

# Beyond the math

Preparing for disruption  
and innovation in the US  
electric power industry

# Furthering the conversation on innovation

We are pleased to offer this insight as a part of Deloitte's innovation series—a collection of articles aimed at providing ideas and practical insights specific to innovation.

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A member of the board of directors of the United States Energy Association, Aliff is co-author of the annually updated industry reference book *Accounting for Public Utilities*, published by Matthew Bender since 1983. His articles and commentary have appeared in *Electric Light & Power*, *Electric Perspectives*, *The National Interest*, and *Public Utilities Fortnightly*. Aliff is also the author of the Deloitte Center for Energy Solutions report, *The Math Does Not Lie: Factoring the Future of the US Electric Power Industry*, which precedes *Beyond the Math: Preparing for Disruption and Innovation in the US Electric Power Industry*.

During his 36-year career, Aliff has appeared on industry programs sponsored by organizations such as the American Gas Association, Edison Electric Institute, the National Association of Regulatory Utility Commissioners, and the United States Energy Association.

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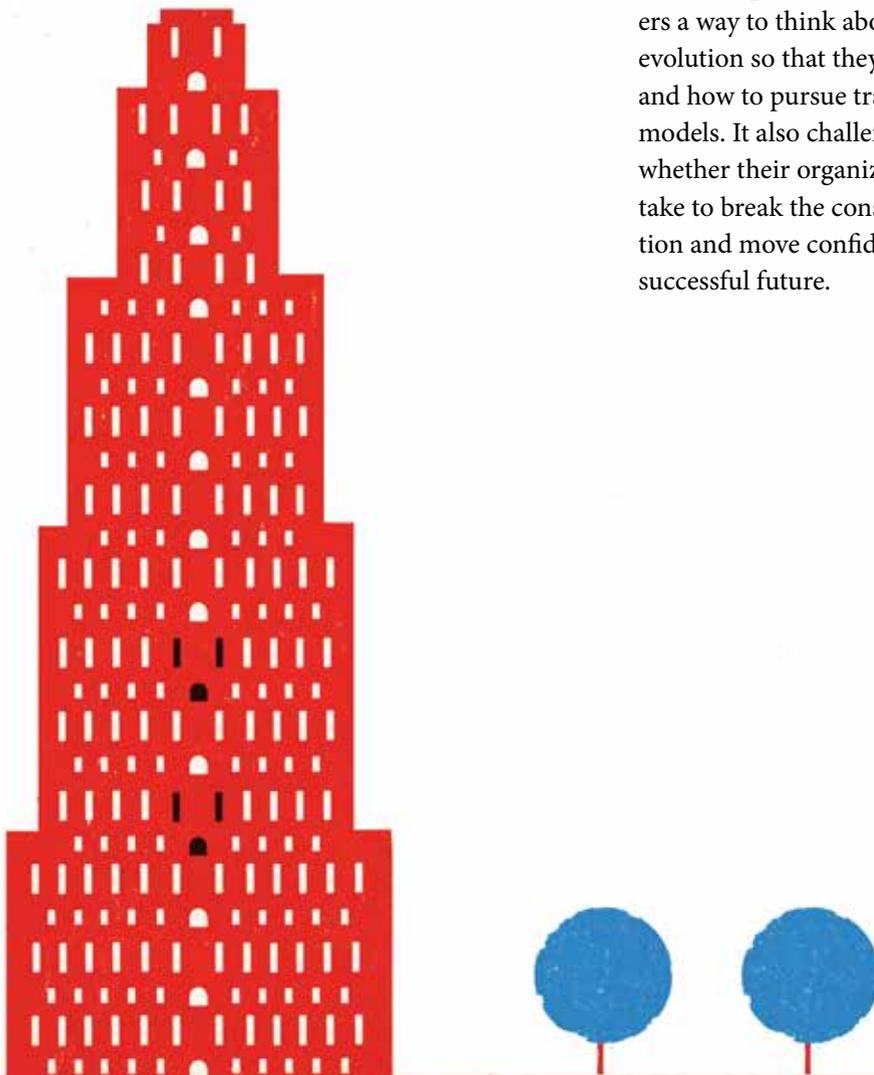
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# Introduction

A RECENT Deloitte report—*The Math Does Not Lie: Factoring the Future of the US Electric Power Industry*—suggests that the pace of change in the electricity sector is accelerating. It posits that this is due to both new technologies and projections for stagnant or even declining electricity consumption in the face of rising costs and changing customer attitudes and practices.

If indeed the sector is changing in unusual ways, the time to innovate may be now. The key will be to develop innovative solutions that meet changing customer needs and expectations. This is not familiar territory for much of the industry. While the electric power sector has historically improved its performance in providing safe, reliable, and affordable electricity, its basic operating model for meeting customer requirements has not changed for decades.

This report offers electric sector stakeholders a way to think about the industry's coming evolution so that they can determine if, when, and how to pursue transforming their business models. It also challenges stakeholders as to whether their organizations have what it will take to break the constraints to true innovation and move confidently toward a profitable, successful future.



# A time to innovate?

**T**HE electric power industry could soon be facing its most disruptive period of change since the commercialization of electricity in the 19th century. The time is ripe for significant transformation because the potential for dramatic disruption<sup>1</sup> to the existing electricity operating model is coming not from one direction, but from many—demand, technology, regulation, new products, and new competitors.

The single most powerful force, however, is likely the wave of energy-related technologies that are breaking long-established boundaries—most critically, the lines that separate electricity providers from customers. Distributed generation, for instance, is turning the tables on traditional business models by enabling many customers to produce and consume their own electricity, as well as to sell excess production to electric companies. In parallel, increasingly intelligent hardware and software systems are allowing consumers and businesses to smartly manage and thus significantly shift and reduce their electricity consumption. Continuing advancements in energy storage also have the potential to alter the traditional electricity customer/supplier relationship. In the not-too-distant future, homes and businesses may rely on energy storage units, fed by local renewable sources and distributed generation, as their primary sources of power.

These fast-paced technological changes, when added to the gathering forces of moderating demand, extreme weather, and costly regulation, are starting to shake the foundation of the traditional electricity operating model: the provision of safe, reliable, and affordable electricity to customers in exchange for steady, predictable returns. And when affordability and reliability are called into question, so too are the efficacy and viability of the current electric sector value proposition.

This suggests that the stage is set for innovative new products that better meet electric customers' demands and needs in ways that substantially disrupt today's electric sector operating model.

If so, disruptive innovation, by its very nature, gives birth to new business models. These models will require electricity companies to redefine their value propositions to create a win-win for producers and customers alike, where some of the products being provided will likely be behind the meter or off the grid. Some of these new business models may well afford even greater opportunities for profitable growth than those employed today. The question isn't if thriving in the new environment is possible, but rather if it is plausible: Do today's electric-sector participants have the capacity and the will to transition to new business models in order to participate in the coming transformation?

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<sup>1</sup>"Innovation" is a widely used term. The definition in the context of this paper is generally intended to be "any combination of activities or technologies that breaks existing performance tradeoffs in the attainment of an outcome in a manner that expands the realm of the possible."<sup>2</sup>

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# Five dimensions of change in the electric utility industry

**A** CRITICAL question facing the US electric sector is this: Are market forces signaling that the pace of change is accelerating in disruptive ways, and that new business models are needed? And, if change is indeed around the corner, how should the electric sector position itself?

The “environmental velocity” of change in any industry can be examined across five dimensions: demand, technology, regulation, products, and competition.<sup>3</sup> As an industry’s environmental velocity increases, companies may well be required to innovate in order to survive and thrive. Analyzing today’s electric sector across these five dimensions can provide stakeholders with a common framework for evaluation, analysis, discussion, and debate.

## Demand

This dimension encompasses changes in “the willingness and ability of the market to pay for products and services,”<sup>4</sup> in this case, electricity. It includes changes in the trend of electricity consumption as well as in the shifting behaviors of customers. The signals here are enlightening.

## Electricity sales

After earlier recessions, US electricity consumption rebounded strongly. However, recent US electricity consumption suggests that history may not repeat itself after the latest recession. The US Energy Information Administration (EIA) now projects annual growth in consumption of just 0.5 percent a year for industrial users and 0.9 percent for homes through 2040. In the middle of the 20th

century, by contrast, utilities could count on consumption to grow by more than 8 percent annually. Even in the wake of the 1973 Arab oil embargo, demand growth averaged 2-4 percent a year.<sup>5</sup>

A recent Brattle Group study paints a more dire picture. It predicts that by 2020, electricity demand and consumption will decline 7.5-15 percent and 5-15 percent, respectively, compared to what they would have been without associated energy efficiencies.<sup>6</sup>

## Customer behavior

US consumers and businesses are taking increasing advantage of opportunities to reduce consumption, produce renewable energy, and invest in self-generation.

## If change is indeed around the corner, how should the electric sector position itself?

- **Consumption falling:** Deloitte’s 2011 and 2012 reSources studies show that a growing percentage of consumers are taking steps to reduce their electricity usage—83 percent in 2012 versus 68 percent in the 2011 study. The 2012 reSources study also reveals that businesses on average are targeting reductions in energy consumption of 23 to 24 percent over a three- to four-year period.<sup>7</sup>
- **Efficiency improving:** Consumers are showing a growing interest in purchasing

energy management systems to alter their home energy use and, in some cases, in shifting their usage to lower-tariff periods.

- **Consumer empowerment increasing:** While cost remains a primary concern, consumers also are seeking convenience, control, instant gratification, and customizable solutions.<sup>8</sup> These desires are rooted in concern for the environment and a general sense that technology should empower consumers.

## Technology

New energy technologies are fundamentally shifting the value chain from a one-way to a two-way flow of electricity and information. The three areas where technology may well have the greater impact are the electric grid, distributed generation, and energy efficiency.

### Smart grid transformation

The smart grid allows the use of information technology to enable automation and two-way digital communications. Already, the smart grid not only transports electricity, but also captures large volumes of data that electricity suppliers and other players can use to add value and create new products—for instance, to allow customers to analyze and modify consumption patterns. The impact of big data on the electricity industry should not be underestimated. Eventually, the management of data is expected to be essentially automatic, opening vast new horizons for industry participants.

### Distributed supply

The cost of investment in renewables is falling, while battery storage technology continually improves. Combined, these trends can enable more efficient, reliable decentralized energy production and distribution closer to the point of consumption. This could be the

real game-changer for the electric sector, subverting the traditional spoke-and-wheel model of centralized generation and spoked transmission to areas of concentrated distribution. It also places electric power-related assets in the hands of non-traditional suppliers.

Already, microgrids are emerging across the country as communities and organizations seek to secure electricity supply, manage costs, and reduce their carbon footprint. Self-generation is proliferating in American businesses. The Deloitte reSources 2012 study found that 35 percent of companies surveyed were generating some of their own electricity supply through renewable sources, cogeneration, or self-generation, up from 21 percent in the 2011 study. And approximately 17 percent more American businesses have plans to invest in self-generated power in the near term.<sup>9</sup>

### Energy efficiency

The rapid evolution of technology-enabled energy efficiency solutions is significantly cutting into consumption. The drive for efficiency is coming from every direction: Most states have increasingly ambitious efficiency targets and stricter energy-related codes; a fast-rising number of businesses are employing demand management systems; federal efforts like the Better Buildings Initiative are expanding; and appliance efficiency standards are on the rise.

## Regulation

State and federal regulations impacting the electric sector are continually evolving in response to, among other things, environmental concerns, energy savings goals, and protection of critical infrastructure. Among the more significant regulatory trends:

### Federal

For the electric power generation sector, the US Environmental Protection Agency's (EPA's) new Mercury and Air Toxics Standard

(MATS), promulgated under the Clean Air Act of 1970, is expected to cost utilities an incremental \$55 billion between 2015 and 2020.<sup>10</sup> Other federal standards also have the potential to cause a sea change in the industry. For instance, federal policies supporting the adoption of electric vehicles could contribute to new patterns of electricity demand and consumption, including the potential for substantial decentralized electricity storage.

## State

- **Renewable Portfolio Standards (RPS):** While state RPS mandates are raising costs for electricity in the short term, investments in wind and solar generation (in particular) are also helping to bring these technologies to scale—and closer to grid parity.
- **Energy Efficiency Resource Standards (EERS):** State EERS are growing, resulting in reduced consumption. The combined energy efficiency budgets of US states are expected to increase at a compound annual growth rate of 4-10 percent by 2025 as more states enact energy efficiency policies and increase savings targets.<sup>11</sup>
- **Third-party resale of electricity:** Third parties traditionally have been prohibited from selling electricity by the kilowatt-hour (kWh). But with the buildout of charging

station infrastructure to serve electric vehicles, several states have lifted these prohibitions and other states may well follow suit.

## Products

This dimension encompasses both new and enhanced products as well as changes in how existing products are perceived by the market. For the electric power industry, the question of perception is crucial: Will customers continue to perceive their electricity supply as safe, reliable, secure, and affordable? If not, they will be open to an increasing number of alternatives offered by non-traditional suppliers.

There is growing evidence that consumers already are looking for alternatives, prompted in part by concern that the aging US electric infrastructure no longer can be relied on to provide a consistent electricity supply. This notion has been reinforced by massive power losses in the aftermath of recent hurricanes and storms. Furthermore, electric customers are not immune from all of the news media suggestions of potential attacks, both physical and cyber, on the US electric infrastructure.

In 2011-2012, 14 extreme weather events, each causing more than a billion dollars in damage, occurred in the United States.<sup>13</sup> Major power outages caused by weather have increased from about 5-20 each year in the mid-1990s to about 50-135 each year in the past five years.<sup>14</sup> Some analysts believe the

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A series of recent outages caused by massive storms and equipment problems has raised the awareness—and ire—of electric customers:<sup>12</sup>

- In October 2012, Hurricane Sandy knocked out power to 8.5 million customers in 21 states, the largest storm-related outage in US history. A week later, 650,000 homes and businesses were still dark.
  - In late June of 2012, a set of storms called a “derecho” ripped through the middle of the country, killing power to an estimated 4 million homes and businesses along a path between Indiana and Virginia. A week later, 416,000 homes and businesses were still dark.
  - In October 2011, a Northeast snowstorm knocked out power to 3 million homes and businesses. A week later, 176,000 homes and businesses in Connecticut were still without power.
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increasing outages may be due to a combination of power grid deterioration and a real increase in the number of extreme weather events.<sup>15</sup>

It is no surprise that backup generator sales have increased 17 percent annually on average in the decade through 2011, and that the largest manufacturer's sales and adjusted earnings jumped 40 percent in 2012.<sup>16</sup>

“On an average day, 500,000 Americans suffer some sort of power outage. It is precisely that lack of power quality and reliability that will force some customers to search for better and more reliable behind-the-meter solutions. And the high cost of remedying the problem will result in higher rates, providing an even more competitive environment for new technologies.”<sup>17</sup>

—*Forbes.com*

Combine declining confidence in the reliability and security of supply with the prospect, described in *The Math Does Not Lie*, that electricity prices will continue to rise, and the pursuit of alternatives to the traditional electricity supply can only intensify.

The products being offered by new entrants are legion: Solar services providers are installing photovoltaic panels on commercial and residential rooftops, abetting the revolution in distributed generation; wind power also is becoming widespread; energy is increasingly being stored in batteries—in vehicles, in homes, or for the purpose of providing backup power to entire communities; home energy-management products are empowering consumers to control energy usage and their carbon footprint; and corporate energy and demand management products are doing the same for businesses. Meanwhile, financing programs for renewables and energy efficiency are proliferating, aided by policies such as Property Assessed Clean Energy (PACE), which helps consumers spread the costs of new systems over longer time periods.

Not only are individuals and companies seeking out reliable, secure alternatives—so too are entire communities, states, and the federal government. After two historic storms in 2011 caused unprecedented outages, Connecticut passed a bill in 2012 requiring its Department of Energy and Environmental Protection (DEEP) to establish a microgrid program to support distributed energy generation for critical facilities.<sup>18</sup> Others are getting in on the act as well: Santa Rita Jail in California, which depends on electricity to keep inmates in their cells, has transformed its 113-acre campus into a microgrid.<sup>19</sup> Also, the US military has over 40 microgrid installations in use or under development.<sup>20</sup>

Some traditional electricity suppliers are already engaged in introducing new

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Duke Energy Corporation may expand into rooftop solar as wider use of photovoltaic panels by customers cuts into demand for electricity, according to chief executive officer Jim Rogers. Rooftop panels are gaining popularity as the industry faces “anemic” growth in power demand that may redefine the traditional utility business model, he added.

“It is obviously a potential threat to us over the long term and an opportunity in the short term ... If the cost of solar panels keeps coming down, installation costs come down, and if they combine solar with battery technology and a power management system, then we have someone just using us for backup.”<sup>23</sup>

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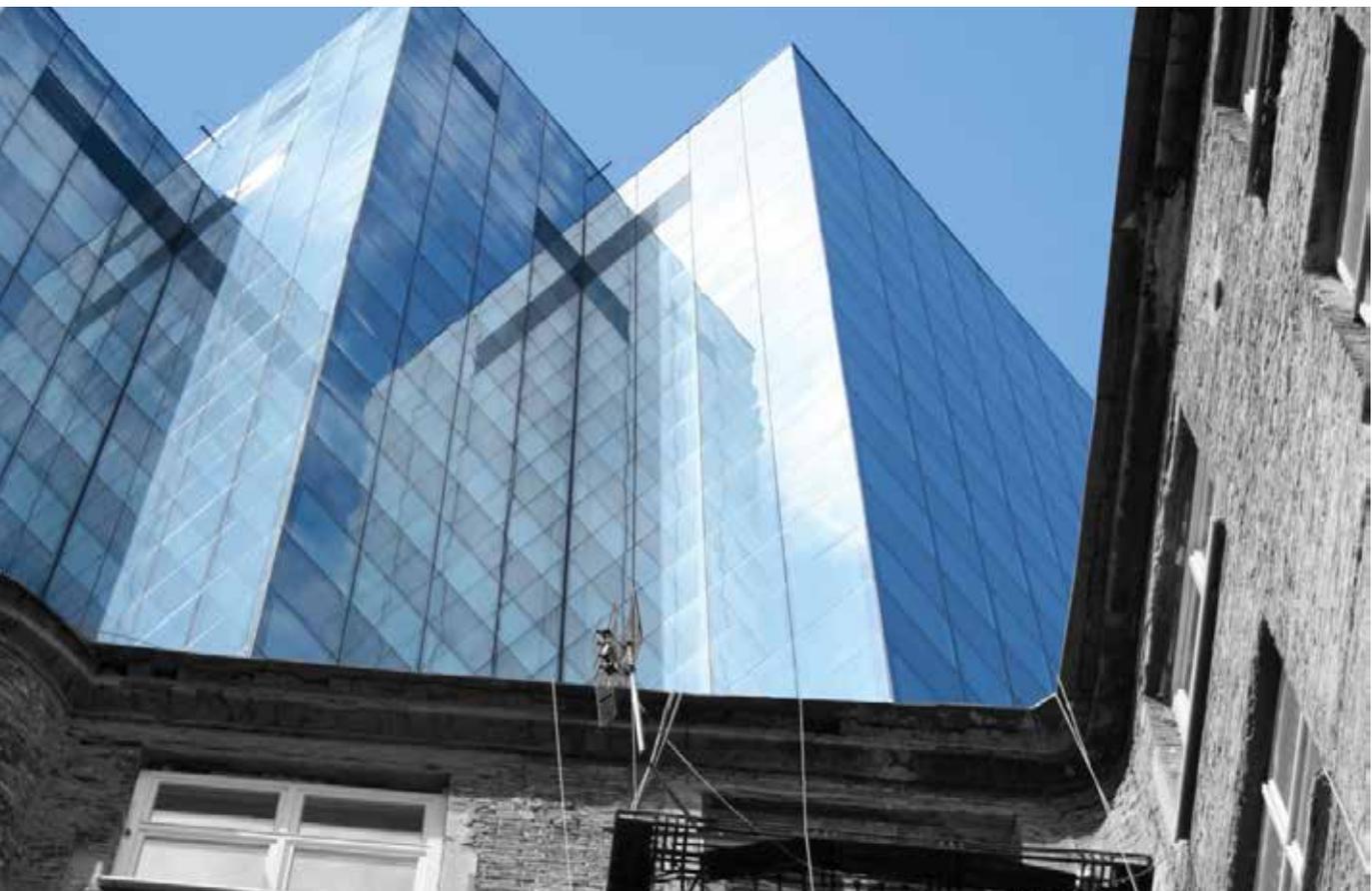
products to customers. Arizona Public Service Company, among others, installs and finances renewable energy systems for its customers—and even owns some of these systems itself.<sup>21</sup> NextEra Energy Resources LLC, meanwhile, has embraced clean energy, generating nearly 74 percent of its power from emission-free sources. Austin Energy owns a network of electric vehicle (EV) charging stations. And two years ago, Constellation Energy (now a subsidiary of Exelon Corporation) purchased demand response provider CPower to increase its demand-response offerings to customers.<sup>22</sup>

## Competition

Significant changes in growth rates and in the structure of competition within an industry—industry size, population, and density—can fundamentally affect an industry’s existing business model. The electric industry has been

consolidating in recent years,<sup>24</sup> as companies merge to strengthen balance sheets, confront the challenges of increasing capital expenditures, and take advantage of synergies. At the same time, new technologies and changing customer requirements are opening markets to new entrants.

By investing in the aging electric infrastructure, especially the electric grid, traditional electricity suppliers could be paving the way for their competition. An analogy could be to the builders of broadband infrastructure, who often took massive losses while watching nimble, consumer-oriented companies like Amazon and YouTube see their valuations soar into the tens of billions. In the consumer electricity market as well, it could be new entrants that reap significant benefits from present and future capital outlays in electricity infrastructure.



# Calculating the velocity of change

**T**HE chart below illustrates the relationship of these five dimensions to three possible scenarios—the most disruptive scenario, the least disruptive scenario, and the most likely scenario. The most disruptive and least disruptive scenarios are self-evident. It is the analysis of where the most likely scenario sits between the two ends of the spectrum that suggests the “velocity of change” an electric power company should anticipate and the associated urgency of examining new business models that may well open the doors to innovation.

This analysis suggests that the most likely scenario for the US electric power industry looks very similar to the most disruptive scenario. The differences between them are really a matter of degree, not of substance. Viewed this way, it is quite likely that the electric power industry can anticipate a “velocity of change” that leans toward the disruptive end of the spectrum. Given this overall picture, the questions are: How far away is the reality of this disruption, and how can the industry break traditional constraints and innovate in this new environment?

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Dimensions	Scenario 1 Most disruptive	Scenario 2 Most likely	Scenario 3 Least disruptive
<b>Demand</b> (electricity consumption) <i>(higher or lower)</i>	Lower	Lower	Higher
<b>Technology change</b> <i>(high or low)</i>	High	High	Low
<b>Regulation</b> <i>(more, same, less)</i>	More	More	Less
<b>Products</b> <i>(new or existing)</i>	New	New	Existing
<b>Competition</b> <i>(more, same, less)</i>	More	Same	Less

# Catalysts and barriers to innovation

**I**f market forces indeed signal an accelerated pace of change and disruption such that new business models emerge, will electric power companies be able to position themselves to survive and thrive in the new environment? Which industry characteristics will help them succeed in this transition, and which are more likely to hold them back? The challenge in developing new and flexible business models to deal with disruption will be to balance the industry's inherent "catalysts of change" against the industry's institutional "barriers to change."

## Catalysts of change

The US electric power industry is healthy today. Most of its participants boast strong balance sheets, strong earnings, and steady dividends. The sector is well-versed in raising capital to finance its long-lived infrastructure.

Meanwhile, the sector has developed core competencies that historically have served it well in its mission to provide safe, reliable, and affordable electricity. When combined with a strong balance sheet, these competencies can serve as important catalysts to a successful transition to new business models.

### Political savvy

Given the significant regulatory oversight that the electric sector has historically faced, the sector is politically savvy at the federal, state, and local levels. As a "regulated" industry, the sector is experienced in dealing with many aspects of regulation. At its core, rate regulation (i.e., successful rate case outcomes) has been the lifeblood of the business. While

the outcome of every rate case may not be as successful as hoped, the industry has a track record of acceptable results where most, if not all, parties to the process deem the results a win-win.

Beyond the rate case process, the industry also has a long history of legislative and regulatory experience. Indeed, achieving a successful regulatory balance in terms of balanced policy (and actual compliance) touches practically every aspect of the business—from environmental, health, and safety, to construction and operations, to infrastructure and cyber security, to shareholder requirements.

### Local community relations

Electric distribution companies, in particular, are generally viewed as good corporate citizens. They are usually major employers in their headquarter cities and have a reputation for making significant contributions to their local communities. Their employees are active in the communities where they live and are often highly visible on community boards and even in local politics. These grass-roots activities engender a high level of customer loyalty and a strong brand image.

### Corporate governance

Electric companies generally operate in an environment of good corporate governance, with experienced boards of directors and strong risk management structures and processes. Holding company structures are often used, in part, to insulate regulated operations from other lines of business that are often viewed as more risky.

Good governance structures and processes tend to extend throughout the business—including capital structure and financing alternatives, merger and acquisition activities, and succession planning. Boards are adept at evaluating and challenging current business models and keenly interested in emerging marketplace and regulatory trends that may create risks to be managed or new opportunities to be considered.

### Human capital

Substantial talent can be found in electric power companies. While not considered a “sexy” business, these companies are known for their good compensation packages, employee benefits, and opportunities for advancement. They generally are deep in traditional engineering skills and have substantial talent throughout their finance organizations, including in finance, treasury, accounting, budgeting, corporate development, risk management, and mergers and acquisitions.

### Barriers to change

While the electric sector has historically increased the safety, reliability, and efficiency of its core businesses—generating, transmitting, and delivering electricity—little has changed in its basic business model and operating structure since the nuclear power buildout of the 1970s to early 1990s. The exceptions are that, in some parts of the United States, the integrated ownership model has evolved to separate ownership of generation, transmission, and distribution (with the latter two remaining highly rate-regulated), and also that retail competition has been introduced.

Given this tradition of consistent performance, will the industry be able to move to new business models in response to multiple disruptors that may well fundamentally alter

its traditional value chain? A number of institutional factors may constrain the evolution of the US electricity business model and will likely challenge the industry’s ability to truly innovate.

### Regulatory compact

The relationship between the electric power sector and its regulators has historically served both the industry and US electricity customers well. In exchange for near-monopoly status, electric companies have agreed to regulatory oversight designed to give consumers the benefits of electricity service that substantially substitutes for a competitive environment. The result, for the most part, has been safe, reliable, and affordable electricity since the early 1900s. In fact, on average, the real residential price of electricity, adjusted for cost of living, fell 34 percent between 1983 and 2004. Despite very modest increases since then, the average 2012 price was still 28 percent below the inflation-adjusted price of 30 years ago.<sup>25</sup>

The challenge is that the existing regulatory paradigm has evolved as the electric sector has grown and developed. The very nature of the regulatory construct is to ensure that the electricity industry continues to operate within the confines of the industry’s current business model. This institutional barrier to change can be further complicated by the political environment in which the regulatory process necessarily functions.

There is substantial evidence that regulators are willing to listen and embrace change where there is a demonstrated benefit to customers. However, the regulators’ hands are often tied by legislative mandates and out-of-date court decisions. The situation is further complicated by the existence of both federal regulation and a myriad of regulations across the 50 US states.

With regard to the regulatory compact, the central question to be addressed is most likely not if this barrier to change can be overcome,

but whether it can be overcome quickly enough to successfully transition to new business models. Or will it be a situation of too little too late?

### Infrastructure investment

The US electricity system is often described as a spoke-and-wheel configuration—where electricity is produced at large, central generating stations, then transmitted over long distances to large population centers, where it is distributed to individual businesses and consumers. This basic model, taking advantage of the diversity of customer load factors and patterns, has contributed to the consistent improvement in providing safe, reliable, and affordable electricity. And, to date, most advances in technology have focused on the ability to increase the performance of the various elements of this system.

As a result, the US electricity industry today owns and operates a massive, complex, long-lived infrastructure. This investment is, for all intents and purposes, on the asset side of the balance sheet of an electric company, while the liability side holds the debt and shareholder equity that has financed this enormous capital investment. Edison Electric Institute projects that industry capital spending will be approximately \$85 billion in 2013 and that an equivalent amount will be invested in 2014. This is the highest capital intensity and the greatest absolute capital spending level of all US industrial sectors, by a significant margin.<sup>26</sup>

Needless to say, any future electricity business model that does not require significant reliance on the current electricity infrastructure can represent a tremendous barrier to change for present owners of the electric power system. If the evolution to new operating models is slow, traditional electricity providers will likely be challenged in making the transition. If the pace of change is fast, or disruptive, and thus raises the specter of abandoning much of

the traditional infrastructure investment, the barrier will be substantially higher.

Said differently, the question shifts from “How can we afford to change?” to “Can we afford not to change?” Ironically, these are the same questions electricity customers will likely be asking themselves in an environment of rising electricity costs and diminishing confidence in the reliability and security of their current electricity service.

### Fiduciary responsibility to shareholders

Present ownership of electric companies could constitute one of the greatest constraints to change—particularly for those companies that own rate-regulated generation, transmission, or distribution assets. Shareholders in many of these companies are often characterized as “widows and orphans” because they purchased the company’s stock for its steady earnings, cash dividends, and low-risk profile. Today’s owners of many of these companies are both individuals and large institutions that, for the most part, expect boards and management to develop and execute a long-term strategy that produces these results.

By their very nature, disruptive innovations and their associated new business models carry a higher degree of risk. They often involve the deployment of new technologies and the introduction of new products where initial success rests on the ability to “make a market” in an environment of multiple competitors.

A decision to transition to a higher overall risk profile will likely involve significant internal debate and the high probability of negative reactions from the financial markets and shareholders. This barrier may ultimately be deemed insurmountable—and as a consequence, new business model alternatives may be severely constrained.

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Exelon CEO Chris Crane explained the company's recent 41 percent dividend cut, at least in part, as a means to pursue growth: "We believe that our dividend should be sized to reflect our business model and keep our balance sheet strong. We also think that the dividend must be sized to allow us capacity and flexibility to pursue growth that will enhance the company's long-term value."<sup>27</sup>

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## Corporate culture

The corporate culture of the electric-ity sector has been shaped, in large part, by its long-standing business model. Words that characterize this culture are traditional, steady, loyal, and trustworthy—all attributes of a business relied upon to provide a safe, reliable, and reasonably priced product to its customers. Electricity companies are deep with talented, dedicated employees and are steeped in effective processes to execute their operations. Naturally, people who thrive in such an environment are attracted to the electricity sector and are rewarded for their contributions to enhancing the company's culture over time.

However, it would be hard to imagine finding a bunch of risk-taking, entrepreneurial types thriving in such a culture. There are likely a select few positions that demand, and value, such attributes in their employees—but still within the confines of the overall corporate culture.

The existing electric sector culture can therefore be a significant barrier to the adoption of new business models. Boards and management should carefully evaluate the likelihood of successfully changing the fundamental way their employees think and what they value. Similar to the regulatory compact barrier, the question to be addressed may not be if this barrier to change can be overcome, but whether it can be overcome quickly enough in the face of disruptive change in the marketplace for electricity products.



# Conclusion

**T**HE *Math Does Not Lie* raised the prospect that electricity consumption may be declining over the long term for the first time in the history of the US electric industry, resulting in substantial increases in the cost to deliver electricity to customers. The report suggests that, in such an environment, electric companies may need to explore new business models.

However, the transition to new business models presents risks and challenges, and a strong case for such endeavors needs to be made by a company's senior management and its board of directors before embarking on such a journey. This paper raises the question as to whether the fundamental pillars of the electric power industry—safe, reliable, and affordable electricity—can withstand a world of rising electricity costs and challenges to the reliability and, for that matter, security of electricity supply to customers.

A confluence of new technologies and rising customer demand for new products foreshadows the high potential for disruptive

innovation in the electricity sector and the advent of successful new business models in meeting customer needs and demands. Against this backdrop, a reasonable question for senior management and boards to evaluate is their company's capacity, and wherewithal, to transition to new business models—if the time is indeed at hand.

The good news is that electricity companies generally have strong balance sheets and capital-raising capabilities, coupled with good governance and risk management practices as well as strong brand permission with their customers—clearly the envy of any start-up enterprise. On the other hand, the barriers to change are both internal and external, and they are substantial. As boards and managements deliberate over these barriers—ranging from regulations, to shareholders, to cultural constraints—it will be important to shift the lens of the evaluation away from “Why we cannot afford to change”—to “Why we cannot afford NOT to change.”

Against this backdrop, a reasonable question for senior management and boards to evaluate is their company's capacity, and wherewithal, to transition to new business models—if the time is indeed at hand.

# Endnotes

1. In this report, “disruption” is used in its colloquial sense. For a discussion of “disruption” as a process of innovation by which entrants often displace incumbents in a wide variety of markets, see *The Innovator’s Manifesto* by Michael E. Raynor (New York: Crown Business, 2011).
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