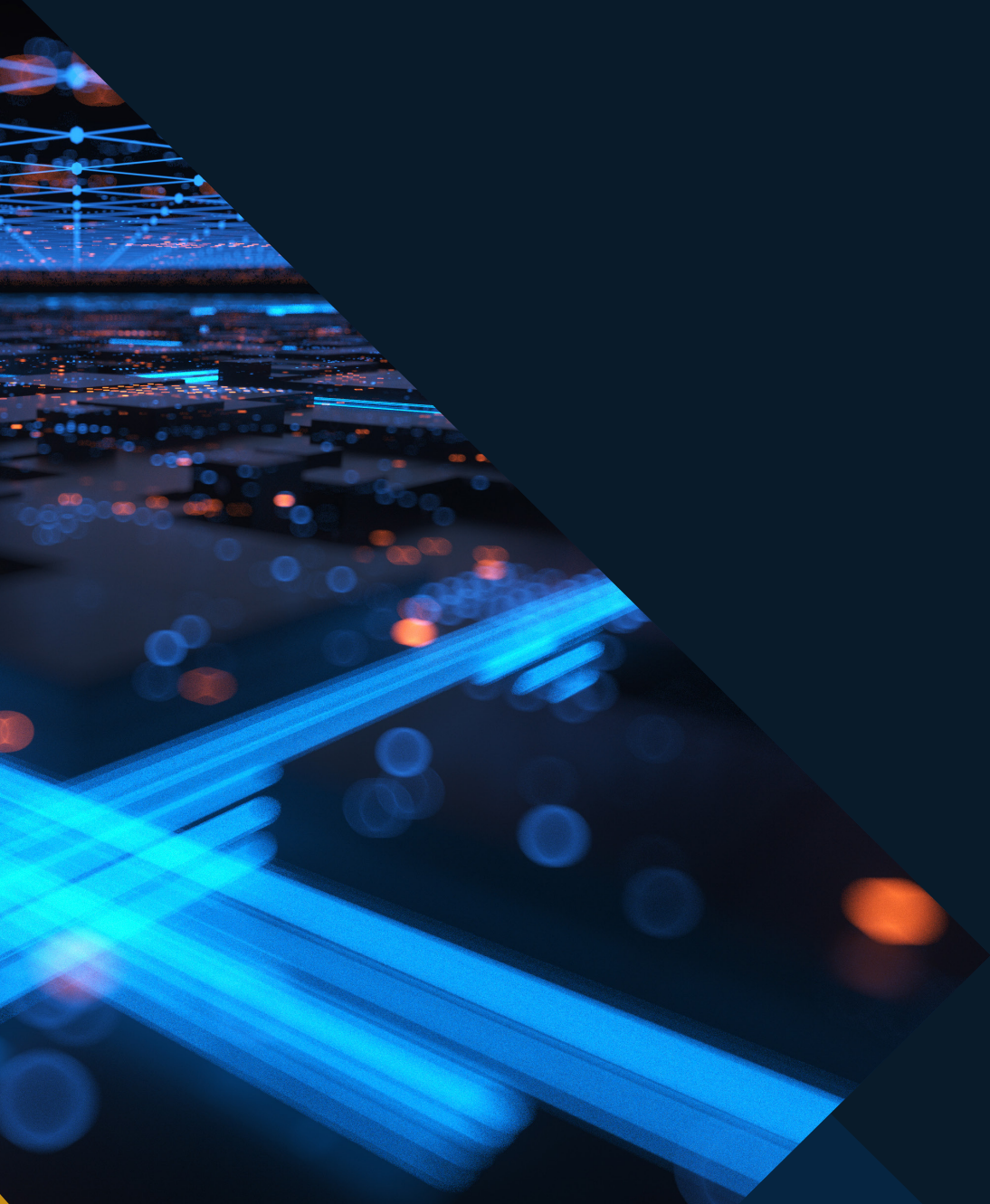
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