This IDC Analyst Connection explores digital strategies for utilities as they work toward their energy transition goals and initiatives.

Digital Strategies for Utilities to Successfully Navigate the Energy Transition

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Questions posed by: CGI

Answers by: John Villali, Research Director, IDC Energy Insights, IDC

Q. What are the main drivers for utilities to invest in digital solutions in preparation for the energy transition and the related disruptions?

A. In preparation for the energy transition and the related disruptions that will come along with it, utilities are focusing on modernizing and improving their grid operations. The number of renewable and distributed energy resources (DERs) is increasing, albeit at different paces and levels in regional markets across the globe. Additionally, increases in beneficial electrification such as municipal transportation (bus and rail), heat pumps, electric vehicles, and industrial electro-technologies are bound to put further strain on the power grid. The rise of intermittent generation and sweeping changes in the consumption patterns that will be induced by electrification has utilities rethinking their power grid operations strategies. This will require both technology and tactical changes in order to manage their utility networks effectively.

In addition to improving operations to ensure grid reliability, utilities are paying close attention to their customers' needs and expectations as they relate to the energy transition and a path toward a cleaner energy future. Utilities will need to adjust and support the new and innovative ways their customers will consume, conserve, fuel-switch, and, in some cases, sell energy back to the power grid. Utilities will need to improve or establish digital forms of customer engagement to ensure they are effectively interacting with their customers and are aligned with customers' interests as they relate to energy transition initiatives. Utilities will need to provide awareness of and attractive incentives to encourage participation in clean energy programs such as energy efficiency, demand response/flexible load management, beneficial electrification, and DER.

Government policy and legislation aimed at reducing carbon emissions are also driving utilities to invest in solutions that support the energy transition. In IDC's *Worldwide Energy Transition Survey*, June 2022, 42.1% of utilities surveyed in North America reported plans to achieve net zero emissions between 2031 and 2035,

consistent with government CO_2 reduction goals and initiatives. That said, this will not be an easy task. According to the International Energy Agency (IEA), to achieve net zero by 2050, clean energy investments globally will need to triple by 2030 to an estimated amount of $4 trillion USD[1].

In summary, grid reliability, meeting electric customers' expectations, and government policy and legislation are some of the main drivers that are increasing investments in digital solutions that will help utilities navigate the changes and disruptions that will come along with the energy transition.

Q. What strategies are utilities pursuing to increase preparedness for energy transition-related disruptions, from a digital solutions standpoint?

A. From a digital solutions standpoint, utilities are prioritizing technology investments, which will support the power grid and specifically the distribution system. Technology investments are occurring throughout the utility value chain (generation, transmission, and distribution), but the distribution system will incur the most disruption due to the energy transition. For a utility's distribution system to operate at its best, in a safe, reliable, and economic manner, utilities will need to go beyond traditional distribution management. In order to operate effectively and successfully in the energy transition, utilities will need to invest in advanced distribution management systems (ADMSs) along with distributed energy resource management systems (DERMSs).

ADMSs and DERMSs are complementary in what they can offer a utility's distribution system. An ADMS is a technology platform with fully integrated core components mainly comprising supervisory control and data acquisition (SCADA), an outage management system (OMS), and a distribution management system (DMS). SCADA helps utilities monitor and control the distribution system, while an OMS assists with tracking and restoring distribution system outages. A DMS allows utilities to analyze and optimize the distribution system. A DERMS is a technology platform that is designed specifically to manage behind-the-meter DERs such as microgrids, solar, battery storage, smart devices, smart homes/buildings (demand response), and electric vehicle charging. Both systems complement each other and can work in tandem or separately as standalone technologies. In many cases, a DERMS is an extension or additional component of an ADMS. ADMS and DERMS applications are becoming more modular in nature in order to meet specific needs for utility distribution systems, providing utilities flexibility on what modules to invest in today and avoiding vendor lock-in if in the future if they wish to add more modules and functionality down the line.

In addition to ADMSs and DERMSs, regional power market mechanisms can be leveraged by utilities to better manage the grid. For example, in some regional power markets, time of use rates (TOUs) allow for off-peak pricing (encouraging off-peak energy use) or critical-peak pricing (to discourage on-peak use) as a way to help utilities shift demand. This can maintain system reliability and avoid or defer grid investment, which in turn puts downward pressure on rates while also lowering electricity bills for customers that manage their demand accordingly. Other market mechanisms being adopted in regional markets include the evolution of demand response programs and markets being created that allow DERs to bid supply into wholesale markets. Demand response and bidding DERs into wholesale power markets have created an opportunity for aggregators that

1. Source: IEA, Net Zero by 2050: A Roadmap for the Global Energy Sector, Flagship Report, May 2021

work with utilities to help manage clusters of supply and demand from customers and in turn create greater operational and economical optimization of the power grid.

Q. How can DERMSs and ADMSs reduce the overall cost for utilities while increasing the value delivered to their customers?

A. ADMSs and DERMSs can help defer capital cost investments such as increasing the capacity on distribution lines or upgrading or replacing substations and transformers. ADMSs and DERMSs are technology platforms that help distribution system operators manage supply and demand. For example, DERs and demand response programs in particular help utilities adjust the levels of distributed generation and electric consumption to ensure that power delivery and load obligations are being met in an efficient, economical, and safe manner.

Demand response, energy storage, vehicle-to-X scenarios, and smart inverters can all alleviate sections of the distribution grid's being overloaded at the grid edge. As a result, proper management of power flows on the grid helps avoid or defer capital expenses at the grid edge while enhancing reliability and minimizing post-outage recovery efforts. High levels of market participation in DERs and demand response programs can provide a significant amount of support and reliability to the power grid.

DERMSs can also enhance energy-as-a-service opportunities for utilities in managing and servicing customers' DERs and equipment such as rooftop solar, heat pumps, electric vehicle charging, and battery storage. Utilities can create additional revenue streams above and beyond their regulated business, usually transmission and/or distribution, by providing contracted grid services related to DERs. The increased cash flow from these energy-as-a-service opportunities make them profitable business endeavors on their own. Furthermore, they have the side benefit of supporting increased customer engagement and creating greater DER and energy efficiency adoption while alleviating grid management costs. Additionally, beneficial electrification offerings can increase off-peak utilization of current assets. In both cases, it helps lower utility rates in the long run for customers. Ultimately, DERMSs and ADMSs can provide utilities with greater overall efficiency and optimization of their distribution systems, which can lead to a positive impact on utility rates.

Q. What trade-offs do utilities face between investing in energy transition preparedness now or waiting to invest in the future?

A. Utilities could be at risk of being too late in deploying digital solutions to manage the grid if they begin to realize negative impacts on grid reliability caused by a high penetration of uncontrolled and unmanaged DERs. Conversely, utilities also face the risk of investing rate-payer dollars prematurely, potentially putting unjustified upward pressure on electricity rates. An increase in rates may cause concern for a utility's stakeholders and result in backlash from the utility's constituents, which in turn could potentially lead to the denial of regulatory approval for future investments.

Utilities and utility commissions will not invest in energy transition readiness without a sufficient degree of certainty about the future prospects of a rapid rise of DERs and/or electro-technologies to justify the investment. This is partly why utilities have preferred to participate in pilot projects that have lower financial consequences. If anticipated high penetration in clean energy projections does not materialize, utilities would most likely end the pilot project without a permanent solution or investment in place. That said, recently there has been a shift, with utilities moving away from small-scale pilots and moving toward full-scale deployments. When investing in full-scale DERMS or ADMS deployments, utilities prefer flexible and modular options in such applications, which allow them to adapt and grow over time as DER and electrification technology penetration increases.

Q. What should utilities look for in ADMS and DERMS solutions to prepare for the energy transition and reduce the risk of premature investments?

A. First, utilities should identify ADMS and DERMS solutions that have flexible deployment models and that also offer modular applications. This provides utilities with flexibility in how the solution is deployed and allows utilities to invest in what is needed today, with the option to add on modules as needed in the future. It is important to realize that every utility is unique and could be at a different maturity level regarding DER adoption, electrification penetration, the use of cloud, and their digital capabilities. That said, flexibility in the deployment models of DERMS and ADMS solutions — such as cloud, hybrid, and on premises — will be important to many utilities. The utilities sector, compared with other asset-intensive industries, has historically been slow to adopt cloud. This is gradually changing, as utilities are beginning to understand and embrace the benefits of cloud. Some of the major barriers for utilities to investing in cloud have been costs, security concerns, and the lack of internal skill sets to manage cloud technologies. Having flexibility in how ADMSs or DERMSs are deployed and additionally having options of modular ADMS and DERMS solution add-ons allow utilities to prepare for the energy transition while reducing the risk of premature investments.

Utilities should also seek out technology vendors that have the ability to adapt to evolving communication standards, particularly in the areas of ADMSs and DERMSs. ADMS and DERMS vendors must have the ability to successfully coordinate with utilities and implement the best communication standards for the region and products at hand. ADMS and DERMS vendors must have the ability to implement common DER communication standards such as IEEE 2030.5, OpenADR, SunSpec, and Open Charge Point Protocols. Communication protocols and standards for DERs vary by region and DER asset. The ability to adapt and implement the most effective communication protocols in a timely and proficient manner will be key for utilities in managing DERs at scale.

Lastly, when investing in ADMS and DERMS solutions, utilities should partner with an experienced enterprise systems integrator that can provide a technology road map to meet the utility's current and future needs. This will allow a utility to add DERMS or ADMS modules as the energy transition evolves and avoid vendor lock-in. Additionally, utilities will need the ability to interconnect ADMS and DERMS solutions with core legacy operational utility equipment, applications, and systems such as advanced meter infrastructure (AMI), enterprise asset management (EAM), asset performance management (APM), mobile workforce management (MWFM), and customer information systems (CIS), among others. More importantly, it will be essential for utilities to ensure

that the data from these interconnected legacy systems is in order and clean to maximize the value of their ADMS and DERMS investments. In IDC's *2022 Future of Operations Survey*, over 30% of utility respondents reported that access to data and the visibility of operational performance is one of their biggest challenges with respect to achieving operational excellence and resilience. The quality and accessibility of the data from these core utility systems and applications will be paramount. Data governance, consolidation of data, the interoperability of data sets, and avoiding duplicates or redundancies in data are some of the many items that need to be addressed for the successful and seamless integration of these legacy systems.

About the Analyst

John Villali, Research Director, IDC Energy Insights, IDC

John Villali is a research director for IDC Energy Insights, primarily responsible for thought leadership in the areas of digital transformation and smart operations in the power sector. Mr. Villali's expansive experience within the energy industry allows him to provide superior market insight, having firsthand experience understanding and meeting the needs of professionals in the energy industry. Mr. Villali's core research coverage includes but is not limited to distributed energy management, asset management, energy policy, demand response, mobile workforce management, energy trading, and the energy transition.

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