

# Today and Tomorrow: The Distribution Automation Ecosystem

RESEARCH BY:



# INTRODUCTION

Distribution automation (DA) can achieve substantial impacts—such as improving distribution system resilience and reliability, and the fault location, isolation, grid integration of selected distributed energy resources (DER)—as utilities modernize their grid infrastructure. DA requires an ecosystem of technologies to fully achieve these benefits, but utilities have yet to build out this ecosystem. Where are utilities investing in DA today? How do they expect their DA investments to change in the years ahead? Zpryme surveyed 160 primarily North American utilities to understand:

- The current state and future vision of DA for utilities
- DA technologies needed to best leverage the benefits of DA
- Key actions to build a DA ecosystem

Findings from the research include:

- Nearly 90% of respondents agree that DA is critical for their grid modernization initiatives
- 42% of utilities are deploying DA technologies incrementally as they offer value
- The areas that utilities expect to grow in importance for DA include distributed renewables (79%), energy storage integration (75%), electric vehicle (EV) infrastructure (74%) and microgrid integration (73%)
- Just 21% of utilities say that their DA applications are extremely or very well integrated
- Less than 30% of utilities feel that communication networks are very well to extremely well prepared for what's next with DA

## RESPONDENT DEMOGRAPHICS

### UTILITY TYPE:

Investor-owned (38%)  
Municipal/district (38%)  
Cooperative (19%)  
Federal/state (5%)

### ANNUAL REVENUE:

> US\$1B (32%)  
US\$500M to US\$1B (17%)  
US\$100M to US\$500M (25%)  
< US\$100M (25%)

### SERVICES PROVIDED:

Electric (96%)  
Gas (30%)  
Water (22%)  
Wastewater (14%)

### LOCATION:

Northeast (12%)  
Southeast (11%)  
Midwest (26%)  
Mountain (6%)  
Southwest (18%)  
Northwest (11%)  
International (15%)

## THE CURRENT STATE AND FUTURE VISION OF DA FOR UTILITIES

As the grid becomes increasingly digitalized and decentralized, its ability to adjust on a real-time basis to the changing loads, generation, and failure conditions of the distribution system through distribution automation (DA) will become increasingly important. What does DA look like today? How are utilities approaching it? How will things change in the future?

### THE CURRENT STATE OF DISTRIBUTION AUTOMATION EFFORTS

DA is important, but the shape it ultimately takes at each utility varies. With rapidly evolving technologies like DA, utilities often understand its importance, but the maturity of the solutions deployed covers a wide range. Nearly every utility has some sort of DA effort going on (94%)—which ranges from evaluating DA options (25%) to completed deployments (5%). (Figure 2)

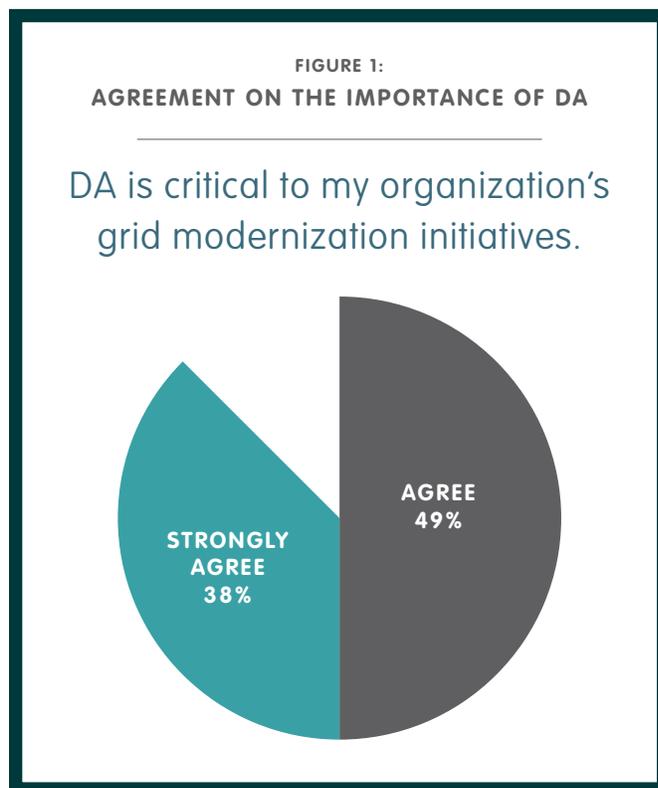
Even with utilities that are moving forward with DA investments, many are deploying technologies incrementally as they offer value—using evolving data analysis and control tools over time to solve different problems. “Many organizations are doing catch up with their DA solutions, and as a result, have a lot of different solutions.” said Allan Connolly, CEO and President, Aclara.

We also see variance in where different types of utilities are with their DA efforts:

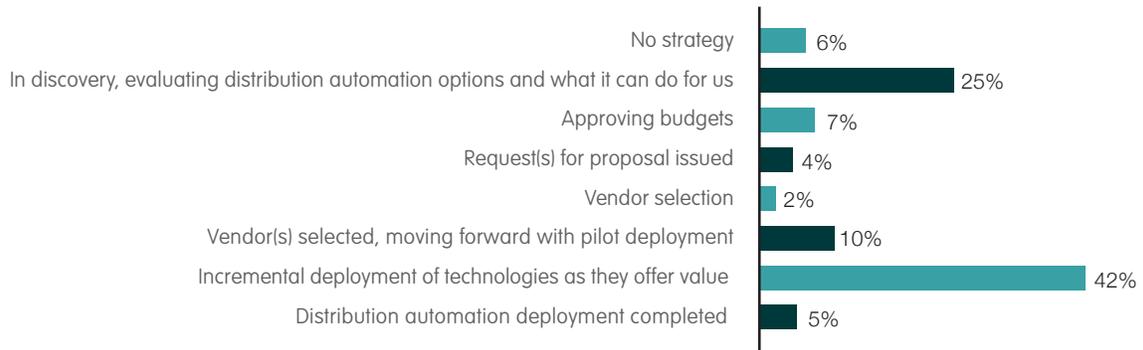
- 54% of cooperatives are deploying DA incrementally, and 29% are in the discovery phase
- 28% of municipalities are deploying DA incrementally, and 36% are in the discovery phase
- 49% of IOUs are deploying DA incrementally, and 11% are in the discovery phase

*“Many organizations are doing catch up with their DA solutions, and as a result, have a lot of different solutions. There is an opportunity for them to consider a more comprehensive approach,” said Allan Connolly, CEO and President, Aclara.*

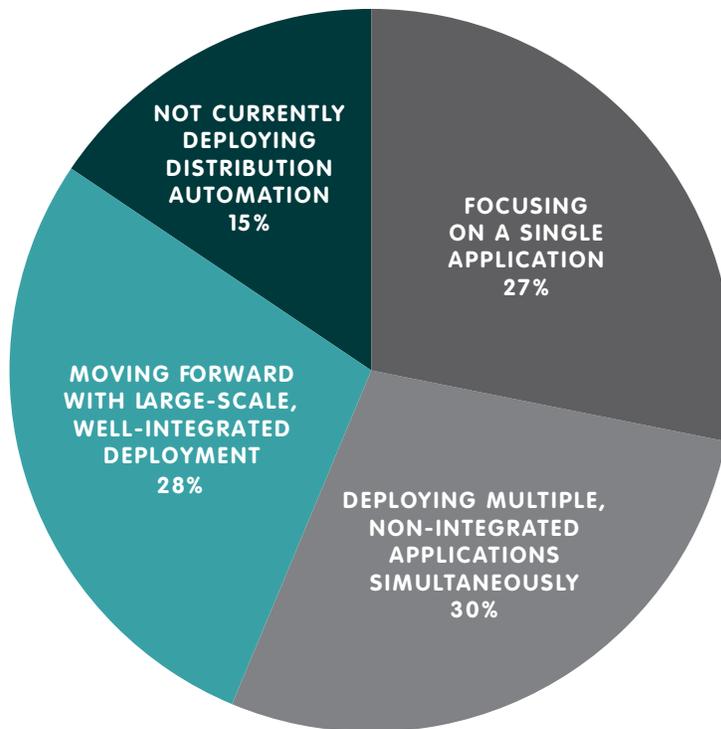
In addition to trying to keep up with new challenges, utilities for many years have held a philosophy to get best-of-breed applications. These approaches have resulted in numerous systems and databases—and trying to integrate them can be costly. Just over a quarter of utilities are moving forward with a large-scale, well-integrated deployment. Another 30% are deploying multiple non-integrated applications simultaneously, and 27% are just focusing on a single application at this point, such as voltage management or fault location, isolation, and service restoration (FLISR). (Figure 3)



**FIGURE 2:  
DA DEPLOYMENT STATUS**



**FIGURE 3:  
DA APPROACH**



## A LOOK INTO DA'S FUTURE

DA is important, but as one Midwest cooperative noted, “It is in its infancy. There’s a lot more we can be doing.” The importance of DA will grow over the next 3 to 5 years—90% of utilities expect its importance to increase. (Figure 4)

The electrical system of the past was vertical and one way. It came from the power plants to the transmission and distribution lines right to the customers. **Now, new types of non-dispatched resources such as residential solar require more intelligent sensors interconnecting at the distribution level to provide new levels of real-time visibility and rich data to manage the increasingly complex power flow.** The emerging vision of DA is one in which DA will manage a two-way power network in real-time that is adaptive, sustainable, and interconnected with other intelligent devices. This will require utilities to install innovative new technologies and converge them with long-standing ones to create an ecosystem that will improve utilities' overall day-to-day delivery of power in our digital society, and ultimately provide tangible value to customers.

DA will be critical in an increasingly digitalized and decentralized grid, but utilities must continue to prepare. Utilities generally understand the importance of DA, but are still working through how their systems and processes will grow and evolve to embrace the changing model. Just 9% of utilities strongly agree that their DA is prepared for DERs and just 14% strongly agree that DA is prepared for decentralized intelligence. (Figure 5)

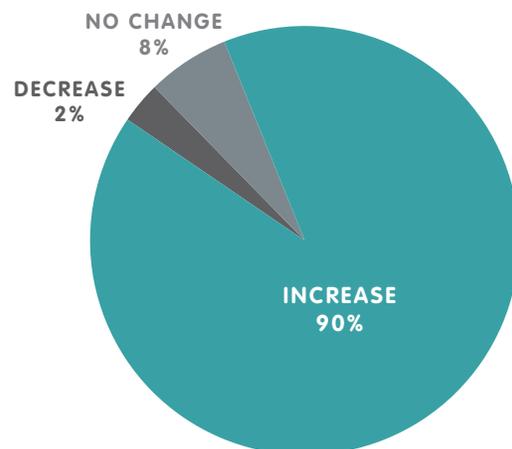
One of the reasons for this level of preparedness is that utilities often must balance the fundamentals of operating the grid today with anticipating the changing environment of the grid, which is only starting to come to fruition for many organizations. “We’re a cooperative, so we’re a little more hesitant to be on the leading edge of technology. We usually look at our peers to see what they are doing in the industry,” said a Midwest cooperative.

“Three years from today I would see us 60% through our DA strategy and then in 5 years probably about 90% done. Our biggest project is AMI, then we’ll focus on SCADA and then trying to communicate with down-line devices.”

A variety of advanced technologies and systems will shape the vision of what’s next for DA, including:

- Microgrid integration
- Renewable energy integration (centralized)
- Renewable energy integration (distributed)
- Smart cities
- Internet of Things (IoT)
- Energy storage integration
- Electric vehicle infrastructure
- Advanced metering infrastructure (AMI)

FIGURE 4:  
CHANGE OF DA IMPORTANCE  
IN NEXT 3 TO 5 YEARS

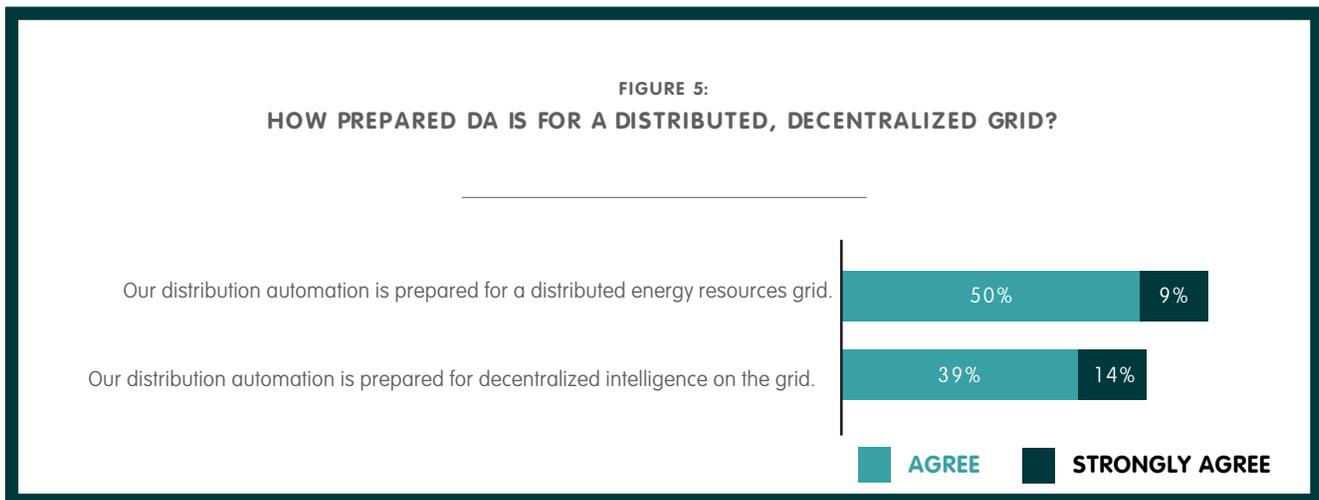


The list of advanced technologies that utilities can leverage is growing, but AMI is clearly the most important today. (Figure 6) AMI is one of the foundations for growing real-time control and intelligence for distribution networks. As Connolly noted, “If you can read all meters, then you can read anything.”

AMI is leading the way, but other advanced technologies where DA plays an important role include distributed and centralized renewable energy integration, the internet of things (IoT) and microgrid integration. (Figure 6). In many cases, IOUs are more focused on these types of advanced technologies relative to cooperatives and municipalities, placing higher importance on microgrids and distributed renewables and smart cities. Municipalities and cooperatives are more focused today on AMI with two-thirds of municipalities (62%) and 67% of cooperatives ranking AMI as very important for DA, compared with 43% of IOUs.

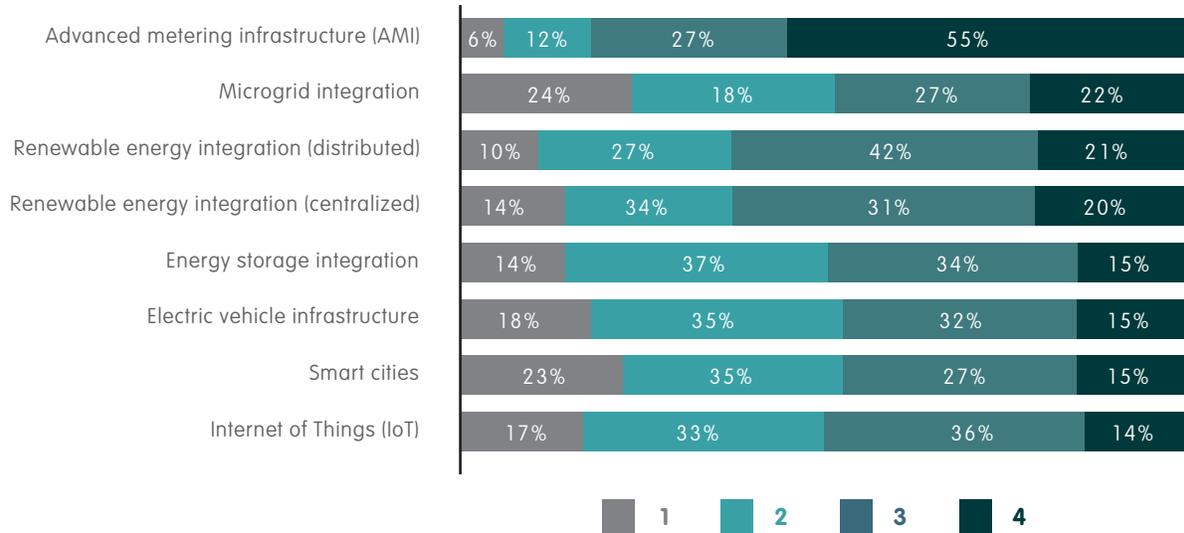
Even with these differences in terms of focus today, the importance of managing an increasing breadth of advanced initiatives beyond AMI will only continue to grow for all types of utilities. The areas that most utilities expect to grow in importance include distributed renewables (79% expect an increase in importance), energy storage integration (75%), electric vehicle (EV) infrastructure (74%) and microgrid integration (73%). (Figure 7) “There are more and more applications for DA, and we’re looking forward to that,” said one mid-sized Southeast utility.

Additional sensors and detailed information from distributed assets—such as DERs and IoT devices—will help build a more complete picture of the grid, but also require a more cohesive ecosystem than what exists today at most utilities. DA can no longer be about deploying individual systems just as they add value, but rather creating a comprehensive ecosystem of sensors, applications, communications and data to effectively manage an increasingly connected network of distribution assets.

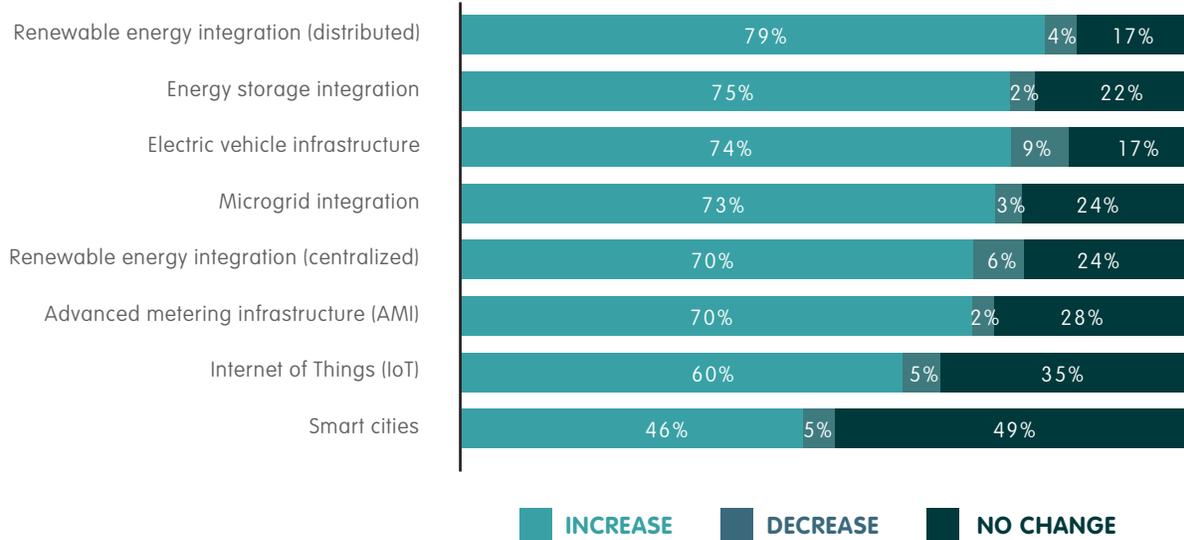


The list of advanced technologies that utilities can leverage is growing, but **AMI is clearly the most important today.**

**FIGURE 6:**  
**IMPORTANCE OF DA FOR ADVANCED INITIATIVES (1=NO ROLE, 4=VERY IMPORTANT)**



**FIGURE 7:**  
**CHANGE IN IMPORTANCE OF DA FOR INITIATIVES IN THE NEXT 3 TO 5 YEARS**



# DA TECHNOLOGIES NEEDED TO BEST LEVERAGE THE BENEFITS OF DA

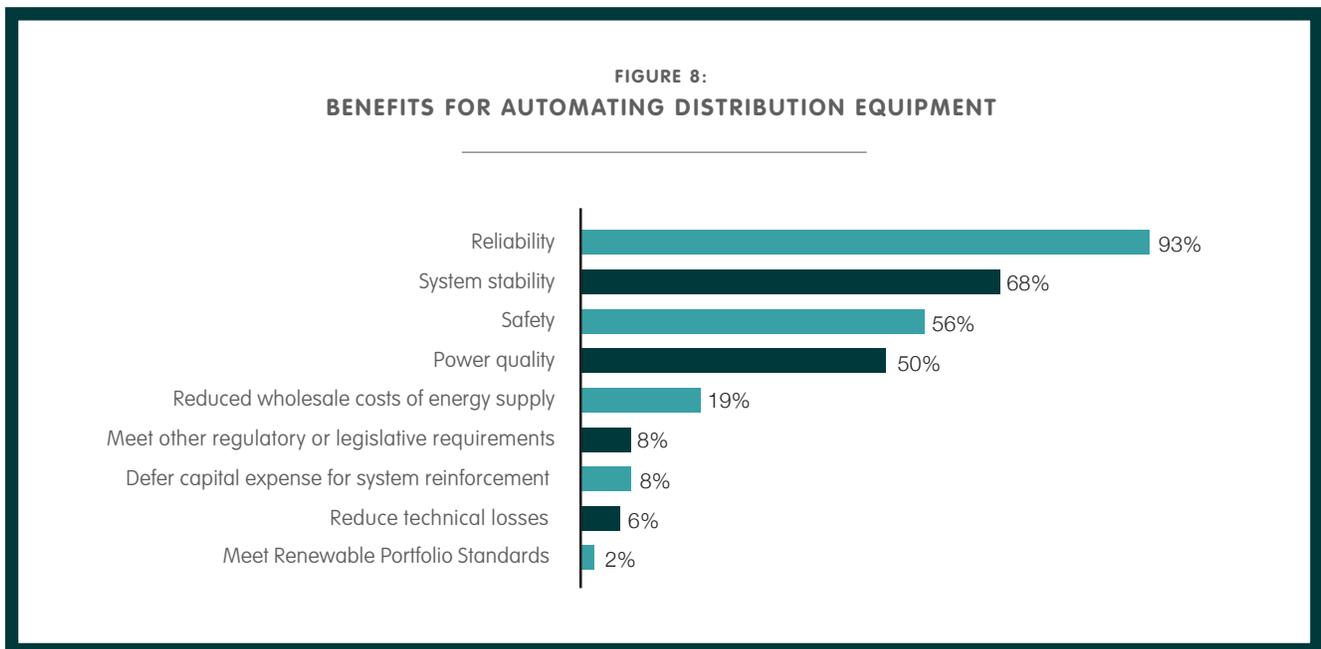
More assets, more sensors, more data and more analysis will deliver unprecedented connection and information across distribution networks. DA will leverage new technologies, but also existing infrastructure and systems that utilities have leveraged for years and even decades. This section focuses on the automation, applications and communication networks needed to build the foundation of the DA ecosystem for today and tomorrow. Where do utilities stand in terms of investments? What is driving their investments?

## DISTRIBUTION EQUIPMENT AUTOMATION

The utility industry often talks about new technologies and their impacts, but DA also requires improvements to existing assets that utilities have used for decades. At its core, DA is very much about delivering greater reliability, system stability and safety in an economical fashion by automating distribution equipment. (Figure 8) About 85% of respondents say reclosers are in their top three priorities for automation, followed by voltage regulators (76%) and capacitor banks (57%). (Figure 9)

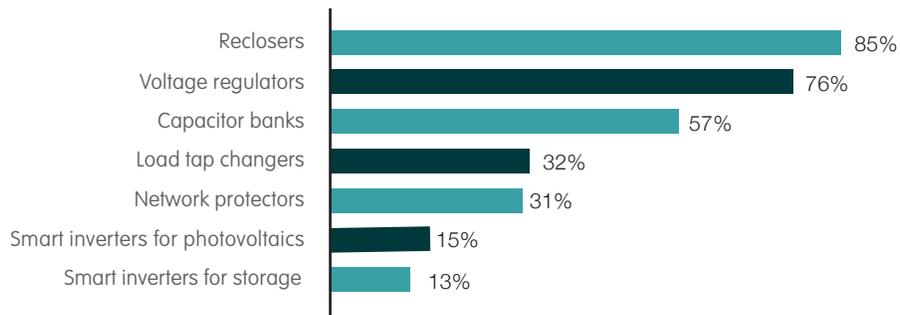
There are a variety of applications expected from automating distribution equipment. Clearly at the top of the list is fault location, isolation, and service restoration (FLISR). (Figure 10) “Right now, it is really about FLISR driven by reliability—particularly CAIDI and SAIFI—that utilities are trying to meet,” said Kumi Premathilake, Senior Vice President, Advanced Metering Infrastructure, Aclara.

Other key benefits include validating switching to provide accurate crew information, peak reduction and Volt-VAR management.



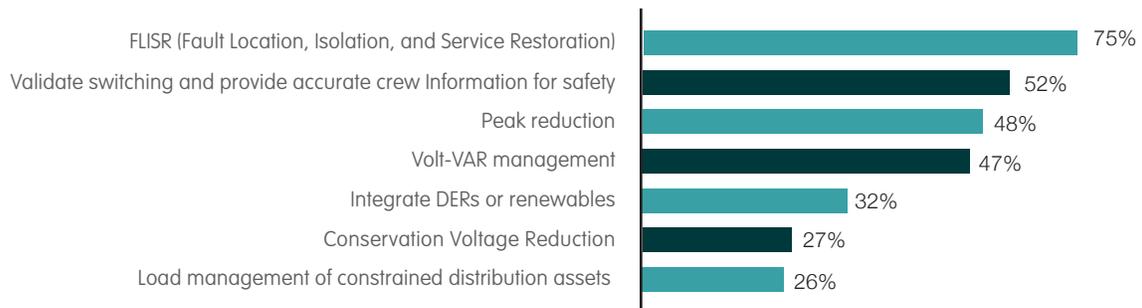
*Note: This chart shows percent of respondents who ranked an option as 1, 2, or 3 (1 = most important).*

**FIGURE 9:  
PRIORITY FOR AUTOMATING DA DEVICES WITH COMMUNICATIONS**



*Note: This chart shows percent of respondents who ranked an option as 1, 2, or 3 (1 = most important).*

**FIGURE 10:  
TOP APPLICATIONS FOR AUTOMATING DISTRIBUTION EQUIPMENT**



*Note: This chart shows percent of respondents who ranked an option as 1, 2, or 3 (1 = most important).*

## DISTRIBUTION AUTOMATION APPLICATIONS

As utilities build out their DA ecosystems, they will use a variety of applications in addition to the newer technologies, such as IoT and DERs, we discussed earlier in the paper. Nearly two-thirds of respondents say that SCADA plays a significant role in DA, followed by OMS (60%), and GIS (53%). (Figure 11) These are often foundational systems that utilities have used for decades, but likely used within business silos—such as GIS systems and data that reside largely in utility GIS departments. As utilities look to build a more complete picture of their distribution networks, they face questions about how to best integrate these diverse systems and data sources.

A variety of best-of-breed applications implemented over the years as they offer value means that utilities often find themselves working with a variety of providers. Utilities are relying on multiple providers for their DA solutions—26% of respondents say they use many vendors and 49% say they use at least few vendors. (Figure 12)

With multiple applications from multiple vendors, utilities understand there is room for improvement when integrating applications for DA initiatives. (Figure 13) Just 21% of utilities say that their DA applications are extremely or very well integrated. Nearly 50% say that their applications are integrated just fairly well. Cooperatives, typically using fewer vendors than their municipal and IOU counterparts, believe more strongly that their applications are better integrated. Nearly 55% of cooperatives say their applications are well or very well integrated compared with 40% of municipalities and 43% of IOUs.

The importance of integration will only continue to grow for all utilities as they work to handle increasingly complicated distribution networks with more sensors, more players and more distributed energy resources. “Utilities have to consider timeframe when implementing an application. How will their applications integrate down the road? It is not necessarily just thinking about your applications look today, but ensuring that your organization has the flexibility and scalability to build out a network,” Premathilake said.

With multiple applications from multiple vendors, utilities understand there is room for improvement when integrating applications for DA initiatives.

**FIGURE 11:**  
**IMPORTANCE OF APPLICATIONS FOR DA EFFORTS (1=NO ROLE, 4=SIGNIFICANT ROLE)**

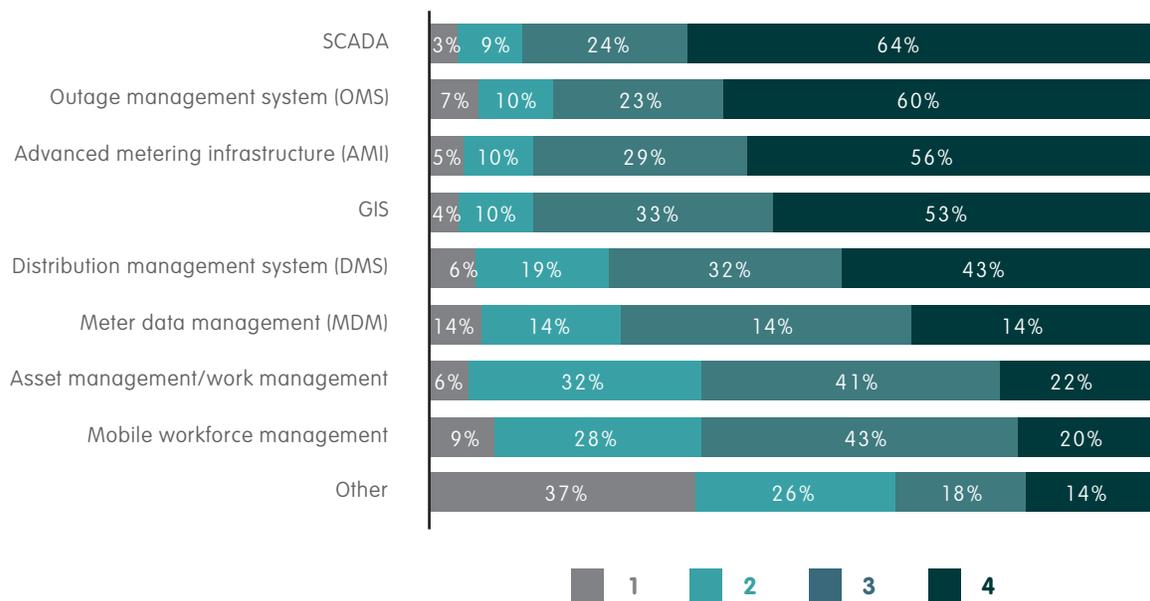
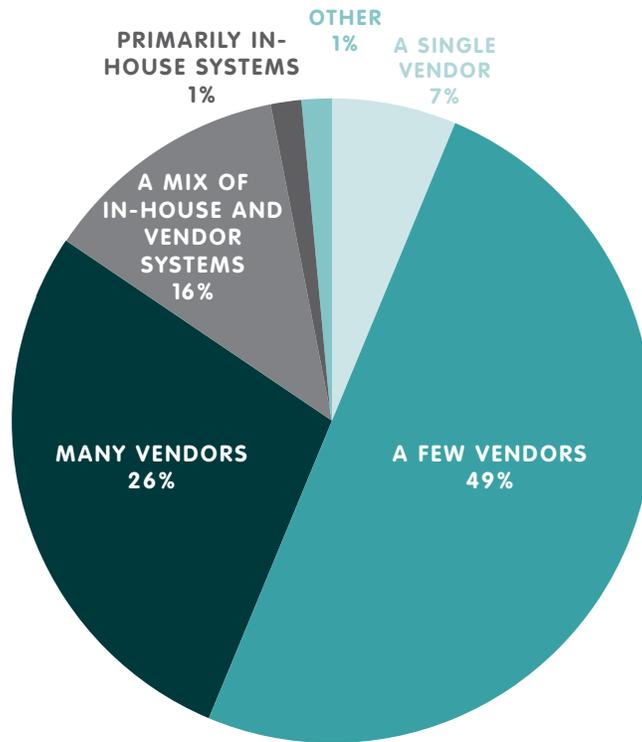
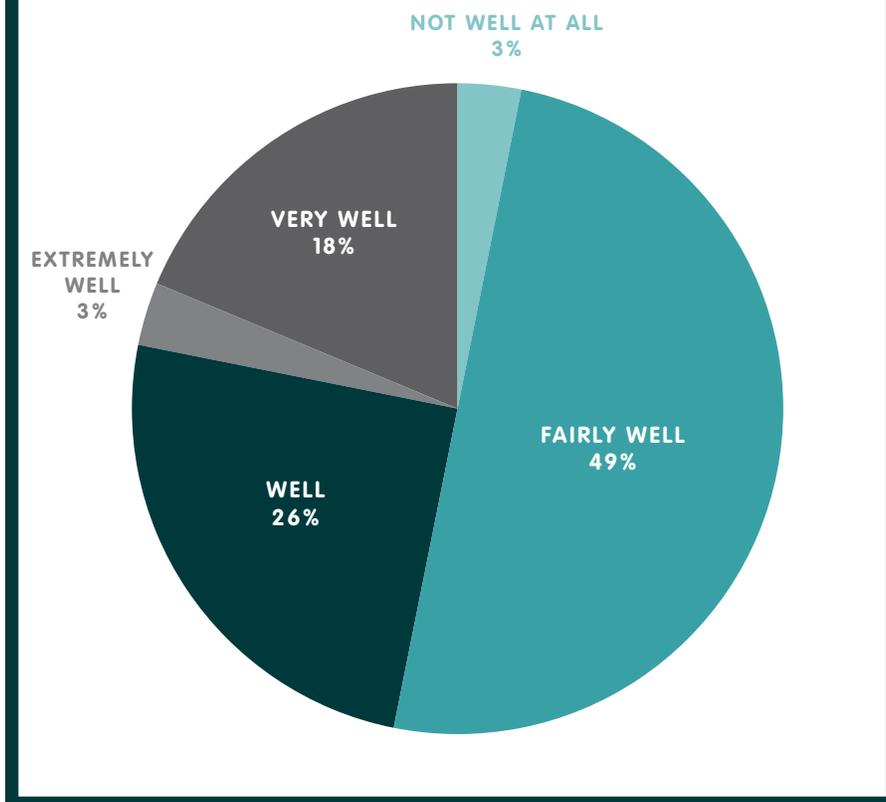


FIGURE 12:  
PROVIDERS OF APPLICATIONS FOR DA INITIATIVES



Utilities are relying on multiple providers for their DA solutions—26% of respondents say they use many vendors and 49% say they use at least few vendors.

FIGURE 13:  
INTEGRATION OF APPLICATIONS FOR DA INITIATIVES



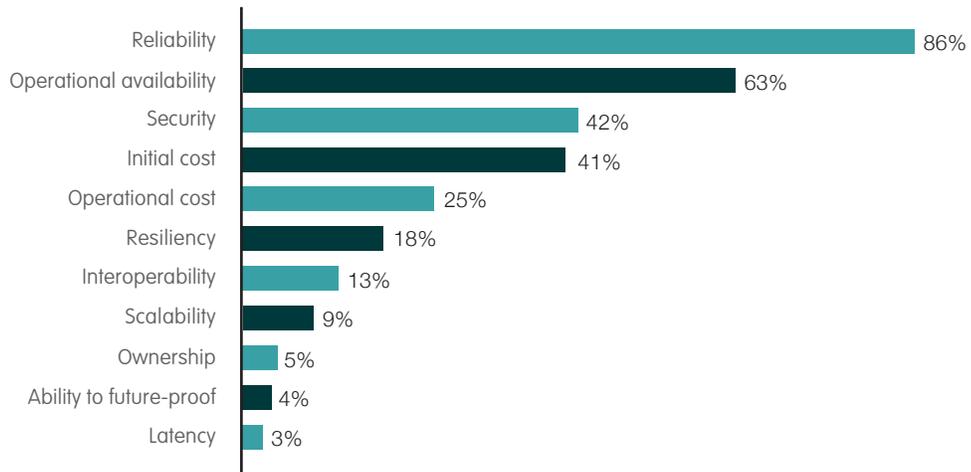
## COMMUNICATION NETWORKS FOR DISTRIBUTION AUTOMATION

At the core of delivering greater automation and real-time control is the ability to communicate among key assets and sensors along the grid. As a result, utilities are looking for communication networks that are reliable (86% ranked it in their top three), available (63%) and secure (42%). (Figure 14)

As the grid becomes increasingly distributed in terms of intelligence, generation resources and third-party participants, most utilities do not feel entirely ready for this transition with their current communication networks—but they recognize the opportunity for improvement and growth. Given the importance utilities place on DA, they are feeling a sense of urgency regarding their communication networks with less than 30% of utilities feeling that that communication networks are very well to extremely well prepared. (Figure 15)

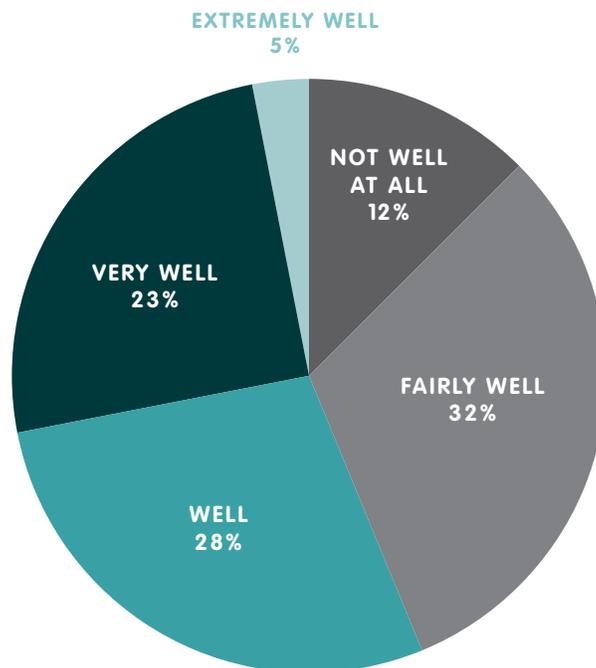
Utilities are beginning to define what their communication networks look like going forward, which often includes upgrading existing networks and converging them with new networks. As this collection of communication networks must serve utilities in the long run and adapt to changing DA needs, communication networks bring interoperability concerns for utilities, along with obsolescence issues. Cybersecurity is also a key concern as utility networks continue to reach deeper into the distribution grid and beyond, and touch an increasing number of distributed devices. (Figure 16)

**FIGURE 14:  
TOP COMMUNICATION NETWORK CHARACTERISTICS FOR DISTRIBUTION INITIATIVES**

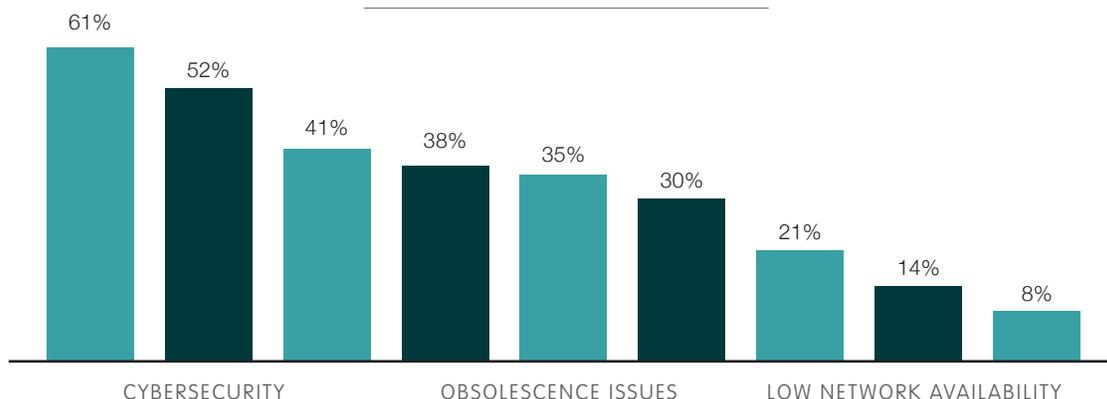


*Note: This chart shows percent of respondents who ranked an option as 1, 2, or 3 (1 = most important).*

**FIGURE 15:  
PREPAREDNESS OF COMMUNICATION NETWORKS TO  
SERVE ORGANIZATION'S FUTURE VISION FOR DA**



**FIGURE 16:**  
**TOP PAIN POINTS OF CURRENT NETWORKS FOR DA INITIATIVES**

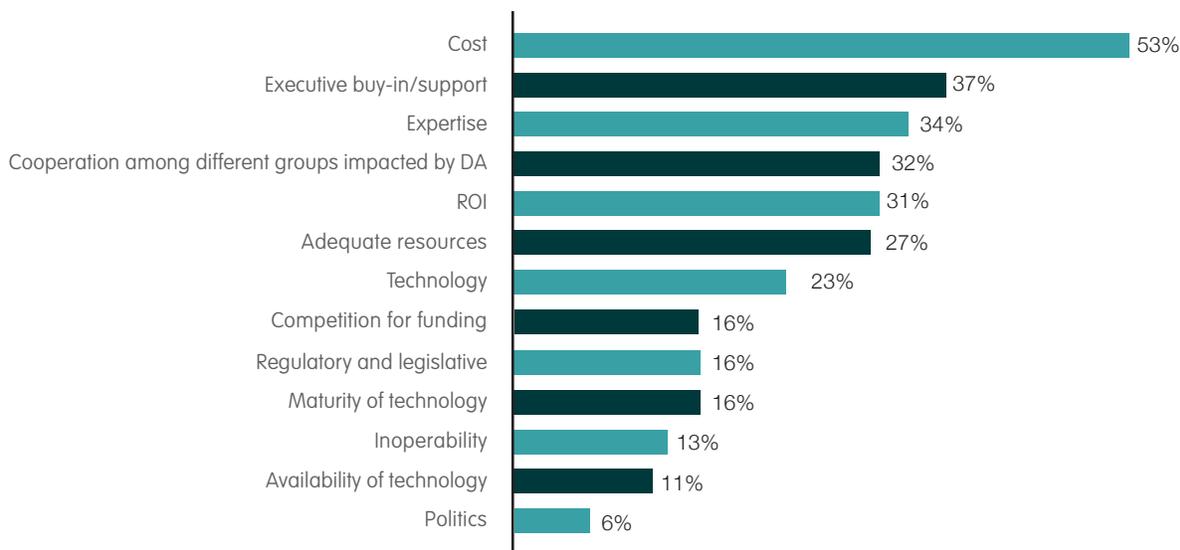


*Note: Percent of respondents who selected an option as his or her "top 3"*

## RECOMMENDATIONS: KEY ACTIONS TO BUILD A DA ECOSYSTEM

DA requires an ecosystem of technologies and systems to fully realize the benefits that utilities seek through a modern, digital grid. As demonstrated above, however, utilities have yet to build out this complete ecosystem. As with most new technologies and investments, the most significant factor preventing utilities from growing their DA efforts is cost (53%). Other key factors include executive buy-in and support (37%), expertise (34%), and cooperation among groups impacted DA (32%). (Figure 17)

**FIGURE 17:**  
**TOP FACTORS PREVENTING ORGANIZATIONS FROM INCREASING DA EFFORTS**



*Note: This chart shows percent of respondents who ranked an option as 1, 2, or 3 (1 = most important).*

## RECOMMENDATIONS: CONTINUED

Cost will always be a factor, but a key challenge within cost is figuring out what will deliver the best value today, as well as in the coming years. Implementing technologies as they offer value should be done while considering how those technologies contribute to what the bigger picture of DA looks like, and how each system will support the vision. Now, more than ever, organizations must be able to bring together once disparate technologies and systems to better operate their increasingly complex distribution networks. Key recommendations to start building your DA ecosystem include:

- **Build a well-defined strategy.**

Utilities must have well-defined DA strategies and visions, so each investment made in DA contributes to the larger ecosystem. Every company is different, so it is important to define what it means for your utility to deliver increasingly diverse and complex distribution networks. The smart technologies being deployed at utilities today provide a great opportunity for companies to transform their approach to distribution automation.

- **Understand what you have today.**

In addition to envisioning what's next, it is important to understand what you have today and how your organization will make the transition between today and tomorrow. What existing technologies can you leverage? Where do your current technologies fall short? How will existing and new technologies best integrate? These are just a few questions to consider as your utility assesses its current systems and technologies.

- **Select good leaders who are in a mode of partnership.**

It is important to understand the changes in technology that need to happen to realize the DA vision, but it is also important to understand the people who make it all happen. Utilities must consider partnerships not just within the company, but outside of it as well—including their vendor partners. "We need to collaborate, we need to integrate, and we need to automate," noted a utility. "Some of these things are hard, but it's not going to get any easier. We must commit ourselves to the fact that we will solve problems, even though we can't solve.

- **Invest in solutions that consider tomorrow.**

There are opportunities with low-hanging fruit, for example, to develop better visibility across the data and control systems you already have today. "We design solutions so when you lay the pieces down, you can start reaping benefits today," Premathilake said. "Our communication solution, for example, can help with data collection. You're able to read, analyze, and control every meter, every sensor and all smart assets across the entire service territory. It is flexible and scalable, and it integrates all of the different pieces." Communication networks will be critical, and opportunities like this will help your utility build stronger connections across the organization and provide a great starting point for a DA ecosystem. Organizations should also consider how existing and new technologies will work together to build true DA ecosystems that maximize the benefits of their investments in the long run.

### TO LEARN MORE ABOUT HOW TO GROW YOUR DA ECOSYSTEM, CONTACT:

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