LOCKHEED MARTIN

ENERGY

LOCAL POWER

State of The Distributed Grid 2017

18 January 2018

INTRODUCTION

The power sector continues its transformation from a one-way to a more distributed grid, but what does a decentralized power network really look like? What is the path forward? Who will drive it?

The distributed grid isn't just a conversation among utilities or among commercial and industrial (C&I) businesses. Rather it's a conversation that must happen among all parties. This study explores the state of the distributed grid, and where these groups align and diverge.

DEFINING THE DISTRIBUTED GRID

Distributed grid: The distributed grid is the concept of moving from a more centralized electrical grid in which one-way power flows from large generation plants (e.g. coal, nuclear) to customers to a more decentralized, two-way grid in which electricity is increasingly generated by smaller-scale generation sources (e.g., DERs). The power is either used directly by energy customers or shared among energy customers.

Distributed energy resources (DER): A DER is a device or measure that produces electricity or reduces electricity consumption, and is connected to the electrical system, either "behind the meter" in the customer's premise, or on the utility's primary distribution system. A DER can include, but is not limited to: energy efficiency, distributed generation, demand response, microgrids, energy storage, energy management systems, and electric vehicles.

Key findings from the surveys of 200 utilities and 160 C&I customers include:

- Nearly two-thirds of utilities — **66%** — believe that distributed grid's importance will increase in the next 12 to 24 months compared with **53%** of C&I customers.
- Many organizations are working on developing business plans or designing projects for the distributed grid — **29%** of utilities and **25%** of C&I customers are currently developing business strategies for grid.
- Both utilities and C&I customers are focused first on **energy efficiency and solar** as they move into the distributed grid.
- Nearly **two-thirds** of C&I customers say their utilities should play an important role in helping them build a more distributed grid and their capabilities with DERs.
- Nearly **two-thirds** of utilities and **76%** of C&I customers believe the federal administration will influence the distributed grid.

UTILITY REVIEW

The utility respondents include investor-owned (54%), municipal (18%), cooperative (19%) and district/federal (10%) organizations from across North America. Here's a breakdown of company size by annual revenue:

19%	Greater than $5B
24%	$1B to $5B
16%	$500M to $1B
18%	$100M to $500M
22%	Below $100M

C&I CUSTOMER REVIEW

The 160 C&I customer respondents include organizations across North America from a variety of industries such as: science and technology, manufacturing, and construction. Here's a breakdown of company size by annual revenue:

15%	Greater than $5B
11%	$1B to $5B
7%	$500M to $1B
12%	$100M to $500M
55%	Below $100M

THE IMPORTANCE OF THE DISTRIBUTED GRID

The distributed grid is moving beyond the hype, and its importance is growing. Both utilities and their C&I customers agree that DERs will be important for their organizations' future success. Nearly 85% of utilities agree, with 48% of them strongly agreeing. Nearly three-quarters of C&I customers agree, too, with 36% of them strongly agreeing. (Figure 1)

Both utilities and C&I customers expect the importance of the distributed grid to increase, with utilities expecting a greater increase in importance. The distributed grid is usually thought of as something that primarily benefits end customers, but utilities expect its importance to increase for them as well. Nearly two-thirds of utilities believe that the importance of the distributed grid will increase in the next 12 to 24 months, along with 53% of C&I customers who expect its importance to increase as well. Even with this expected growth in importance in the near term, significant transformation will likely require many years to fully implement. We've found that organizations are on their way. (Figure 2)

Figure 1: The distributed grid and DERs are critical to my organization's future success.

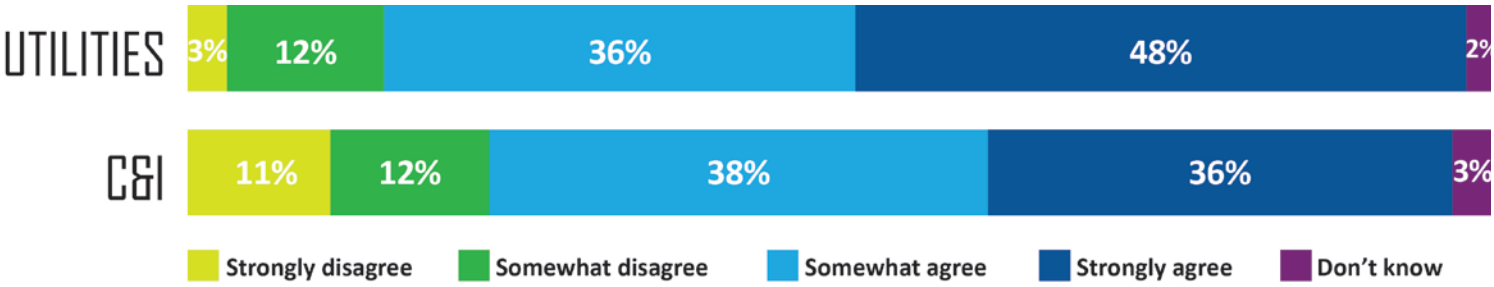
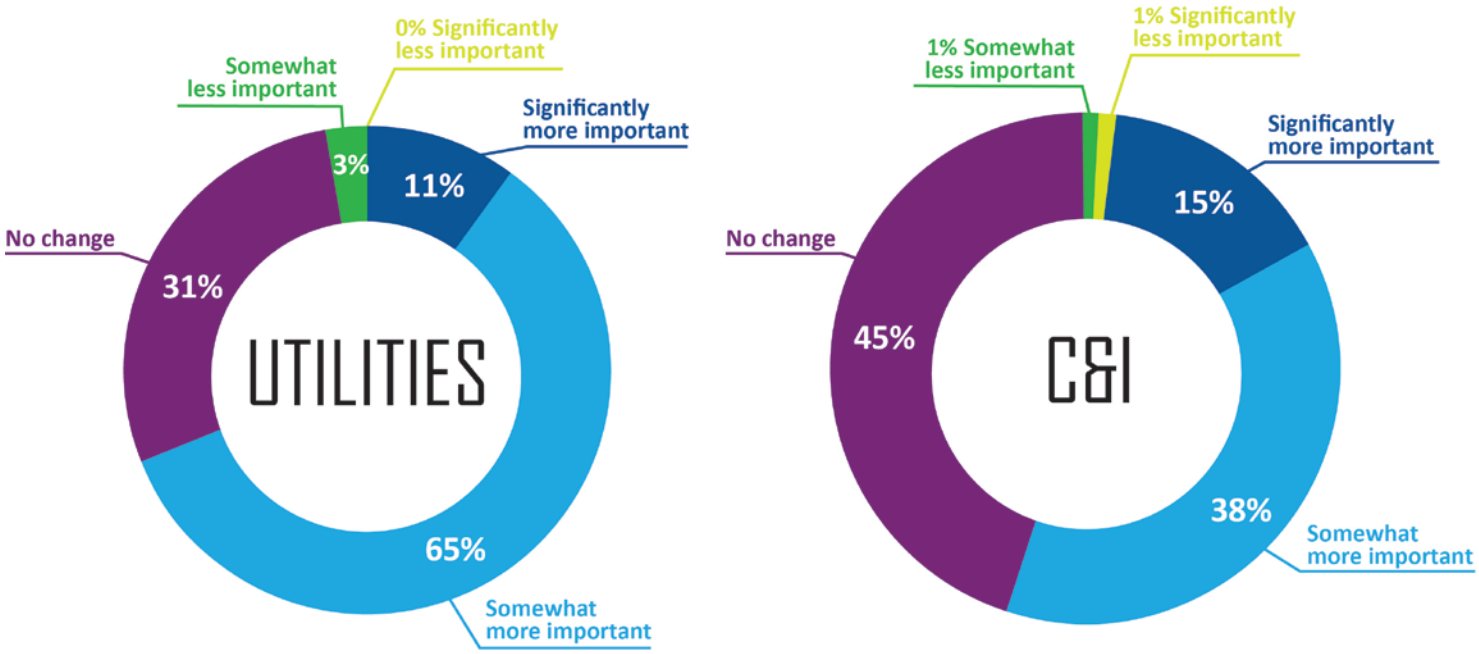


Figure 2: Change of importance in the distributed grid over next 12 to 24 months

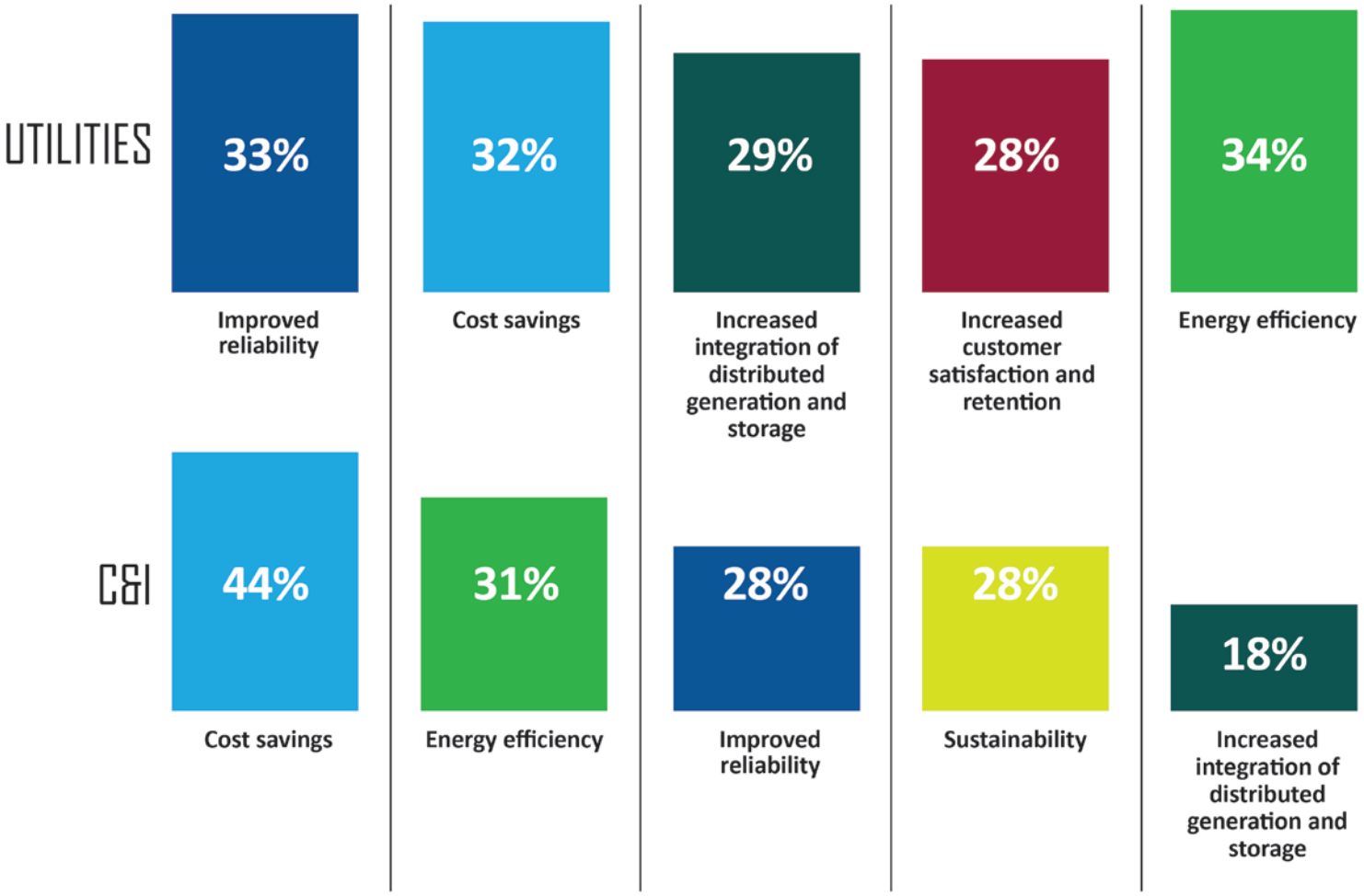


There are many reasons for utilities and C&I customers to focus on the distributed grid. We asked respondents to select their top three benefits from a list of 15 options. Those options included:

- Cost savings
- Comfort
- Control
- Energy choice
- Improved power quality
- Energy efficiency
- Sustainability
- Increased integration of distributed generation and storage
- Environmental/GHG reductions
- Increased security
- Improved reliability
- Improved resiliency
- Increased customer satisfaction and retention
- Increased sales and profits
- Avoided capital investment

Utilities are looking at a variety of benefits with improved reliability (33%) and cost savings (32%) topping the list. Other key benefits include the ability to increase the integration of distributed generation and storage (29%), and to increase customer satisfaction and retention (28%). (Figure 3)

Figure 3: Top distributed grid benefits



KEY AREAS FOR DISTRIBUTED GRID

So, utilities and C&I customers think the distributed grid is important, but what areas of the distributed grid are truly capturing their attention? How much progress is actually being made with building the distributed grid?

Overall, progress is happening. Of the respondents we surveyed, nearly 90% of utilities and 70% of C&I customers are taking steps toward building out a more distributed grid. Many organizations are working on developing business plans or designing projects for the distributed grid. 29% of utilities and 25% of C&I customers currently focus on business strategies for the distributed grid. (Figure 4)

Both utilities and C&I customers focus first on energy efficiency and solar as they move into the distributed grid. After that, utilities tackle demand response for managing the grid resources, and C&I customers take on energy management systems for controlling their buildings and infrastructure. (Figure 5)

Figure 4: Distributed grid progress

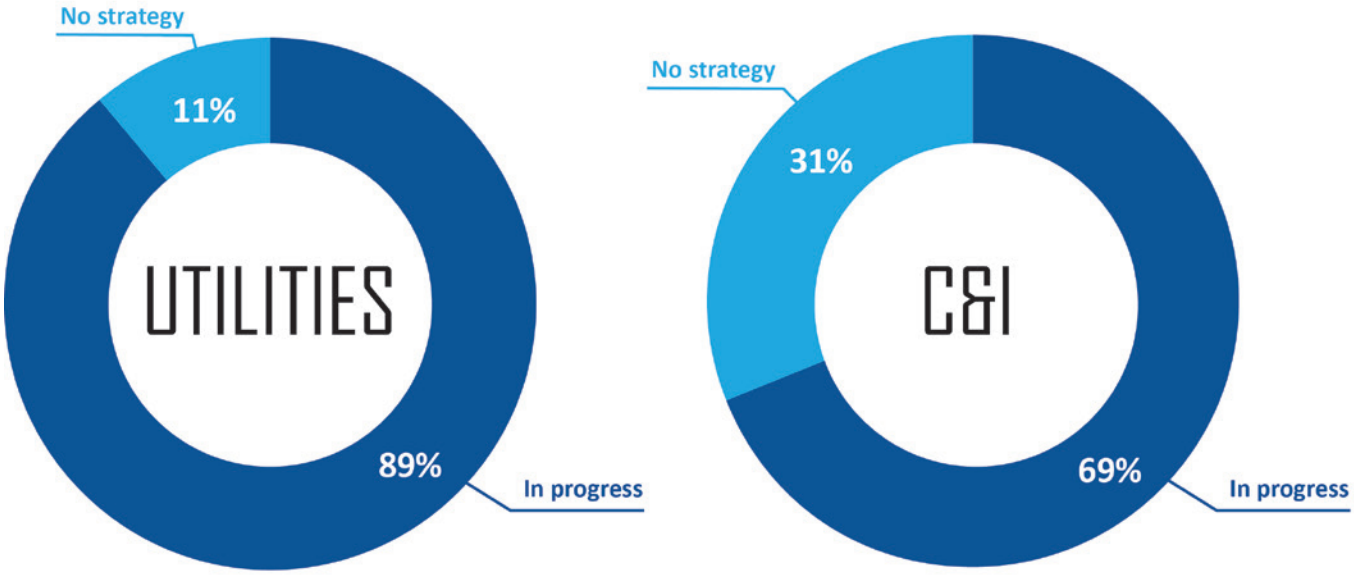
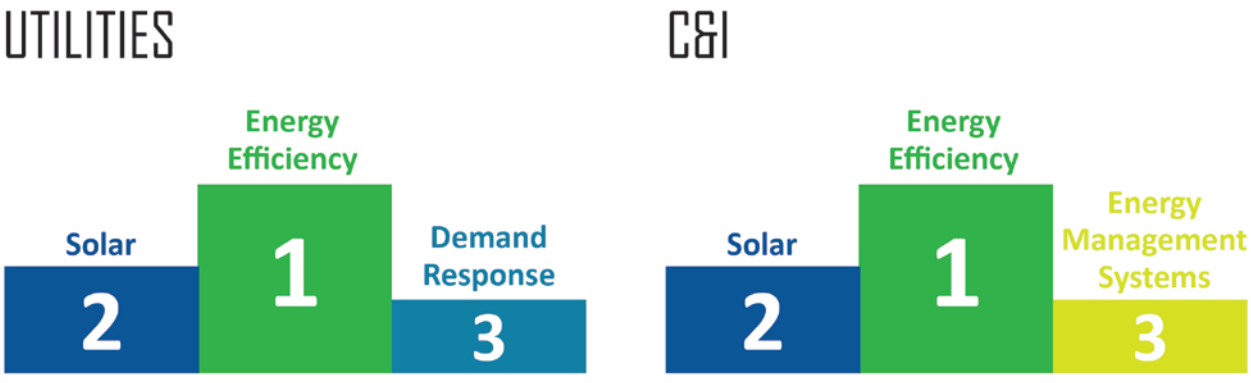


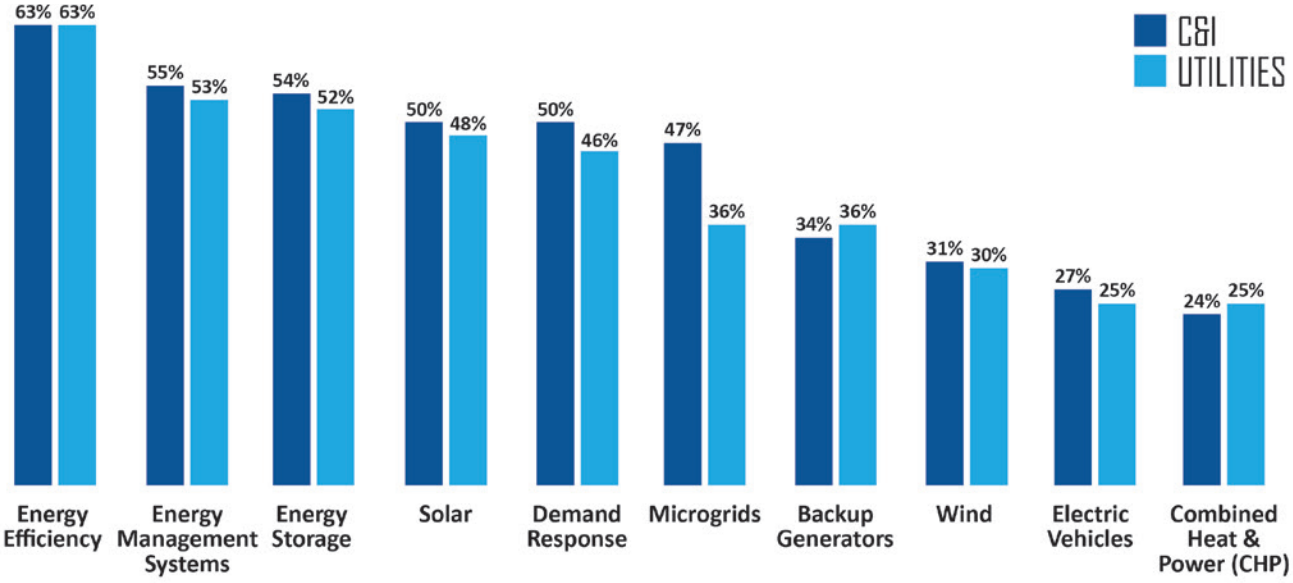
Figure 5: Top three areas underway for utilities and C&I



Progress is happening in key areas for utilities and C&I customers, but both groups agree that many areas will ultimately contribute to their organizations' distributed grid initiatives. Figure 6 looks at the importance of key distributed grid technologies. Energy efficiency, energy management and storage rise to the top of the list for both groups. Even though the survey asked about these areas separately, we should note that many of these areas must work together — such as solar, storage, and microgrids — to deliver on the benefits these organizations anticipate from the distributed grid.

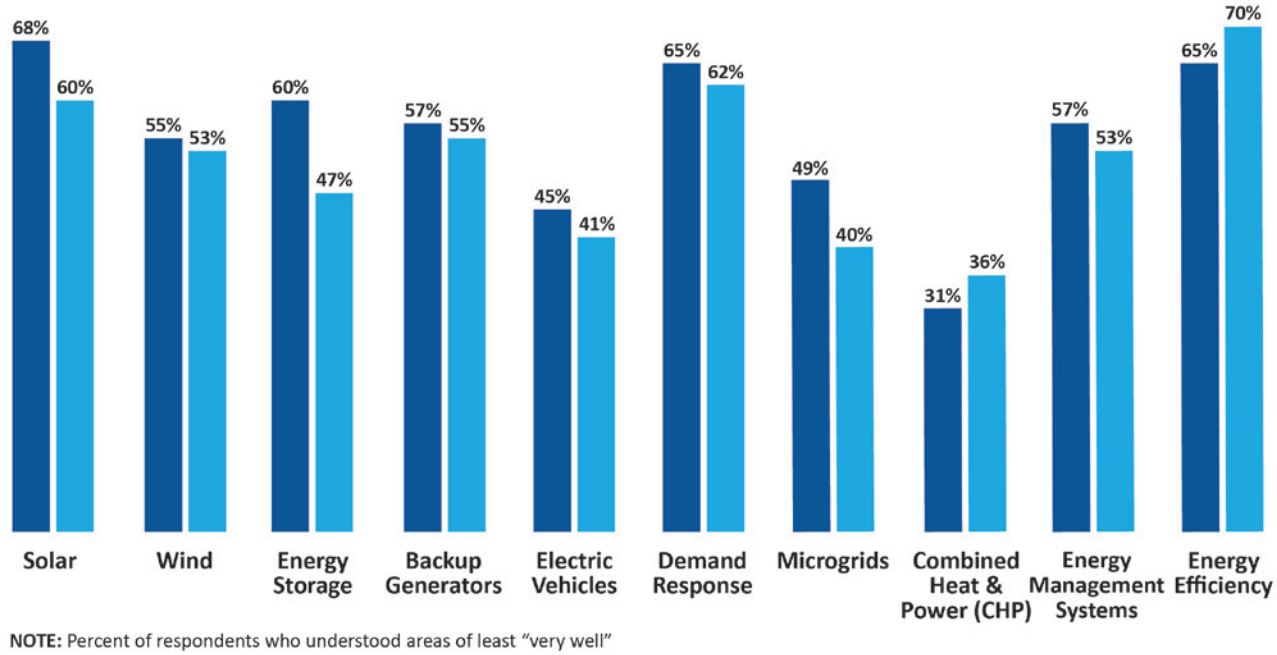
In terms of understanding these areas, many organizations are starting to understand key components for the distributed grid, but there is still certainly room for growth. Topics that seem ripe for further learning and conversations include microgrids, combined heat and power (CHP), and electric vehicles. (Figure 7)

Figure 6: Importance of key distributed grid initiatives for organizations' future success



NOTE: Percent of respondents who selected "very important" or "extremely important"

Figure 7: Understanding of areas for future success



NOTE: Percent of respondents who understood areas of least "very well"

THE DISTRIBUTED GRID PARTNERSHIPS AND INFLUENCES

The distributed grid isn't just about technologies. It's about the people, organizations and policies that will shape it.

When asked about the role that utilities and energy providers play in assisting businesses with the distributed grid, both utilities and C&I customers believe that utilities should play a key role. Nearly two-thirds of C&I customers say that their utilities should play an important role in helping them build a more distributed grid and their DER capabilities. (Figure 8) This finding represents a significant opportunity for utilities to become more engaged with their customers.

Where utilities and their customers differ is how quickly they're making progress toward a more distributed grid. Just over a quarter of utilities think that we're not progressing fast enough toward a distributed grid, compared with 44% of C&I customers who believe we should be moving faster. (Figure 9) This attitude makes sense as C&I customers must often be more nimble and competitive than utilities, but it also means that utilities should consider how they can increase their pace as they work to keep up with — and even stay ahead of — their customers.

Figure 8: Role of utilities/energy providers assisting businesses with distributed grid

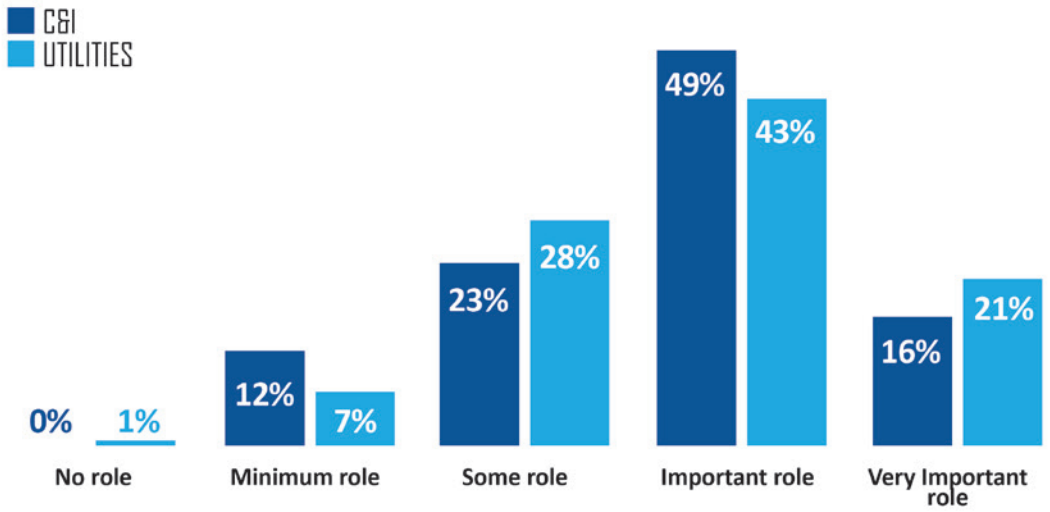
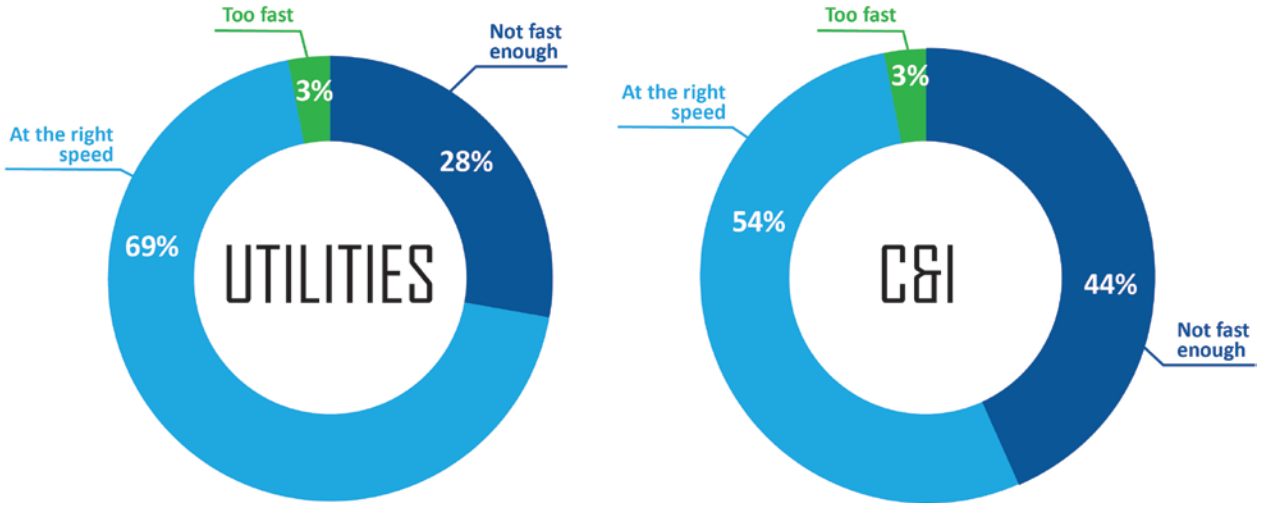


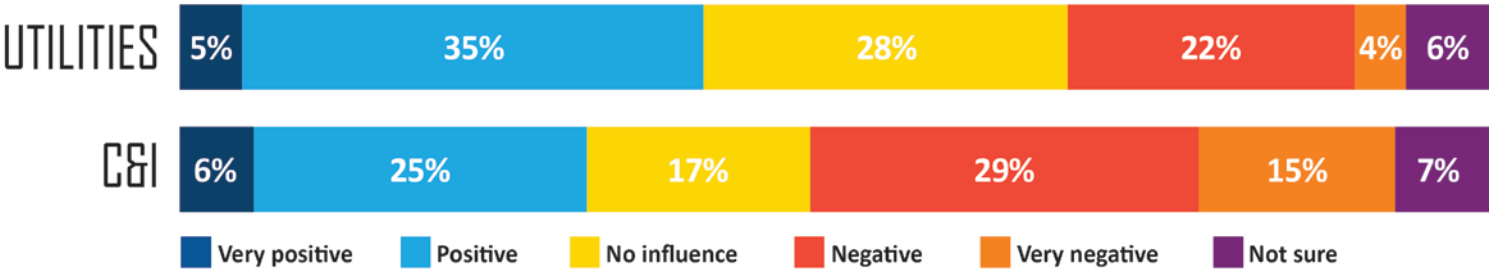
Figure 9: Speed of deploying distributed grid strategies



Looking beyond the relationship between utilities and their customers, other relationships influence the growth of the distributed grid as well. One area we focused on in the research is the impact of the current federal administration on the growth of the distributed grid.

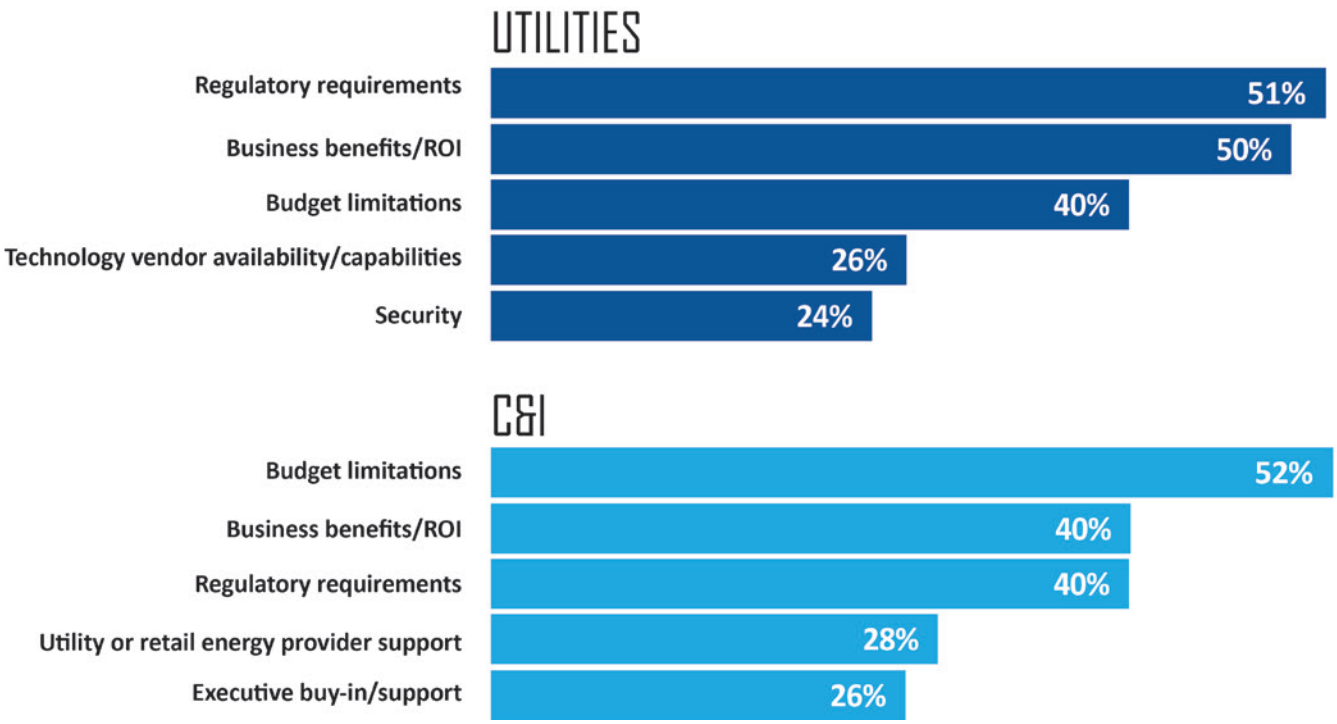
Faced with policies encouraging coal and discouraging climate change consideration, nearly every respondent believes that the current administration will influence the distributed grid in some way. Nearly two-thirds of utilities and 76% of C&I customers believe that the administration will influence the distributed grid. (Figure 10) In terms of whether that influence will be positive or negative, 26% of utilities and 44% of C&I customers believe the administration will negatively influence the development of the distributed grid.

Figure 10: Current administration's influence over creating a distributed grid



Other factors influencing the distributed grid's rollout vary. For utilities, the primary challenge is regulatory requirements. For C&I customers, it is around budget limitations. Despite the expected cost savings and energy efficiency, both groups still must work on the business case for the distributed grid and why it makes sense for their organizations. (Figure 11)

Figure 11: Top challenges for distributed grid



RECOMMENDATIONS

Even with the increased focus on the distributed grid in recent years, many organizations are still just getting underway with initiatives. Organizations have invested in efforts such as energy efficiency, demand response and solar, but more advanced initiatives like energy storage and microgrids are just getting started. To continue building momentum:

Consider how to build a true distributed grid ecosystem. Organizations should consider how different technologies work together to build true distributed grid ecosystems that maximize the benefits of their investments. For example, organizations should consider how technologies such as solar and storage support one another in making them practical for the power grid.

Now is the time to work together. Both utilities and the C&I customers have common drivers and reasons for investing the distributed grid. Utilities must better engage with their customers and learn what they can be doing better and faster. This is truly an opportunity for utilities to be a part of building a more distributed grid that could make them key innovators in the space.

Education and understanding is key. Many organizations are familiar with key distributed grid technologies, but there is an opportunity for solution providers to tell the story of the distributed grid better, and help organizations understand how these technologies can truly apply to their organizations and how they can best work together.

About Lockheed Martin Energy

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