



**Harvard  
Business  
Review**

ANALYTIC SERVICES

Pulse Survey

# BUSINESS RESILIENCY AND ENERGY INNOVATION



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**SIEMENS**

## Putting the World in Power

The expectations for how our grid should work—and what it should be capable of—are higher than they've ever been. Meanwhile, the whole system is playing catch-up. Throughout the 20th century, other innovations evolved rapidly. Yet by 2000, the grid was a relic. It was not only aging, with assets going on a century old, it also was still largely analog in an increasingly digital society. The grid was still carrying out its mission—carrying currents across vast distances and, with few exceptions, generating continuous power—but pent-up disruption was coming. Two powerful trends, in fact, changed everything.

First, there were climate change and a higher frequency of severe weather. Second, there was the formation of the internet of things. With it was the potential to transition to a digital grid. With that was the potential to answer the above resiliency challenge and, as market forces turned in favor of alternative energy—natural gas, wind, and solar—to pursue sustainability and cost savings. With a digital grid, power providers can generate electricity based on actual demand. System failures can be addressed before they happen. Automated backup generation and distribution can keep the power on during severe weather and ensure that the intermittency of natural gas and renewable energies won't reduce reliability.

But while the country may want and need this today, we can't have this digital grid anytime soon—at least not on a national scale. Our power grid not only has to be made newer, it also has to be made smarter. This will take time—decades—to complete.

Consumers are not willing to wait this long. Whether their concern is climate change, resiliency, or cost, they're eager to reap the benefits of a digital grid today. There is, however, an alternative to waiting. Our solution, at Siemens, is to put customers back in power.

Siemens enables customers to stay connected to the grid while also having the capability of generating and managing power themselves using the latest technologies and software. Using localized, efficient power systems and automated controls, consumers become “prosumers” who buy power from the grid when rates are lowest or sell excess power supplies back to a utility. Siemens' customers have more control over how they manage their energy supply, how they use it, and how much they pay for it. And critically, they are shielded from damaging storms and severe weather.

These solutions—microgrids, for example—can sometimes be described as “alternatives” to the utility grid. But Siemens believes that these systems complement rather than compete with the existing grid. They can help maintain power, restore power from a black start, and add value to the grid's transformation.

In time, the grid will catch up. But if you can get back in power, the future is already here.

For more on how Siemens is helping to transform the future of on-site energy, visit [www.usa.siemens.com/onsite-power](http://www.usa.siemens.com/onsite-power).

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# BUSINESS RESILIENCY AND ENERGY INNOVATION

The vast majority of U.S. business, hospital, and higher education leaders have strong concerns about rising energy costs, business interruptions from weather-related events, and the daunting specter of cyberattacks on power grids. But, according to a Harvard Business Review Analytic Services study, only a small minority of organizations have embarked on any significant course of action to address these concerns; only about a third of organizations have developed business resiliency plans. Even fewer have put an energy procurement strategy in place.

Businesses and other organizations need to pick up the pace, according to experts. New technologies are on the cusp of driving an energy industry transformation that will likely change consumption and delivery to the same degree—and with similar speed—that cellular technology revamped telephony. Businesses are already turning away from non-sustainable energy sources. And the most prescient are taming energy costs and ensuring resiliency through increased use of on-site power generation.

Equally striking, despite decades of debate about the role of government in the economy, business and organizational leaders firmly believe in a strong government role in energy innovation. Moreover, the vast majority of respondents believe businesses and municipal governments should partner to ensure the resiliency of cities and the organizations that operate in them.

## A New Energy Era on the Horizon

Businesses and other organizations are clearly turning away from fossil fuels and nuclear power. In their place, solar energy leads the list of energy sources that organizations will significantly increase their use of in the next 10 years. Natural gas also ranks high because of its widespread availability and relatively low carbon emissions. [FIGURE 1](#)

Converting waste to energy is also high on the list. Landing in the number four spot, the process has proven to be very effective, especially in countries with limited fossil fuel resources, according to Robert Thornton, president of the International District Energy Association. He points to Denmark as an example. “During the first oil embargo in 1973, Denmark relied on imported oil for over 92% of its primary energy supply, and the economy nearly came to a standstill. Subsequently, policies like the Electricity Supply Act and Heat Supply Act catalyzed much greater energy and resource efficiency,

### SURVEY HIGHLIGHTS

**37%**  
OF SURVEY RESPONDENTS SAY THEIR ORGANIZATIONS HAVE INITIATIVES IN PLACE TO ADDRESS CLIMATE CHANGE.

**71%**  
OF RESPONDENTS CITE REDUCING ENERGY COSTS AS THE MOST IMPORTANT DRIVER OF DEVELOPING ON-SITE POWER GENERATION.

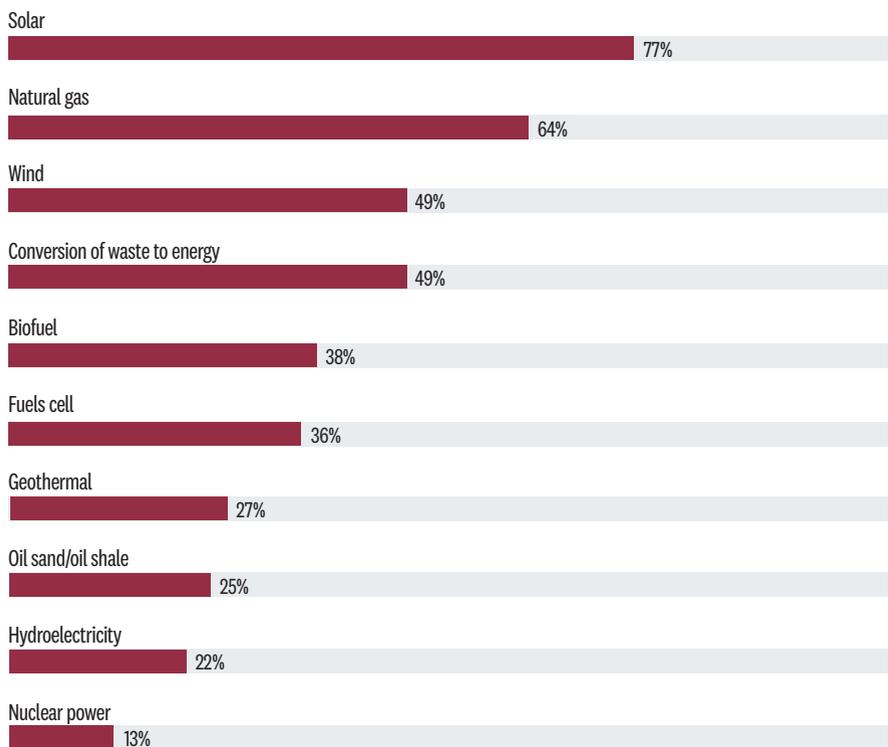
**Nearly 50%**  
OF RESPONDENTS SAY THEIR ORGANIZATIONS PURSUE ENERGY REDUCTION OPPORTUNITIES ON AN AD HOC BASIS.

Businesses are already **turning away from non-sustainable energy sources**. And the most prescient are taming energy costs and ensuring resiliency through **increased use of on-site power generation**.

FIGURE 1

## WHICH ENERGY SOURCES ARE EXPECTED TO GROW?

Respondents indicating that the use of each of the following will increase somewhat or significantly in the next 10 years



SOURCE: HARVARD BUSINESS REVIEW ANALYTIC SERVICES SURVEY, APRIL 2017

ultimately enabling Denmark to sell oil exports from North Sea discoveries. In 2010, Denmark generated 42% of its electricity with wind turbines and 45% by converting waste to energy and using biomass in combined heat and power plants that also supply vast district heating networks.”

St. Paul, Minnesota, is another example, according to Thornton. In 2003, District Energy St. Paul began burning local wood waste in a downtown combined heat and power plant, selling power

to the grid and supplying district heating for nearly 90% of buildings downtown. Previously, the wood waste from tree trimmings or damaged trees would simply end up in landfills. “By converting local wood waste into usable energy, St. Paul has been able to cut coal use by about 250,000 tons per year, reduce carbon emissions by 100,000 tons annually, keep \$12 million in fuel recirculating in the local economy, and maintain stable energy prices for consumers,” Thornton says.

### Multiple Forces at Play

Greg Unruh, an expert in sustainable energy and Arison Professor of Values Leadership at George Mason University, points out that the U.S. has significantly underinvested in its power grid to the same degree that it has neglected other forms of infrastructure. The costs of upgrading the grid can be steep—as much as \$160 billion. And even then, the grid may not be especially resilient. Although grids in the U.S. have advanced controls and more operational flexibility than those in much of Europe, wires in the U.S. are mainly aboveground. “My colleagues from Europe are always shocked when they come here and see our wires overhead,” he says. “Wires aboveground make our grid very susceptible to weather outages. A city block can be taken out by a tree branch! In Europe, most of the electrical grid is underground.”

As the U.S. confronts the enormous expense of upgrading its power grids, renewable energy sources—especially solar—are becoming cheaper and installation is easier to finance. Add advances in storage technology, and it is becoming easier for consumers and businesses to generate their own power away from the grid. Unruh believes that these factors will drive fundamental change in the energy industry. “The pace of the switch will accelerate when

solar energy is less expensive than other sources,” he says. “The transformation can move as fast as the transition from landlines to cell phones. Remember, after the tipping point, it only took about 10 years for cars to displace horse-drawn carriages.”

Richard DiClaudio, president and CEO of the Energy Innovation Center in Pittsburgh, believes that the declining costs of renewable energy will fuel the growth of microgrids—small networks of electricity users with a local source of power that can function independent of the power grid. He also argues that the grid is essentially a one-size-fits-all solution that made sense a hundred years ago when the country was trying to provide power to everyone across the country’s vast landmass.

Today, however, many parts of the U.S. are populated densely enough to make microgrids a potent alternative to the grid. As businesses and consumers realize they can generate their own power, they are likely to combine forces through microgrids to achieve maximum efficiency. Cyberthreats will also accelerate the adoption of microgrids, according to DiClaudio: “When the power stays on in a neighborhood while the lights go out everywhere else, it won’t be very long before people really understand the advantage of microgrids.”

Financial industries will also exert significant influence on the use of both renewable energy and microgrids. Andrew Winston, author of *The Big Pivot*, says that banks are highly unlikely to loan money for coal-burning power plants and investors aren’t likely to put money into them either. DiClaudio believes that insurance companies are on the verge of expecting businesses to use microgrids or face large premiums for business interruption insurance.

Humayun Tai, a senior partner at McKinsey & Company, sees employees as a key factor driving the organizations that they work for to become more energy efficient. Just as people expected their employers to embrace new technologies such as social media, they will expect them to use energy efficiency tools when they start to become common at home. “Voice-activated apps that are connected to smart energy

devices in homes will allow people to manage their energy use with a few verbal commands,” he says. “That will drive energy efficiency at home and businesses will feel obligated to become more sophisticated in their energy use.”

### What Organizations Are—and Aren’t—Doing

Organizational leaders are worried about energy. The most pressing concerns are fluctuating energy prices and competitive pressures to reduce costs. Business interruptions from weather-related events and the specter of cyberattacks on the grid are also gnawing worries, with 76% of respondents strongly agreeing these are a major source of concern. **FIGURE 2**

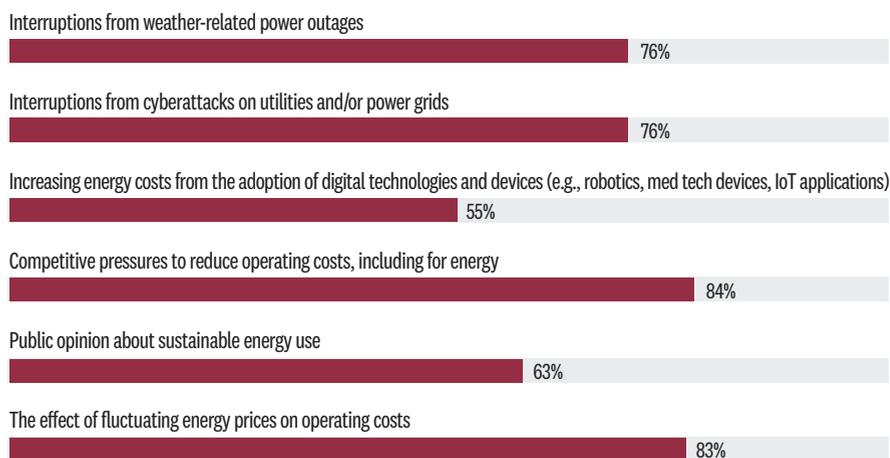
However, most organizations aren’t acting on their concerns, at least to a significant degree. Only 28% of respondents say their organizations have resiliency plans in place. Only 19% say their organization has an energy procurement strategy in place that has strong senior management support. Nearly 50% of respondents say their organizations pursue energy reduction opportunities on an ad hoc basis.

**TODAY, MANY PARTS OF THE U.S. ARE POPULATED DENSELY ENOUGH TO MAKE MICROGRIDS A POTENT ALTERNATIVE TO THE GRID.**

FIGURE 2

### WHAT LEADERS ARE WORRIED ABOUT

Respondents ranking each of the following 8 to 10 on a 10-point scale

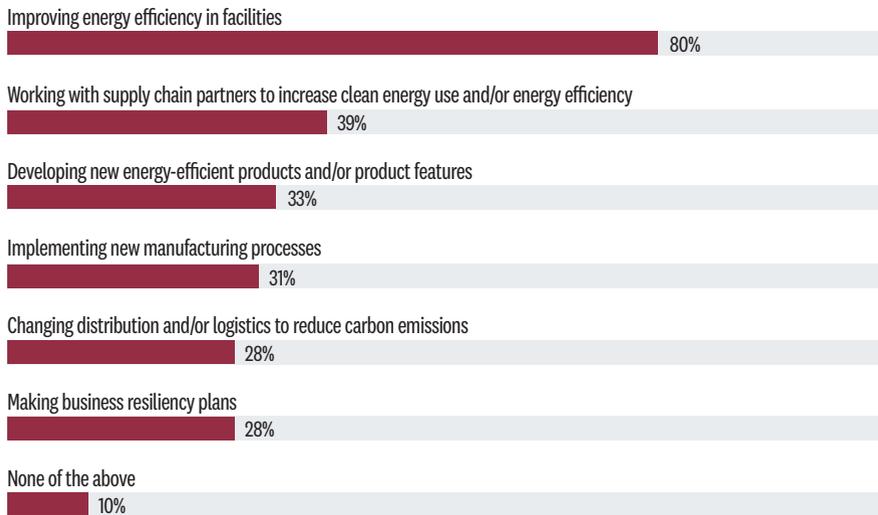


SOURCE: HARVARD BUSINESS REVIEW ANALYTIC SERVICES SURVEY, APRIL 2017

FIGURE 3

## WHAT BUSINESSES ARE DOING ABOUT ENERGY SUSTAINABILITY

Respondents indicating that their organizations are taking each of the following actions

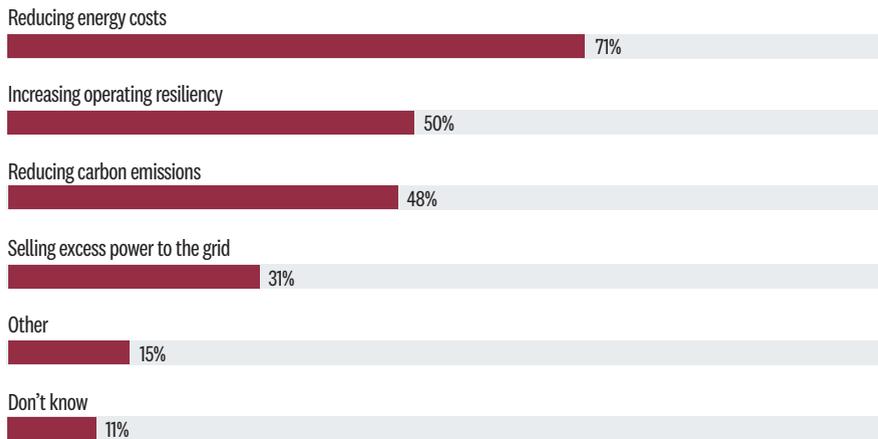


SOURCE: HARVARD BUSINESS REVIEW ANALYTIC SERVICES SURVEY, APRIL 2017

FIGURE 4

## DRIVERS OF ON-SITE POWER GENERATION

Respondents citing each of the following



SOURCE: HARVARD BUSINESS REVIEW ANALYTIC SERVICES SURVEY, APRIL 2017

What are businesses doing? The vast majority focus their sustainable energy efforts on reducing energy costs in facilities, which can often be as simple as installing energy-saving light bulbs.

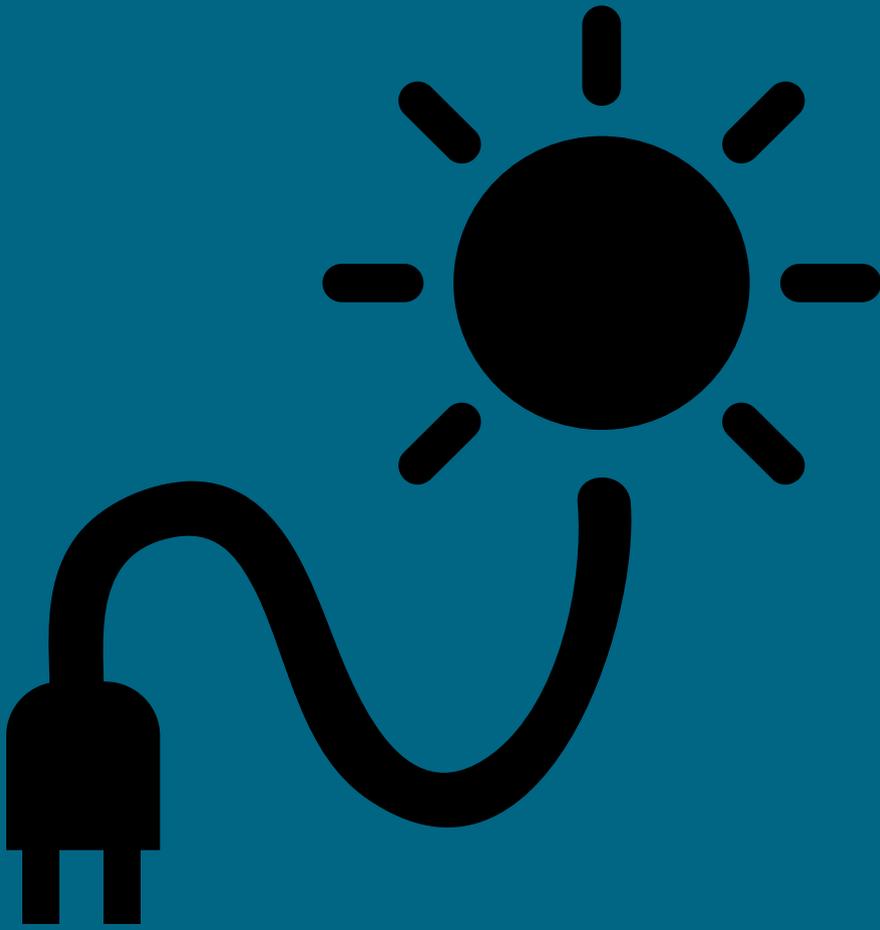
FIGURE 3

Unruh argues that executive mindsets about energy are the greatest barriers to energy innovation. Since utilities provide electricity on demand to everyone, generations of organizational leaders expect electricity to be there when they turn on the switch. Thus, organizations rarely charge anyone with overall responsibility for energy costs and efficiency. In businesses, energy is often the domain of procurement officers who seek the best deals and contracts but aren't looking at overall energy use and efficiency.

However, an increasing number of organizations are moving beyond ad hoc efforts to address their energy-related concerns. They are developing business resilience plans and energy procurement strategies and are also turning to on-site power generation. Approximately one-third of organizations generate their own power. These entities do so to address precisely the top concerns about energy sustainability—reducing energy costs and increasing operational resiliency. FIGURE 4

Solar is a common source of on-site generated electricity. According to the 2016 annual Solar Means Business rankings of U.S. companies' solar energy use, retailers, including Target and Walmart, lead the list. But organizations in other industries are also turning to the sun to achieve energy independence.

The Campbell Soup Company is a case in point. It powers many of its industrial facilities through on-site generated solar power. And now, the company is using solar power generated on-site to power its corporate headquarters in Camden, New Jersey. "Generating power on-site lets us plan and drive more resiliency in the system," says vice president, corporate responsibility and chief sustainability officer, Dave Stangis. "It also helps the community, since we are able to sell unused electricity back to the utility, which helps everyone make more efficient use of energy."



**APPROXIMATELY ONE-THIRD OF ORGANIZATIONS  
GENERATE THEIR OWN POWER. SOLAR IS A COMMON  
SOURCE OF ON-SITE GENERATED ELECTRICITY.**

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Utilities are also playing an **increasingly helpful role**, and only 34% of respondents see their efforts to preserve the status quo as a major barrier to energy innovation.

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California-based Prologis has gone a step further. The global warehouse company realized that generating solar energy on its roofs can become a significant source of revenue. Although Prologis occupies the number three spot behind Target and Walmart, its warehouses aren't as energy intensive as retail facilities with extensive lighting, refrigeration, heating, and computers. But Prologis realized that it could mount solar panels on the flat roofs of the warehouses it leases to companies and sell the power it generates to local utilities. "We were motivated to generate clean power but also to leverage an underutilized asset," says Matt Singleton, senior vice president of global energy and development. "This is a for-profit activity."<sup>1</sup>

Concerns over climate change are another driver of on-site power generation. The survey found that about 40% of organizations have a climate change initiative in place or plan to within the next three years. These organizations are twice as likely to generate power on-site as are others. "Companies are concerned about their carbon footprint and want to have an impact," says Winston. "As the price of renewable forms of energy continues to drop, the correlation will go up even more."

### **Getting the Ball Rolling**

Getting the ball rolling can be tough if energy efficiency isn't a top corporate agenda item. Among companies that have the most substantial energy strategies, the process often starts with a high-level sustainability officer raising energy concerns, which can trigger a thorough analysis and action. Winston describes the process at Microsoft to illustrate.<sup>2</sup> Like many organizations, Microsoft viewed electricity as an inexpensive commodity that came instantly when someone flipped a

switch. But the rise of cloud computing and volatile energy prices have made electricity a much larger expense for many technology companies. Thus, in 2011, Rob Bernard, the company's senior sustainability executive, asked Microsoft's risk assessment team to look at the firm's exposure. The team concluded that Microsoft's risk exposure was high. Emerging carbon regulations and volatile energy prices were likely to drive significant expense. Energy promptly landed on the C-suite agenda.

The public's growing mistrust of big business is another impetus to put a strategic lens on energy. Increasingly, businesses realize that they need to meet the expectations of multiple stakeholders, including members of the communities in which they operate. "We have found that more advanced organizations understand that 100% of their expenditures can't be allocated to just shareholders, product lines, and markets," says DiClaudio. "Some has to be invested in the community, whose members are often concerned with environmental issues such as carbon emissions."

McKinsey's Tai observes that although energy savings may not be a large enough expense to attract C-suite attention, those savings can be considerable at energy intensive sites such as a manufacturing plant. These facilities have probably implemented a number of energy-efficiency initiatives. C-suite members often become aware of these and then implement several across the enterprise as part of operational efficiency programs.

## The Demand for a Strong Government Role

Despite ongoing debates about the role of government in the economy, only a tiny minority of respondents—16%—believe that governments should have no involvement in energy innovation. A significant majority believe that government should support energy innovation through research funding and energy financing for businesses and consumers. Nearly 90% of respondents believe that businesses and municipal governments should work together to improve operational resilience. **FIGURE 5**

The city of Pittsburgh is at the forefront of forging such relationships and taking a leadership role in energy innovation. Several decades ago, Pittsburgh officials realized that the city needed to build significant economic resilience in order to emerge from the deep recession of the 1980s. To spur growth and draw new businesses and residents, Pittsburgh diligently brings together representatives from local government, universities, utilities, and businesses to work on driving a citywide renaissance.

An aging infrastructure is a major impediment to Pittsburgh's full economic revival. To improve the infrastructure as efficiently and effectively as possible, the city government has developed resilience and energy strategies. For example, Pittsburgh modeled energy consumption and generation across the region to identify inefficiencies and opportunities to leverage innovations including microgrids and combined heat and power systems. Armed with that knowledge, city leaders reached out to businesses and other constituencies to improve the efficiency of the regional energy system.

The Almono real estate development is a prime example. For a 178-acre project at the intersection of Pittsburgh's three rivers, the developer didn't initially realize that just plugging into the grid could cause problems. "The developers came to realize that they needed to understand the strengths and weaknesses of the grid in the area [where] they were building," says Grant Ervin, Pittsburgh's chief resilience officer. "They also wanted to figure out what they could do to assure

FIGURE 5

## GOVERNMENT'S ROLE IN ENERGY INNOVATION

Respondents indicating that they somewhat or strongly agree with each of the following

Governments should provide tax incentives and research funding to support innovation in sustainable energy

89%

Municipal governments and private enterprise should work together closely to assure operational resilience on the part of both

87%

Government should support organizations and consumers with energy financing, such as a green bank to stimulate private investment in sustainable energy

74%

Governments should increase regulation of traditional, non-sustainable energy use to encourage alternative energy innovation

50%

Government should not be involved in energy innovation

16%

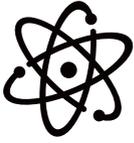
SOURCE: HARVARD BUSINESS REVIEW ANALYTIC SERVICES SURVEY, APRIL 2017

resiliency in the area." A partnership with another large energy-intensive company followed a similar path. As Erwin observes, "As the company turned to on-site power generation and microgrids, they needed to understand the power sources and resiliency needs of the neighborhoods they operated in. They realized that they shouldn't go it alone if they want to achieve a high degree of efficiency and resiliency."

Utilities are also playing an increasingly helpful role, and only 34% of respondents see their efforts to preserve the status quo as a major barrier to energy innovation. Although some utilities lobby state and local governments to create regulations that prevent companies and consumers from leaving the grid, some are starting to take the lead into a new era of energy.

Consider Green Mountain Power in Vermont. The electric utility is encouraging businesses and consumers to install solar panels, storage, and microgrids to generate some of their own power and become less reliant on the grid.<sup>3</sup> When customers generate some of their own electricity, they save money and are less likely to leave the grid. When customers defect, the

**TO MEET THE DEMANDS OF A CHANGING ENERGY LANDSCAPE, ORGANIZATIONAL LEADERS ARE WELL ADVISED TO ADD ENERGY INNOVATION TO THEIR SKILL SETS.**



## ONLY A FRACTION OF ORGANIZATIONS HAVE BUSINESS RESILIENCY AND ENERGY PROCUREMENT STRATEGIES IN PLACE.

utility's costs have to be spread over a smaller base of customers, which drives up prices. As prices increase, more customers defect, creating a downward spiral that Green Mountain Power is determined to avoid.

### **Conclusion: A New Energy Skill Set**

In terms of energy and innovation, Winston draws an analogy between marketing executives and social media. "There was a time when the rise of social media was something that marketing executives were aware of but didn't do much with," he says. "A decade later, it's a skill they have to have."

Energy innovation is similar. The vast majority of business, health care, and higher education leaders are quite concerned about the costs of energy and interruptions from weather-related events and cyberattacks on the grid. Yet only a fraction of organizations

have business resiliency and energy procurement strategies in place.

The time is ripe to pick up the pace. The U.S. is entering a new energy era. The costs of renewable energy are declining, and technological innovation is creating opportunities to be less reliant on power grids, including by generating power on-site. To meet the demands of a changing energy landscape, organizational leaders are well advised to add energy innovation to their skill sets.

#### Endnotes

- 1 Daniel Gross, "Put a Solar Panel On It." *Slate*, January 29, 2016
- 2 Andrew Winston, George Falaloro, Tim Healy, "Energy Strategy for the C-Suite." *Harvard Business Review*, January-February 2017
- 3 Dianne Cardwell, "Utility Helps Wean Vermonters from the Electric Grid." *The New York Times*, July 29, 2017

## METHODOLOGY AND PARTICIPANT PROFILE

A total of 162 respondents drawn from the HBR audience of readers in the U.S. (magazine/enewsletter readers, customers, HBR.org users).

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### SIZE OF ORGANIZATION

<b>30%</b> 10,000 + EMPLOYEES	<b>13%</b> 5,000 - 9,999 EMPLOYEES	<b>17%</b> 1,000 - 4,999 EMPLOYEES	<b>11%</b> 500 - 999 EMPLOYEES	<b>29%</b> 50 - 499 EMPLOYEES
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### SENIORITY

<b>22%</b> EXECUTIVE MGMT OR BOARD MEMBERS	<b>45%</b> SENIOR MANAGEMENT	<b>22%</b> MIDDLE MANAGEMENT	<b>11%</b> OTHER GRADES
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### KEY INDUSTRY SECTORS

<b>24%</b> MANUFACTURING	<b>14%</b> UNIVERSITY/ HIGHER EDUCATION	<b>14%</b> ENERGY/ NATURAL RESOURCES	<b>9%</b> EACH IN RETAIL/ CONSUMER GOODS AND FOOD/BEVERAGE	<b>8%</b> HOSPITALS	<b>7%</b> LIFE SCIENCES/ PHARMACEUTICALS	<b>4%</b> OTHER (AGRICULTURE, AUTOMOTIVE, ENVIRONMENTAL, REAL ESTATE, TRANSPORTATION)
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### JOB FUNCTION

<b>23%</b> GENERAL/ EXECUTIVE MANAGEMENT	<b>8%</b> ADMINISTRATION	<b>8%</b> ENGINEERING	<b>7%</b> OPERATIONS/ PRODUCTION/ MANUFACTURING	<b>7%</b> R&D/PRODUCT DEVELOPMENT	<b>6%</b> OTHER
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