

Energy Utilities on the **Digital** **Front Line**

Equipping Utilities for Success in
the New Energy Landscape

For over a century, the electric utility industry has been providing a service that touches every person in North America. Indeed, this electric service is the foundation upon which modern society has been built.

Now, however, the electric utility industry is undergoing a fundamental shift in how its product is made and delivered to end-use customers of all types. Simultaneously, these customers – residential and commercial & industrial (C & I) – are changing. They are embracing the ever-expanding range of choices from alternative and renewable energy sources and providers while leveraging digital technology to better understand their energy usage and needs. A new relationship between the customer and its energy provider is emerging. Indeed, today's energy customer is an active participant in energy management, partnering with the utility to realize energy and cost savings as well as meeting sustainability challenges.

These major shifts in the energy landscape call for a corresponding shift in how the utility operates and engages with its customers. These shifts dictate that digitalizing the utility is a must. A digital utility platform will enable the seamless coordination of new energy sources, manage assets to ensure reliability, and make a leap forward in the utility-customer relationship. As information and examples in this paper will demonstrate, an enterprise digital platform is now an imperative for utility business viability in this dynamic new environment.





The Confluence Is Happening Now

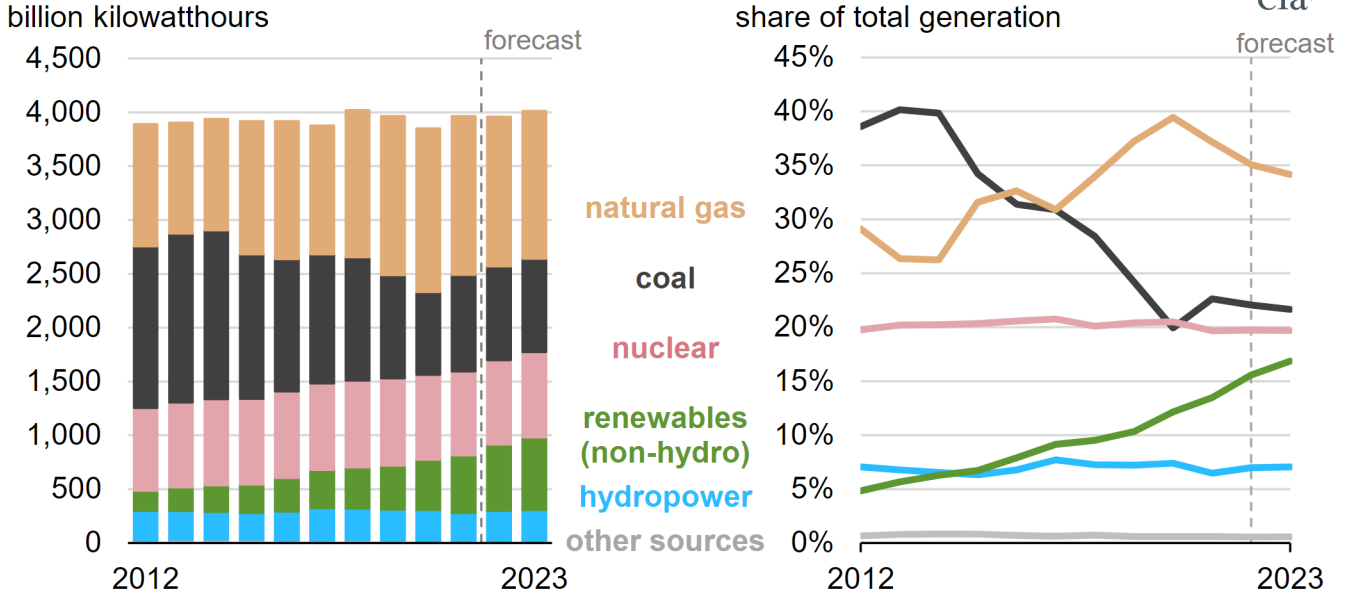
It is worth a brief exploration of the confluence of technical, environmental, customer, and regulatory/legislative changes that has resulted in today's energy landscape.

First, some notable technical capabilities today simply did not exist just a few years ago. Massive improvements in computing power per computing dollar, coupled with advances in analytics and artificial intelligence, have created opportunities for utilities to develop new ways of doing business, from how electricity is generated and delivered to ways the customer is engaged. Consider the power of AI today and utilities' progress toward embedding AI into their core business. While 35% of businesses today use AI (Source: [Tech Jury](#)), energy and utility companies represent only 3% of business users (Source: [O'Reilly Media](#)). Utilities are at the tip of the iceberg in terms of leveraging their digital infrastructure and employing AI for business benefits.

With the need for leveraging new technology comes the need for securing this intelligent infrastructure. The U.S. Department of Energy (DOE) has named energy as one of the 16 critical infrastructure sectors so vital that "their incapacitation or destruction would have a debilitating effect on security, national economic security, and national public health or safety" ([U.S. DOE](#)). Whatever a utility does in the digital realm – from one-off use cases to enterprise applications – cybersecurity is a must.

In terms of environmental and climate concerns, utilities continue to move towards a growing percentage of renewable energy sources in their generation mix, and this growth will only continue. Figure 1 charts the progression of renewables to becoming the #2 fuel source in the United States.

Annual U.S. electric power sector generation by energy source (2012–2023)



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, January 2022

Figure 1. Annual U.S. electricity generation from all sectors, 1950 – 2020 (Source: [U.S. EIA](#)).



This continued and accelerating growth of renewables, driven by climate and sustainability goals, demands that utilities move toward more predictive and real- to near real-time operations to maintain grid stability and reliability, again underscoring the need for a digital platform.

Simultaneously, utility customers are becoming more sophisticated, demanding more and better information about their energy usage and costs as well as becoming active energy participants in step with the growth of distributed energy resources (DERs) across all customer types. Researchers at [Wood Mackenzie](#) report that DER capacity, which was 264 gigawatts in 2015, will grow to 387 gigawatts in 2025. Digitalization is a requirement for managing customer engagement and operating DERs in coordination with the grid.

Finally, the regulatory and legislative picture is part of this confluence of new conditions now driving the utility industry. Renewable portfolio standards have been promulgated by state public utility commissions (PUCs), and significant legislation at both the state and federal levels providing hundreds of billions of dollars in funding for DER deployment and other components of the new energy environment. These regulatory and legislative drivers are not to be overlooked as the energy transition advances.



The Time for Choice Is Also Now Upheaval or Transformation?

With its investments in intelligent infrastructure over the last two decades, the utility industry is poised to meet the challenges that lie ahead in a digitalized, distributed, customer-centric energy landscape. However, what got the industry this far will not be enough for what lies ahead in a world where the data will become as valuable as or more valuable than the electrons. Growing the utility's digital and data/analytics capabilities lies at the core of how the industry will meet these new challenges. Following are examples of the dynamics that will shape the utility space in the coming years and why embracing a digital platform strategy is key.

The Digitalized Customer

Many utilities are making pronouncements about “putting the customer first” or “putting the customer at the center of all we do.” For an industry that had ratepayers for decades, this shift is a welcome one, but it is just a start. Today's and tomorrow's utility customers have different requirements and expectations in both the C & I and residential segments, and in both segments there are new competitive forces driving utilities to change their customer strategies.

In the C & I market, customers are turning more and more to third-party providers for their energy and energy services. This trend can include contracting with third-party renewable energy providers, building their own renewables on-site, or perhaps most likely, developing on-site microgrids to improve reliability, meet power quality needs, and ensure higher reliability and flexibility in their energy use. Each of these examples represents competitive challenges that the utility needs to meet (and beat!) to sustain its business.

The Strategic Response

Imagine a utility with the capability to bypass the C & I customer's journey with third parties. What would this look like? First, it would offer a digital presence that can leverage insights on a facility's energy needs, scheduling, and pricing. Second, the availability of renewable energy sources is foundational to addressing the new demands of C & I customers. Ways that these needs can be met include partnering with the C & I customer to provide customized energy programs that enable capabilities like smart charging of electric vehicle (EV) fleets, deploying dynamic power management in plants and facilities to minimize energy costs for non-essential equipment and processes, and designing energy storage programs that ensure reliability and resiliency during critical events. All of these scenarios require a digital platform to manage and coordinate operations in a real- to near real-time environment.



The residential customer's profile has also changed significantly, from being a passive consumer of a utility's product to becoming an active participant in the energy landscape. These customers also expect their utility to engage and communicate with them digitally like many of the other services they use on a regular basis (shopping, banking, and entertainment, to name a few). The expectations go well beyond simply receiving a monthly bill.

The Strategic Response

An enterprise digital platform provides the utility with a 360-degree view of the customer. This capability can include using energy consumption and payment histories to offer customized energy programs on a mass scale, like demand response, energy efficiency, EV charging, and net feed-in programs. This improved real-time information on energy usage and payment can come with automatic recommendations for energy savings. The same platform can also manage and coordinate DERs to ensure grid reliability and manage emerging distribution-level energy markets.

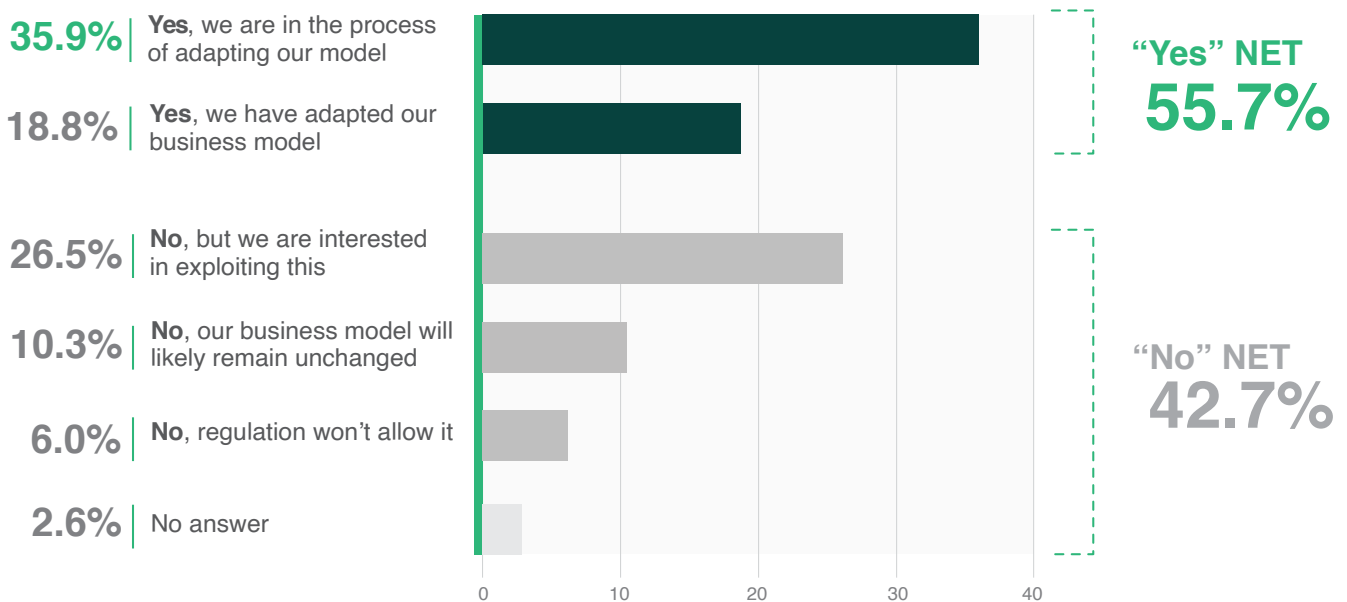


Figure 2. Utilities adapting their business model to the DER-rich future (Source: [Black & Veatch](#)).

Digital Operations and Asset Management

The advent of the smart grid over the last 15 to 20 years has provided a digital information and communications infrastructure that has opened the door to predictive operations and other insights that enable improvements in grid and asset reliability and resiliency.



The use cases that leverage this infrastructure have grown as utility operations staff have discovered new ways to use the data being generated. Taking traditional supervisory control and data analytics (SCADA) controls and monitoring, as well as legacy asset management processes and systems, into a more digitalized operating environment creates opportunities for improving established operating paradigms and encompasses some of the new demands on the grid today. These challenges are not trivial. With global utility asset management spending expected to reach \$12.4 billion in 2031 (Source: Allied Market Research) and the global SCADA market estimated to reach \$16.7 billion in 2028 (Source: Industry Research), along with the growing complexity of grid operations this area is one that utility leaders and operations and asset management professionals need to get right.

The Strategic Response

The grid and its assets work together but typically are managed separately. This area is another one in which a digital platform that captures all of the operational and asset data can provide novel capabilities critical to success in the new energy environment. For example, imagine a transformer management program that models wear and tear using SCADA data, AMI data, and third-party weather data, all on a single seamless platform that is open, scalable, and secure. These changes may also create opportunities to coordinate on the same platform the new capabilities in the coming DER-rich operating environment. DER management systems (DERMs) are now being deployed to manage widespread DERs across a service territory for peaking events and the creation of virtual power plants (VPPs). Having all of this disparate, distributed data consolidated on a single platform is a powerful value proposition on its own.

A recent survey reinforces the need to leverage digital technologies to meet these challenges. Figure 3 demonstrates that these challenges are most acute in the renewable integration and aging infrastructure areas.

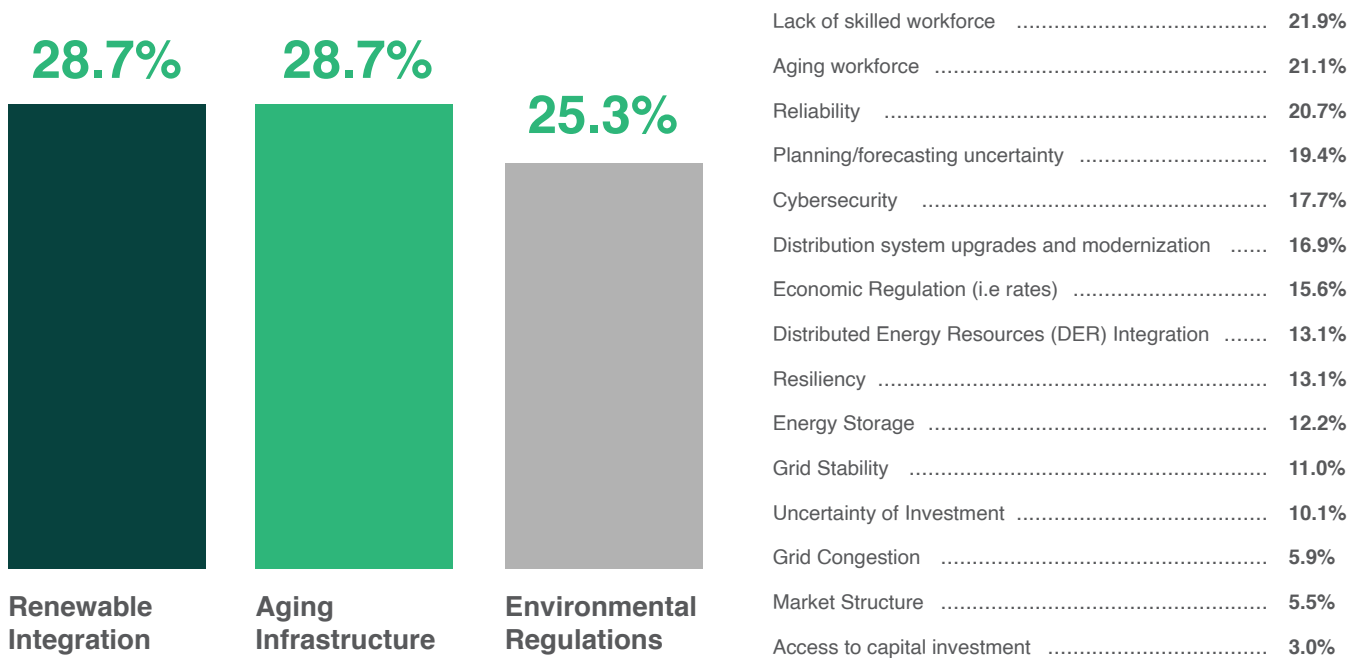


Figure 3. Top challenges facing the utility industry (Source: Black & Veatch).



Meeting Forecasting Where It Is Going

Utility energy forecasters have long been the people doing the math to make sure that power generation and utility infrastructure are available to meet the growing needs of a utility's customer base. Historically, these forecasts have been top-down, using large data sets on power generation trends and seasonal load trends as well as third-party data like economic forecasts and demographics. This worked very well – it kept the lights on for decades – until electric generation became distributed, changing how and where electricity is generated. The end use at the grid edge has also changed as DERs give and take electricity on and off the grid and as customer usage patterns evolve. The growth of EVs might be the most urgent example of this dynamic.

The Strategic Response

The call here is for a bottom-up forecasting methodology that can pull in a variety of data sources to facilitate modeling generation and grid infrastructure needs over the long term on a single digital platform. How will a utility know how many EV charging stations will be needed 10 or more years from now, and where should they be located? How fast will rooftop solar grow, and how will this growth impact distribution system behavior and base load generation needs? And how do we build a capital plan to be prepared for these changes a decade or more from now? Answering these questions accurately will help ensure the utility's viability well into the future. A single platform that can ingest and process this vast variety and volume of data is a leap ahead in planning for the grid of the future.



A Platform to Stand On in the New Energy Environment

Since the dawn of the smart grid era, the utility industry has made great progress toward operating as a more digitally built, intelligence-run industry. The industry is now, however, at a tipping point.

Having an intelligent infrastructure is one thing. Building on this capability in order to have a single digital, purpose-built platform that can ingest and process massive diverse data sets, act on dozens of use cases, and provide real- to near real-time insights for users from the executive suite to trucks in the field - and to do so in an open, secure, governed scalable operating environment - is where utilities need to land as soon as possible.

The **SurgeCloud™** digital platform from Greenstar Technologies is a solution that will enable utility leaders, technologists, and operations and customer staff to execute their demanding and evolving missions. Figure 4 offers a view of the Greenstar Digital Utility Platform Functional Modules.

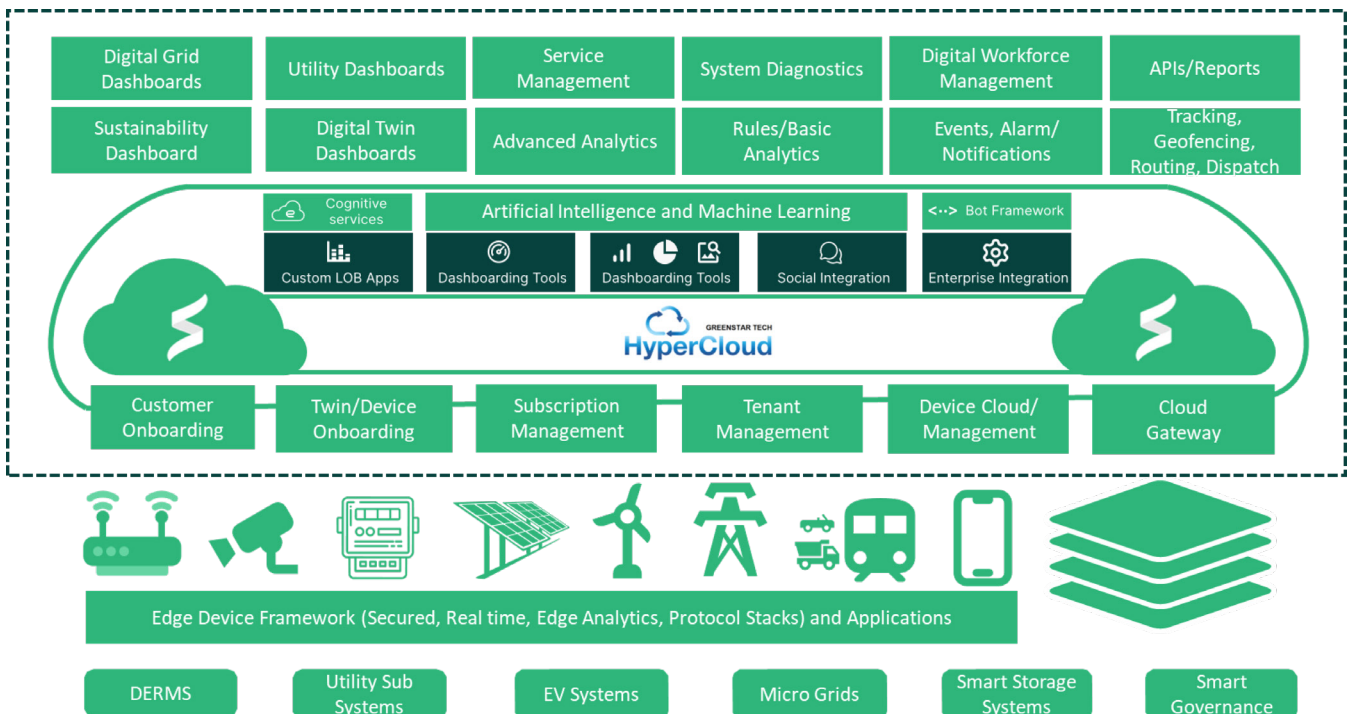


Figure 4. Greenstar Digital Utility Platform Functional Modules (Source: Greenstar Technologies).



SurgeCloud operates from Greenstar's National Energy Operations Center (NEOC), providing secure, scalable data management and analytics to facilitate seamless execution of use cases to support critical utility business and technical requirements. The NEOC also provides a clearinghouse for a variety of data services, enabling industry metrics and benchmarking for continuous improvement.

As this paper has demonstrated, climate concerns are driving utility sustainability goals. This dynamic is converging with new technology and changing customer expectations, and utility leaders are recognizing both the need for and the challenges of the intelligent, digital infrastructure that can support these goals. The digital platform is the future for successful enterprise-wide utility operations in managing the growth in renewable energy resources and addressing changing grid operations as well as evolving customer demands.

Note: This white paper is the first of two that introduce the concept of a single, enterprise digital platform, purpose-built for utilities. The second white paper is available **here**. To receive a copy of this white paper and to learn more about utility digital platforms, please go **here**.

