THE UTILITY VIEW OF ACHIEVING AGILITY IN THE DISTRIBUTED ENERGY ERA THROUGH A HOLISTIC AND FLEXIBLE DIGITALIZATION APPROACH
The Utility View of Achieving Agility in the Distributed Energy Era Through a Holistic and Flexible Digitalization Approach

INTRODUCTION

The energy industry is in the middle of a transformation driven by the adoption of distributed generation, energy efficiency measures, and prosumer engagement services—in other words, smarter, cleaner, and more localized energy through distributed energy resources (DERs). When utilized effectively, DERs can create benefits for both utilities and their customers. However, the complexity of handling different types of DERs with varying energy capacity, in diverse, network-constrained areas presents challenges for many utilities in planning, integration, operation and maintenance.

How can utilities take the reins of this transformation and best leverage these resources within existing infrastructure and business constraints? Only a fully integrated technical, financial, and consumer focused approach leveraging digital solutions will enable energy providers to reach their DER benefit potential.

We surveyed over 200 utilities to find answers to these questions and more. This report breaks down the challenges and benefits of DERs in today's utilities, and discusses how utilities are developing digitalization strategies to build a holistic, fully integrated and flexible DER-enabled grid.

Key Findings:

- 85% of respondents agree DER integration and management is an important challenge for today’s utilities
- The connection between DER enablement and supporting digitalization solution needs is very strong for 55% of utilities
- 36% of utilities already have a specific and comprehensive DER business strategy
- Utilities should prepare their strategic plans now to be able to leverage DERs through digitalization solutions effectively across their organizations
- It is essential to understand your organization’s strengths and weaknesses for supporting DERs, and where it can benefit from additional capabilities and expertise

Respondents at a Glance:

- 50% IOUs, 24% municipal, 19% cooperative, and 8% district/federal
- Primary services include electric (57%) and gas (19%)
- Top U.S. regions for respondents included the Pacific (16%), North Central (21%), and South Central (20%), along with an international presence (16%)
- 43% of respondents have more than 500,000 customers
- Respondents work in groups across their organizations, including engineering (28%), IT (14%), operations (17%), and executive (12%)
DERs HAVE ARRIVED FOR UTILITIES

Distributed energy resources (DERs) are taking over the energy marketplace as alternatives to traditional centralized generation for producing electricity as well as reducing electricity consumption. In other words, DERs have arrived. Some utilities already invest in DERs, and more are looking to jump onboard as these investment opportunities prove their benefits.

DERs provide alternative methods for many utilities to balance supply and demand in a distributed power grid. They provide opportunities for utilities to increase their investments in renewables and reduce carbon emissions. DERs also enable utilities to reach a new customer base who value environmentally conscious, cost-friendly practices. In addition, leveraging DERs against demand creates many benefits for utilities in areas beyond market appeal and customer satisfaction. Aside from increased customer satisfaction and retention (53%), utilities report improved energy efficiency (46%), improved grid reliability (41%), and improved grid resiliency as top DER benefits. (Figure 1)

Figure 1: Top Benefits of DERs

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Customer Satisfaction and Retention</td>
<td>53%</td>
</tr>
<tr>
<td>Improved Energy Efficiency</td>
<td>46%</td>
</tr>
<tr>
<td>Improved Grid Reliability</td>
<td>41%</td>
</tr>
<tr>
<td>Improved Grid Resiliency</td>
<td>34%</td>
</tr>
</tbody>
</table>
85% of respondents believe DER integration and management is an important topic for the industry, and 76% agree that DERs are critical to their organization’s future success. DERs are becoming a reality for a significant number of utilities—just 19% of respondents believe DERs are not relevant for their utility. (Figure 2)

A total of 89% of respondents say their organizations are at least starting to work on some type of DER strategy. (Figure 3) For respondents who have at least some strategy around DERs, 29% are developing a plan for an operating model, 18% are conducting integrated transmission and distribution planning, and 24% are designing and approving budgets. Already, 18% of utilities operate commercial and large-scale DER projects. It’s fair to say that most utilities are just starting to evaluate business strategies and conduct planning activities to understand how best to leverage DERs in their market territory.
It is clear DERs are important and, without a doubt, will continue to significantly increase in the energy marketplace. The importance of DERs has climbed over the past 12 to 24 months, and will continue to become increasingly important. Nearly three-quarters of utilities expect the importance of DERs to continue to increase over the next 12 to 24 months—with over half of utilities reporting DERs’ importance increasing somewhat and 24% reporting a significant increase in importance. (Figure 4)

As utilities embrace DERs, they will need to bring a diverse set of capabilities to their strategies and plans. According to a Strategic Manager at a municipally-owned utility, “It’s really important to maintain flexibility so you can maximize the efficiency of all the generation out there and of all distributed energy resources.”

DERs come in different forms—each contributing to unique utility needs. Currently, utilities have most widely deployed energy efficiency (74%), solar (60%), and demand response systems (50%). Encouragingly, the expansion of DER types used in utility strategies is highly anticipated over the next three to five years. For example, the number of utilities using energy storage (51%) and energy management systems (40%) is expected to grow substantially over the next few years. (Figure 5)
It’s really important to maintain flexibility so you can maximize the efficiency of all the generation out there and of all distributed energy resources.”

Strategic Manager at a municipally-owned utility

Even with the opportunities and benefits DERs offer, there are many challenges when integrating them into existing utility infrastructure. Over half of respondents struggle with the increased complexity of operations that come from DERs. Strategic business planning (44%), grid network capacity and existing infrastructure (37%), and the business case for enabling DERs (38%) also pose top challenges for organizations regarding DER integration. (Figure 6)

BUILDING THE DER ECOSYSTEM THROUGH DIGITALIZATION

Increased operational complexity, ensuring adequate grid capacity, and managing DER-enabling technologies are challenges that face DER integration. Utilities’ digitalization efforts can step in and help overcome these challenges. Digitalization efforts, many of which are already underway at utilities, can deliver value for DER integration such as:

- Advanced communication networks that increase interaction and coordination between DERs, utilities and customers
- Data analysis and advanced analytic capabilities that create transparency for utilities and customers, and support improved decision-making both at the operational and strategic levels
- Customer-facing technologies and services such as Demand Response programs or Microgrids that provide customers with greater access to DERs so they can more effectively participate in the energy marketplace
- More grid automation through self-learning programs that can, in real-time, coordinate millions of diverse DERs and grid edge devices to optimize their participation and benefits
- Fully integrated operational systems – sensors, control software and analytics - that help improve operational efficiency and reduce unplanned downtime by, for example, predictive maintenance for DERs
With digitalization benefits such as these, and the value of DERs for utilities, a more holistic grid can come to life. An overwhelming 87% of utilities say a connection between digitalized software technology and DERs is needed to fully realize DER benefits—with 55% saying a very strong connection is needed. (Figure 7) It is important to note that the connection between DER-enabling digitalized software solutions is needed across the organization—areas such as IT, field engineering, control center operation, and customer engagement must coordinate their technology strategies to ensure a flexible system with maximized benefit realization. As one Strategic Development Manager of an investor-owned utility tells us, “Having more flexible resources, like Cloud Computing, will allow us to scale up and scale down without having to build infrastructure.”

Figure 7:
Strength of Connection Needed Between DERs and Digitalization

"Having more flexible resources, like Cloud Computing, will allow us to scale up and scale down without having to build infrastructure."

Strategic Development Manager at an investor-owned utility
Utilities are looking at the role of different technologies to support DER integration. Advanced metering infrastructure is currently the most utilized technology solution for enabling DERs through digitalized solutions (73%). Respondents also report distribution automation as having a significant importance for enabling DER integration (70%). (Figure 8)

![Figure 8: Technology Solutions in DER Integration](image-url)
How do these technologies actually impact an organization’s ability to integrate DERs into their operating system and network infrastructure? One Strategic Development Manager at an investor-owned utility municipally-owned utility says, “We as a utility have to be open to new technologies. Because if things come out, like smart home thermostats, we want to make sure we are looking over the horizon to what’s next so we can integrate them with our current systems, or else we won’t receive those benefits.”

For example, advanced distribution management systems combine historical and real-time data for grid operators, which helps them identify excess capacity and reroute power from areas approaching an overload. When local generation causes power needs at a site to go from a full load to a negative load, intelligent grid devices and sensors enable grid operators to recognize the load change and manage adjustments faster. Other technologies influence the operational management and maintenance of DERs—such as outage management systems (OMS) and supply chain management (SCM)—while others can improve customer experiences with DERs, such as customer relationship management systems and customer-owned devices. Overall, two-thirds of utilities agree that the integration of technologies such as these with DERs are very valuable for utilities and critical for them to realize a digitalized future. (Figure 9)

We as a utility have to be open to new technologies. Because if things come out, like smart home thermostats, we want to make sure we are looking over the horizon to what’s next so we can integrate them with our current systems, or else we won’t receive those benefits.”

Strategic Manager at a municipally-owned utility
CHALLENGES

A holistic digitalization approach across a utility to integrate DERs into the standard planning process, to optimize network operations, and to enable consumer interaction is possible, however, there are hurdles in creating this more connected ecosystem.

Budget limitations (51%) continue to be a top concern, but other challenges such as meeting regulatory requirements (38%), technology vendor availability/capabilities (34%), and executive buy-in (32%) also play roles. (Figure 10) Technology investments can be significant, and identifying the most sustainable and effective technology for achieving a holistic approach to DER-enabling digitalization solutions continues to be a challenge for utilities. However, we know utilities understand the importance of these technologies and will be looking for cost-effective options that also ensure reliability for their systems.

Figure 10: Top Challenges to Holistic DER/Digitalization Approach
RECOMMENDATIONS

As the energy industry continues to move toward a marketplace incorporating a larger variety and quantity of DERs, it will encounter obstacles but also receive many benefits if a holistic, integrated, and flexible digitalization approach is adopted. Utilities will play a critical role in balancing supply and demand by developing and managing sustainable DERs. Technology digitalization efforts will help utilities integrate DERs into existing systems and manage their complexities. These efforts will also better serve the changing energy consumer needs in today’s increasingly digital environment.

To ensure DER employment is successful, utilities should keep the following insights in mind:

• DER importance will continue to increase as end consumers continue to demand increased energy services and diversified generation resources
• Developing a cohesive strategic plan across the energy providers’ organization is required for successful DER deployment and realization of benefits
• DER systems rely on the digitalization efforts across traditionally siloed organizational areas to be truly effective and efficient

To build a holistic ecosystem that supports increasing types and capacities of DERs through technology digitalization, utilities should consider actions including:

• Build the vision: Each energy provider is different, so it is important to define what it means for your organization to deliver a holistic ecosystem that effectively supports DERs. What will your DER portfolio look like? What’s the vision for technology digitalization? And how are they integrated? Energy providers should prepare their strategic plans now to be able to leverage DERs through digitalization effectively across their organizations.
• Take an integrated, flexible approach: How do we ensure these technologies are less piecemeal and part of a much wider initiative? As energy providers move forward, it is important to consider not just technology integration, but the integration of people and processes as well. And although vision is important, the market continues to undergo significant change. By approaching your implementation with a focus on flexibility, your organization can build the agility it needs to successfully navigate the evolving worlds of DERs through digitalization.
• Find the right partners: As much of the utility world is still predicated on a centralized generation model, the opportunities and changes described in this paper are significant for nearly any energy provider. It is essential to understand your organization’s capacity to handle these changes, and where it can best benefit from partnerships that deliver additional capabilities and expertise.

Focusing on these areas will help put energy providers on the path to fully realizing the promise and benefits of DERs. To learn more about the opportunities for your organization to deliver greater agility in the distributed energy era, please contact:

For further information on Siemens Digital Grid solutions, please visit usa.siemens.com/digitalgrid