Leveraging the Cloud for a Resilient, Secure, and Customer-Centric Utility

aws

Introduction

Utilities are grappling with the three Ds: decarbonization, decentralization, and digitalization.

While the first two Ds are being driven by a combination of internal and external forces, leveraging the full potential of digitalization – powered by cloud computing capabilities – must be driven from within the utility.

The pressure to change isn't new, but it is growing. Plunging renewable energy costs have led to exponential growth, and Wood Mackenzie forecasts an additional 3 terawatts of wind and solar deployments worldwide through 2040.

Three Trends Driving The Energy Transformation

Decentralization

Decarbonization

Digitalization
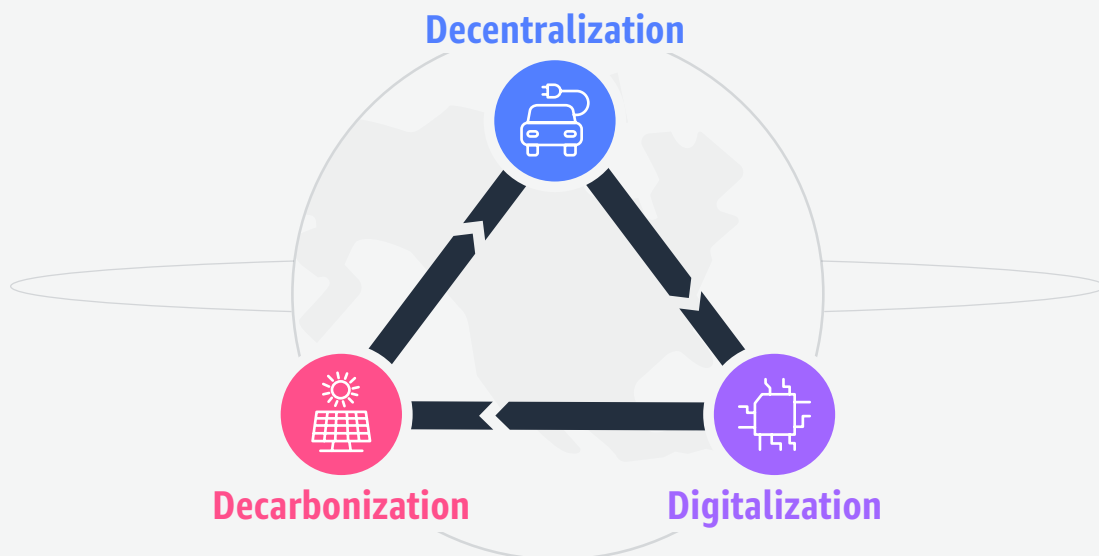
Source: AWS

Global Wind & Solar Capacity Outlook (GW)
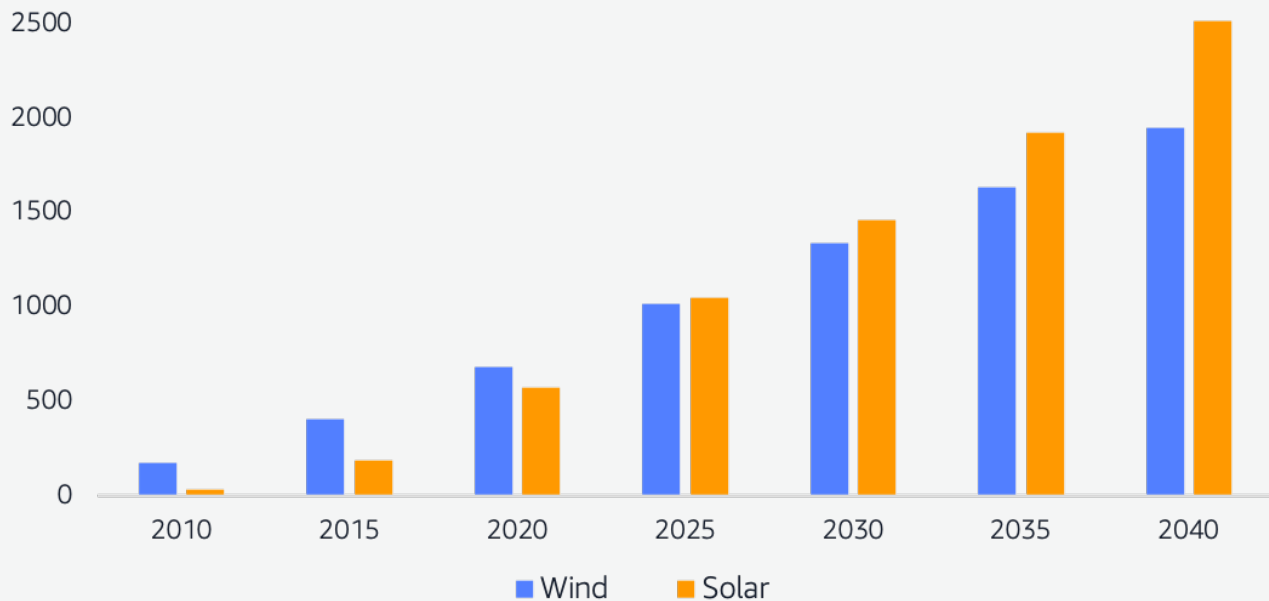
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Aggressive policies are accelerating the trend of decarbonizing the electricity grid with a focus on low- and no-carbon fuels. More than 65 countries, along with 150 cities and seven states in the U.S., have set 100 percent renewables targets, according to global renewable energy group REN21, and that number is steadily climbing.

Decentralization of the grid is advancing alongside decarbonization as distributed energy resources such as solar, battery storage, and electric vehicles – and the flexible software platforms to make them all dispatchable – mature.

If utilities don't move quickly to meet customer demands for decarbonization and decentralization, emerging competitors such as customer-owned distributed energy, community-choice aggregators, and community solar may meet these demands instead, resulting in baseload losses and retail customer attrition.

The Cloud Journey for Utilities

Today, cloud-based applications are ubiquitous in our daily lives. However, while nearly all utilities use the cloud for IT operations to some extent, there are transformative new opportunities the cloud can offer utilities to optimize IT/OT costs and enhance resilience and security. Utilities taking a cloud-first approach can benefit by:

- Building IT/OT integration capabilities
- Leveraging distributed energy resources to quickly assess and capture new market opportunities
- Devising more effective customer engagement tools, including utilization of voice services

As the leading cloud provider, AWS delivers 88 percent higher energy efficiency than on-premise data centers, and AWS is moving steadily toward achieving Amazon's company-wide goal of using 100 percent renewable energy by 2030. With the cloud, every utility can embrace its innovative potential and achieve the three Ds while simultaneously improving resilience, security, and customer satisfaction in a fast-changing world.

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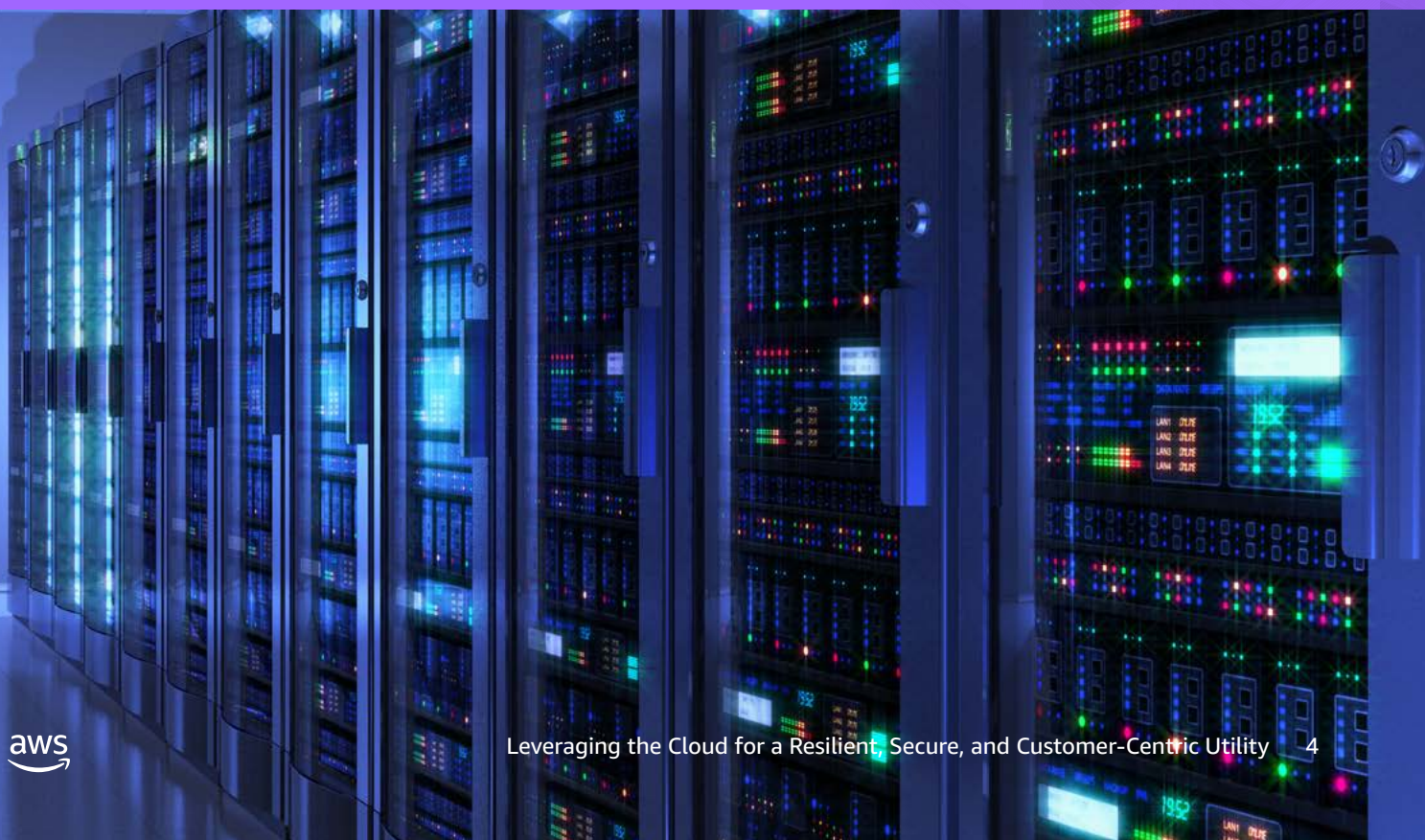
1 The Elastic and Resilient Utility

Utilities are being asked to innovate at speeds never seen before. For some, that means embracing new models to account for a new mix of resources whose capabilities and costs are changing rapidly. It also means adaptation in the face of climate change, which is one driver of extreme weather and natural events such as intense storms and wildfires.

The decarbonized, distributed grid offers its own unique set of challenges, but it also offers new solutions to all of these challenges. In addition to integrating intermittent renewables at ever-higher penetrations, utilities must also be poised to incorporate thousands and potentially millions of behind-the-meter assets, including batteries, electric vehicles, and "smart" homes and businesses, on a near-real-time basis.

Digitalization can unlock this potential, but traditional utility systems may not be equipped to provide the required scale and flexibility. Scaling from hundreds to millions of assets that must be monitored and coordinated requires advanced data ingestion and compute capabilities, and these needs will vary by orders of magnitude between blue-sky days and emergency peaks. Attempting this with on-premise systems would result in expensive overprovisioning that would still be insufficiently agile to meet fast-changing needs.

The cloud allows utilities to harness unlimited elastic computing resources that can spin up and down in seconds, as required by changing grid conditions or innovative new programs. For example, this elasticity is allowing Portland General Electric to quickly build outage management and communication systems that can scale immediately when a storm hits, enabling them to keep customers informed of grid status and minimize outage times.

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The cloud also enables transformative IT/OT integrations that harness data-intensive machine learning, artificial intelligence, and digital twin approaches. A few years ago, global utility Enel moved more than 10,000 servers in 30 countries to the cloud in nine months. Now, Enel uses cloud-based predictive maintenance for its 30 million smart meters and 16,000 substations to digitally model assets and prevent failures before they occur. Similarly, outage prediction modeling anticipates the likely impacts of an approaching storm and enables utilities to harden key assets and position repair crews to minimize risk and downtime.

The AWS ecosystem offers tools customized for a utility's specific geography, assets, and even personnel. Utilities are using machine learning and AWS Textract to analyze decades' worth of handwritten maintenance records, along with analysis of voice and video recordings of repair training from long-tenured personnel. These capabilities allow them to convert irreplaceable institutional expertise into asset-specific insights as staff retire.
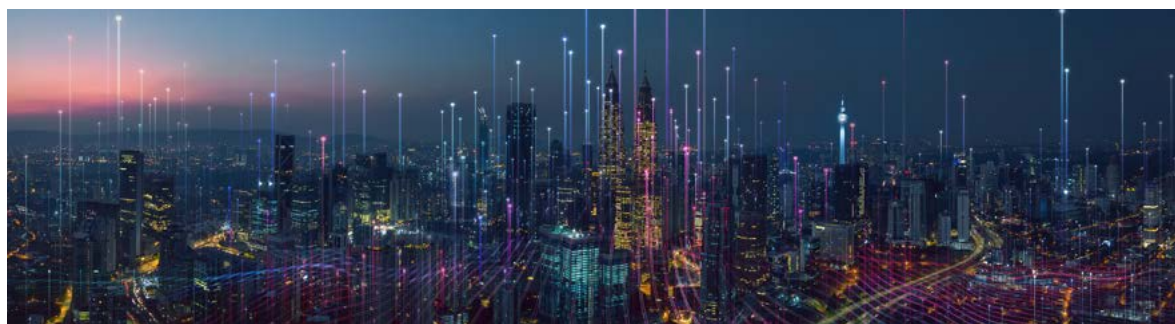
The elastic compute power of the cloud empowers utilities to innovate across all areas of their business, allowing them to spin up initiatives, determine whether they work, and deprovision them if they don't. This level of flexibility is increasingly important as regulators look at performance-based ratemaking, which ties revenue to specific performance metrics and requires that utilities rethink how they deliver services.

In the U.S. alone, 19 states and Washington, D.C. have seen recent legislative and regulatory developments related to performance-based ratemaking in 2019. By saving on IT spending with a cloud-first approach, utilities can reallocate precious resources where they're most needed to enable IT/OT transformation.

2 The Secure Utility

Security remains the top priority of utilities, regardless of where they stand on their cloud journey. The increased number of assets in a decentralized, distributed grid and the digitalization required for coordination increase the complexity of utility networks and change the threat landscape. AWS customers can achieve equal or more stringent security in the cloud as they can in an on-premise environment.

All sectors for which security is critical, including finance, healthcare, and government, are increasingly relying on the power of the cloud to help manage their business and security objectives. Because the cloud is built to meet the needs of such risk-sensitive entities, every AWS customer inherits rigorous security controls that are regularly tested and validated by independent auditors.

For utilities, AWS and its security partners offer cloud-based services to meet key requirements including identity and access management, data privacy protection, patching and vulnerability management, security event monitoring, and incident response. With data centers in multiple geographic regions, AWS also offers a much higher level of resilience and system recovery than can a single on-premise data center. Physical security is ensured by strict access controls to AWS data centers.

AWS has also been certified for thousands of international security requirements, including critical data security standards such as FedRAMP, ISO 9001, ISO 27001, and GDPR. The superiority of cloud-based approaches for meeting emerging cybersecurity threats is also recognized by regulators. The U.S. Federal Energy Regulatory Commission has noted that the cloud "can yield security benefits by allowing the entity to focus on more complex issues in-house and to optimize their security resources."

Examples from around the world show that utilities are gaining confidence in cloud security. Innogy, now part of E.ON, is one utility that has successfully moved even its most sensitive data to the AWS cloud. When its on-premise data center had to be shut down due to flood risk, AWS enabled it to securely migrate its data to the cloud in a matter of weeks rather than months while meeting all relevant data protection regulations.

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In Australia, Woodside Energy installed more than 200,000 equipment sensors connected to the AWS cloud IoT service and optimized asset maintenance as a result. Vector, New Zealand's largest electric and gas utility, deployed a cloud-based distributed energy resource management system to support the utility's goal of reducing its reliance on non-renewable energy and shifting toward a more flexible approach to distribution management.

Working with AWS also means that utilities don't have to face security challenges in a vacuum. AWS collaborates closely with customers on security using a "shared responsibility model," where AWS is responsible for the security "of" the cloud while allowing customers to maintain control over their security "in" the cloud. AWS also offers services, user guides, and other resources tailored to utility needs, simplifying the process of achieving security objectives.

3 The Customer-First Utility

Utilities in both regulated and deregulated environments are eager to embrace customer-first business capabilities. With advanced metering infrastructure now covering more than half of the meters in the U.S., utilities have an unprecedented opportunity to use this data to improve energy efficiency and demand response offerings.

By starting with core programs such as energy efficiency and bill payment, utilities can create new touch points with residential customers by offering proactive, engaging offerings that sit in the cloud. For customers, these provide the potential to save on electricity bills while adding comfort, convenience, and environmental benefits. For utilities, these offerings can boost customer satisfaction and loyalty while facilitating integration and control of distributed energy resources, giving them a valuable new flexible resource for grid-balancing or cutting call-center costs while improving the customer experience.
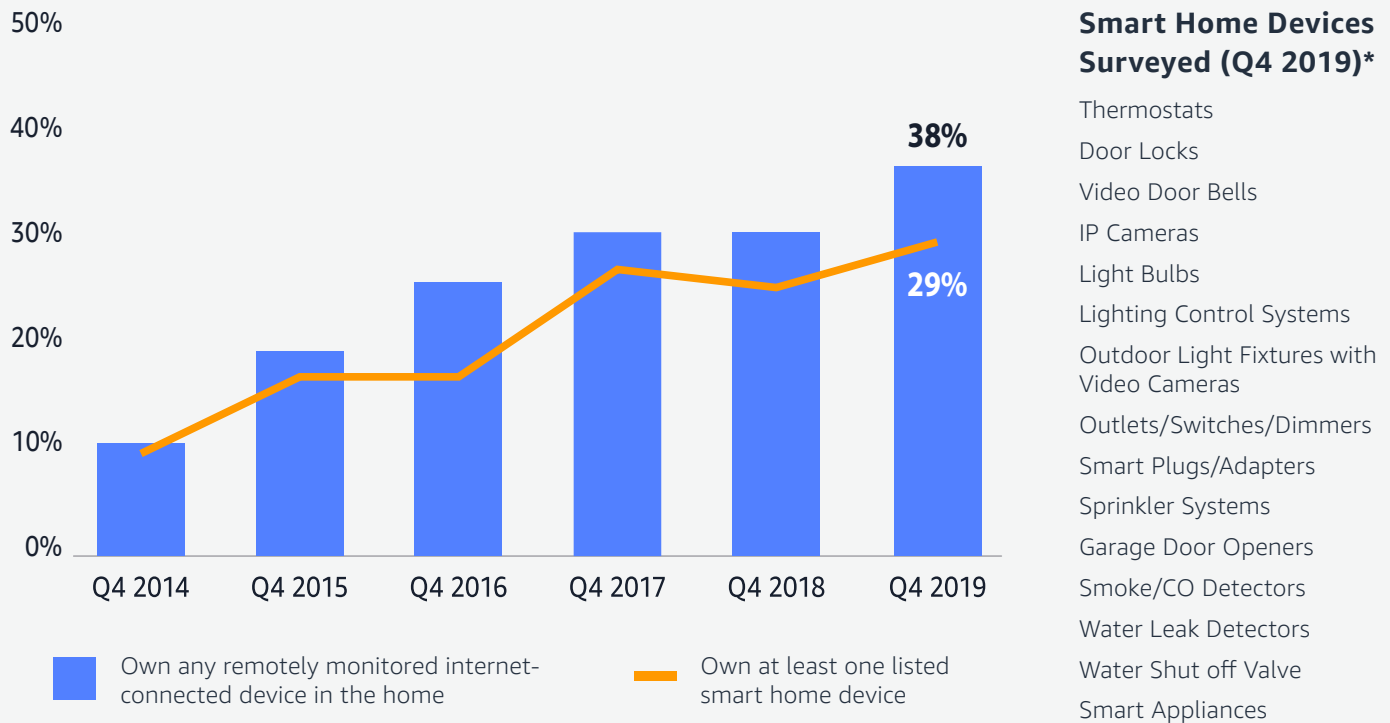
In the case of demand response, scaling from hundreds of commercial and industrial program participants to potentially millions of residential customer assets requires the data ingestion and IT/OT integration enabled by elastic compute capabilities – but that's not all. This undertaking also necessitates a more engaging customer experience that makes participating in these programs easy and renders the benefits easy to understand.

Utilities have an intuitive new channel to tap customers: voice assistants, including Amazon's Alexa device. Smart speakers like Alexa are part of a growing ecosystem of smart home devices that encompass home security, comfort, and convenience. A total of 36 percent of U.S. broadband households now own a smart speaker with a voice assistant, and 28 percent of U.S. broadband households own at least one smart home device to manage energy, security, or household appliances, according to market research firm Parks Associates.

Because voice assistants can control other smart home devices including lighting, thermostats, appliances, and even battery and EV charging, this can be a powerful medium via which utilities can offer customers a range of innovative energy services.

Smart Home Device Ownership (2014-2019)

Among All US Broadband Households

38%

29%

Smart Home Devices Surveyed (Q4 2019)*

Thermostats
Door Locks
Video Door Bells
IP Cameras
Light Bulbs
Lighting Control Systems
Outdoor Light Fixtures with Video Cameras
Outlets/Switches/Dimmers
Smart Plugs/Adapters
Sprinkler Systems
Garage Door Openers
Smoke/CO Detectors
Water Leak Detectors
Water Shut off Valve
Smart Appliances

■ Own any remotely monitored internet-connected device in the home

— Own at least one listed smart home device

Source: © Parks Associates. *This list of devices has changed slightly over the years to include new products.

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For example, New Jersey utility PSE&G's Alexa skill allows homeowners to pay bills, report outages, review usage, schedule service, and get energy tips via voice. In Italy and Spain, Enel X offers Homix, an Alexa-integrated smart home device that lets homeowners use voice to control smart thermostats along with lighting and home security systems. Centrica offers its U.K. and Ireland customers Hive, a range of connected home devices, software, and services.

Other AWS-enabled utility demonstration projects allow homeowners to set thermostat and lighting preferences simultaneously just by saying "Alexa, I'm home" or "Alexa, I'm leaving." More impactful demand response is also possible; imagine using voice to offer millions of customers a financial incentive to turn down their air conditioning by 2 degrees during the peak of a heat wave.

Being able to opt in to demand response actions with a simple "yes" could dramatically increase uptake compared to web or smartphone channels. Such actions will become increasingly impactful as EVs become more common, which could pose a major challenge to the grid if their charging is not coordinated – and which could emerge as a major asset if they are.

Customer-first energy offerings can leverage Amazon's "working backward" approach, which starts by envisioning the ideal customer end state and uses this goal to guide product development. AWS shares Amazon's customer-obsessed DNA and works closely with its utility customers to create engaging energy offerings using voice and other channels that bring them closer to their customers.

4 Innovating Confidently Within the Cloud

When envisioning the ideal end state for utilities – resilient, secure, and customer-first, while operating a decarbonized and decentralized grid – the power of cloud-based digitalization is essential to fully realize that vision. For utilities around the world that are navigating toward this same ultimate destination, each will take a different path on their cloud journey. What they have in common is that it can likely move faster and deliver innovative results in a shorter timeframe than they anticipated by embracing the cloud as so many other highly regulated, essential industries have done.

Each utility's cloud journey is shaped by its regulatory drivers and constraints, its generation portfolio, the geography of its territory, its business culture, and its technology development capabilities. These determine specific objectives and priorities, as well as preferences for using third-party cloud services versus building cloud-based applications in-house.

Leveraging the Cloud for a Resilient, Secure, and Customer-Centric Utility

For each unique utility customer, AWS and its ecosystem offer the services, resources, and partnerships they need to innovate and move forward confidently toward their own version of a decarbonized, decentralized, and digitalized future.

Visit **AWS Power & Utilities** to learn more.