



# 2017 Top Digital Trends for the Electricity Value Network



2016 was a year of accelerating change that will impact the power industry across the entire Electricity Value Network. Power leaders determined to thrive in this rapidly changing landscape must understand these trends, how they will impact their business models and the transformative role of digitalization. In this Executive Brief, GE outlines the trends that warrant consideration by every power and utility executive as they develop strategies for success in 2017.

## 1 | **Impact of Renewables and DERs**

Balancing New Sources of Energy at Every Level of the Network

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Becomes Scalable and Mainstream

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Power Producers, Utilities and Grid Operators Who Employ New Business Models



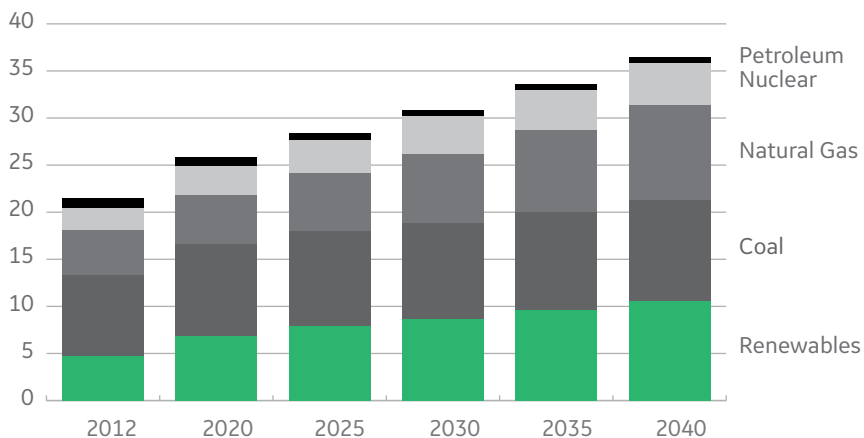
## 1

## Impact of Renewables and DERs Balancing New Sources of Energy at Every Level of the Network

Renewables will have truly hit their stride in 2017, as more utility-scale wind and solar reach grid parity. In many regions, they will offer lower-priced options to traditional energy generation sources. Regardless of the political environment, renewables will grow as these resources become economically competitive without government subsidies.

### World net electricity generation by fuel, 2012–2040<sup>1</sup>

trillion kilowatthours



As renewables and energy storage prices fall, distributed energy resources (DERs) rise, federal and/or state de-carbonization regulations take effect and more intelligent grid technology is deployed, fossil resources will see revolutionary transformations in operation and dispatch in 2017. Yet coal and other traditional sources will continue to be critical energy sources today and in the future, due to factors such as the intermittent nature of renewables, fuel source availability and market maturity for renewables adoption. As EIA projections make clear, fossil is here to stay.

The competitiveness of renewables means that fossil must aggressively adopt digital technologies to become more efficient, more quickly flexible (cycling), and compliant with environmental regulations.

## 2

## Artificial Intelligence (AI) Becomes Scalable and Mainstream

Artificial Intelligence is no longer science fiction, but a reality with a growing influence on our daily lives and business. AI is an exponential technology that will advance at ever-faster rates with correspondingly expansive impacts on society and industry, and will work in collaboration with skilled human beings to solve extremely complex problems with unprecedented speed. While AI will still require ample context to develop and deploy, its impact in 2017 will be significant.



We already interact with AI every day, from Amazon shopping recommendations to Facebook photo tagging. AI is making a major impact in the energy sector too. Electric utilities use AI today to optimize power generation and the grid to meet and optimally balance goals, including availability, reliability, efficiency and environmental compliance. Smart meters, equipment sensors and voltage meters can all be connected via advanced digital platforms that use advanced analytics, optimization and powerful decision support to solve problems in real-time, avoid unplanned downtime by predicting equipment problems before an issue becomes critical and produce ultra-accurate forecasts that will allow more renewable energy integration into the grid.

2017 will see an unprecedented number of new and innovative applications of AI for the energy industry. For example, a transmission company may have 50,000 or more assets that must be inspected, often in extremely remote terrain. Inspecting remote assets requires a large workforce to engage in often dangerous conditions. GE and Microsoft have partnered to use autonomous drones to travel to and inspect remote assets, digitalize the inspection and connect to the GE Predix platform to apply advanced analytics to evaluate the asset. In this case AI is used to replace a manual inspection with an autonomous one.



## 3

## Disruptive Cyberattacks Potential to Catalyze Board and Regulatory Oversight

A major cyberattack on the power sector has been a recognized and mounting concern for years. In 2016, the FBI warned the nation's power companies that sophisticated cyberattack techniques used to bring down part of Ukraine's power grid in 2015 could easily be turned on them. Despite widely acknowledged concerns about the threat, E&Y reports that 64% of power and utilities believe their security strategy is not aligned with today's risk environment. As demand for power and the connected technologies to manage it increases, so does the risk to the system.



Although power and utilities increasingly view cyber security as a board level function and government agencies are focused on bolstering cyber defenses, the power sector remains vulnerable. A Pew Research survey found that 61% of experts agreed that a major cyberattack would occur by 2025 that will cause widespread harm to the nation's security and capacity to defend itself. The costs of such an attack are tremendous. Lloyd's estimates that a blackout across 15 U.S. states would affect 93 million people and cost the economy between \$243 billion and \$1 trillion dollars.

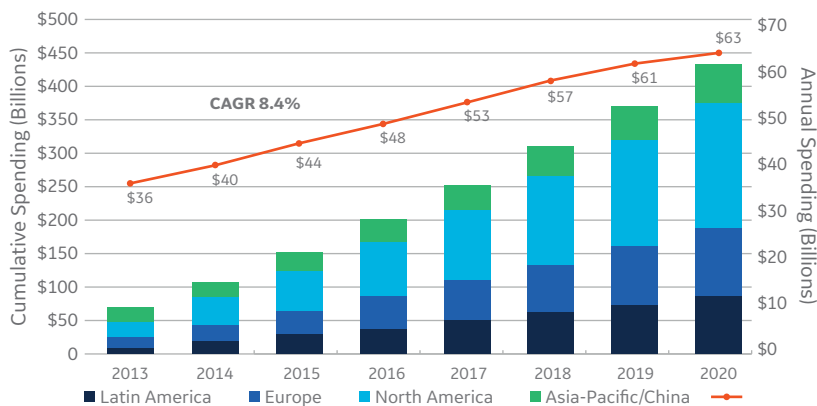
Such an attack would likely initiate a massive and sustained effort by power companies and government agencies to better secure the power sector. The threat of such an attack, together with the realization that most power and utilities are not adequately prepared, will make cyber security an even more critical issue in 2017 and spur the adoption of robust security solutions. By 2018, IDC expects 60% of a utilities' strategic and operational security technology will be managed at the board level and orchestrated by government agencies.

## 4

## Multi-Directional Is the New Grid

DERs, digital technologies, and the cumulative upgrades in power generation, transmission and distribution of the past several years will drive the adoption of multi-directional grid capabilities in 2017 and beyond. The future will increasingly be defined by intelligent grid technology, two-way power flows and higher quality power.

### Smart Grid Regional Forecast, 2013-2020



Source: Global Smart Grid Technologies and Growth Markets, 2013-2020.

The nation's power companies have been steadily increasing their investments in smart grid technologies, including installing automated circuit breakers and feeder switches, as well as mapping systems that immediately stop problems from spreading and show utilities where problems are located. In addition, utilities are implementing digital capabilities and analytics that predict when customers will want to send power onto the grid, what the impact will be and how to optimally manage it in real-time.

The multi-directional grid will reduce barriers to entry, spur competition and increase the velocity of innovation-led change — all of which will challenge established power utilities to rapidly adapt.



## 5 The Prosumer Wave Continues to Rise with Greater Impact

The age when power companies viewed their customers simply as ratepayers is rapidly vanishing as newly empowered end customers (“prosumers”), both business entities and homes, shape the power industry in transformative ways. More than ever, prosumers now control energy usage, are better informed, have more choices, and generate their own power. They also have higher expectations about service levels and the customer experience. 2017 will see the continued shift of influence toward the end customer, challenging incumbent utilities and power providers to keep pace.



As the adoption of new technologies, including smart meters, distributed solar, home devices like Nest, consumer data services, and battery storage go mainstream, utilities will need to radically improve visibility into end customer usage patterns, service and energy preferences. End users increasing array of choices will lead them to seek out power providers that offer them control over their energy usage and costs via well-designed mobile and other customer experiences.

Utilities and power providers that don’t start aggressively moving toward the new prosumer-centric vision of energy in 2017 may find it very difficult to catch up to this trend as it accelerates, particularly as more disruptors enter the market. IDC estimates that by 2020, non-utility companies and digital disruptors will seize 20% of the energy retail market, tripling the profitability gap between “thrivers” and survivors.

To thrive in a prosumer-centric energy market, providers must make digitalization and analytics core competencies. Thrivers will use analytics and digital platforms to improve visibility into customer usage and forecasting, provide end customers with tools to control their usage, know when customers will send power onto the grid and how to balance it. Thrivers will also use analytics to reduce churn by identifying problems early, intervening in a way preferred by the customer and by offering the right solution at the right time.

## 6 CXO Roles Transform Digitalization of Operations Redefines the CIO Role and Creates New Chief Digital and Chief Transformation Officer Roles

Digitalization and analytics are rapidly changing the role of executive management (CIOs, CTOs, etc.) in utilities and power companies, as these firms increasingly adopt digital technologies to improve operations, results and profits. For example, once considered a back-office role, CIOs are now expected to take a broader view of their company’s business as well as its financial, operational and risk management goals. They are also taking a larger role at the board level.

CIOs are focused on digitalization, particularly in their top four areas of focus: analytics, mobile, OT/IoT and cyber-risk threats. According to Gartner, 51% percent of utility CIOs have reported themselves as designated CDO (Chief

Digital Officer) compared with 39% of their peer group. Gartner also reports that 47% of utility CIOs see themselves as leading innovation initiatives compared to only 34% of all CIOs.<sup>2</sup> In addition, the report states that utility digital business focus continues to be operational. Utility CIOs selected more revenue from better operations and cost reduction as the main expected outcomes from digital.

Digitalization initiatives focus on efficiency, reliability, revenue and cost will continue to expand the operational role of the CIO in 2017. Additionally, there will be an increasing number of Chief Transformation and Chief Digital Officers whose job will be to connect business models, information technology and operations. Gartner estimates that 40% of CIOs in energy and utilities will have overall consolidated responsibility for operational technology by 2020.<sup>3</sup>







## 7 Cloud + Edge Is the Next Imperative

The speeding advance of digitalization, distributed energy resources, a smarter grid, platform-based models and the need for more advanced analytics mean that technology is becoming more sophisticated for utilities, power producers and grid operators. This is putting significant stress on home-grown legacy systems and internal resources. The anticipated pace of near-term technological change required by the industry to keep pace will mean that more of their existing technology will become obsolete quickly, hamstringing critical efforts to adopt new business models and paths to growth in a shifting environment.

These companies must scale to consolidate and manage massive volumes and varieties of dynamic and time-series machine data in the cloud, have confidence that it is secure and be able to apply analytics at the edge where near real-time machine response is required. These capabilities are urgent priorities for power companies with executives reporting that in 50% of cases urgency is being driven directly by the Board of Directors. In fact, 93% of power executives list Big Data analytics in their top 3 priorities and 31% make it their number one priority.<sup>4</sup>

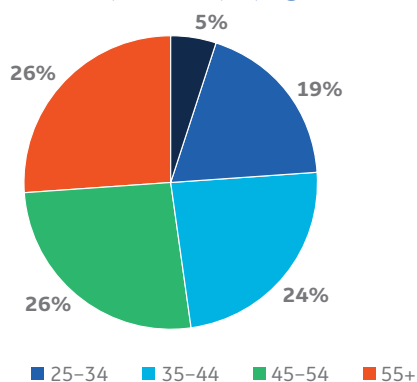
As companies work to become nimble in 2017, the constraining limitations of legacy systems will accelerate plans for widespread cloud adoption because of its clear advantages, including:

- **Speed:** faster to time implementation and innovation due to a ready platform, standardized approach, self-service capabilities and the availability of third-party services and applications.
- **End-to-End Security:** systems built by top talent to be secure from the ground up that support stricter security software and standards as well as rapid security updates.
- **Lower Costs:** avoidance of capital outlays to build and scale a Big Data platform, lower TCO for support and maintenance and better opportunity cost benefits.
- **Performance:** By placing data collection, transmission and analytics at the edge more intelligent algorithms can be run closer to machines, resulting in optimized performance.
- **Ability to Scale:** a cloud service delivery model makes it easy, fast and reliable to scale.
- **Global Visibility:** supports a global business model so that data can be aggregated and analyzed across operating geographies and assets, allowing companies to evaluate each plant's performance in real-time, identify and address vulnerabilities before outages occur and provide visibility into operating performance and financials.
- **Reliability:** the cloud is more reliable because cloud-based microservices mean any failures are isolated in the cloud unlike monolithic systems with complex and vulnerable dependencies for the entire system.

## 8 The Talent Challenge Equipping Workforce with Technology as Hedge Against Brain Drain

Utilities and the entire energy sector face a massive brain drain in the coming years as huge numbers of older workers retire and take with them their skills and experience. This is not a typical problem of personnel turnover because it represents the loss en masse of critical knowledge that will create a large and hard-to-address skills gap. Power companies have been grappling with this problem for many years, but the demographics indicate that it will quickly reach critical levels.

Workers in utility industry by age 2015



Source: Bureau of Labor Statistics

The demographic trends are clear and unstoppable. The average energy worker is seven years older than the average worker across all industries in the United States, and more than 500,000 are expected to retire in the 5 to 10 years.<sup>5</sup> Today, 77 percent of energy companies already find it difficult to find and hire qualified employees. As retirements rapidly increase, recruitment of qualified employees will become a more pressing and difficult challenge.

This challenge will require the industry to respond using multiple strategies, including more aggressive recruitment, training and the application of digital technology to capture, codify and augment the vast industry knowledge of its rapidly retiring workforce.

In 2017, energy companies will continue with aggressive plans to rebuild and reconfigure their workforce for the future by expanding their use of mobile devices, introducing augmented reality and wearables and adopting digitalization initiatives that capture, codify and augment workforce knowledge using analytics, decision support and automation.



## 9

## The Platform Economy What It Means to the Power Industry

We are all living and working in an economy increasingly driven and defined by platforms where digital assets are produced and shared across rapidly expanding ecosystems of technologies, enterprises, developers and services. What started in the technology industry with platform companies like Google, Amazon, Facebook, LinkedIn and others is spreading quickly to other industries, including power.

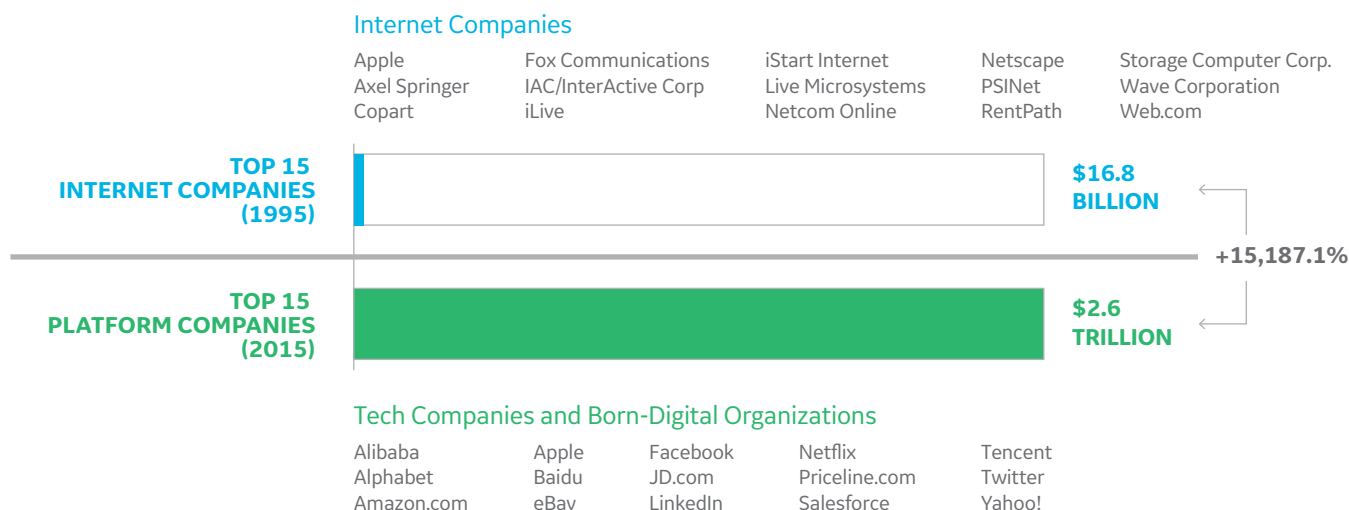
The platform economy is not simply about a technology platform. It is about the rise of platform-based business models, the massive disruption and opportunity they bring to existing industries and their progressively critical role as the foundation for new value creation. They are a cornerstone element of the digital economy that Accenture predicts will account for 25% of global GDP by 2020.<sup>6</sup> There are major platform companies now operating in all major continents with a combined market value of more than \$4 trillion dollars.<sup>7</sup>

The adoption of platform-based models and services by utilities, power producers and grid operators will accelerate in 2017 as they better understand the benefits this model provides, how it opens new paths to growth and as they grapple with how to address digital disruptors, such as Google Nest, that are already using well-developed platforms for demand response.

The most powerful and compelling platform opportunities across the electricity system are based on Internet IoT connectivity and service capabilities that platforms create using an unprecedented ecosystem of developers. GE's Predix platform already has more than 20,000 developers building and delivering purpose-built applications to address a huge number of power challenges by digitally-enabling equipment and devices and applying advanced data management and analytics tools. These capabilities are used to optimize the performance of customer assets to achieve operational and business goals, including improved uptime, efficiency, reduced operating costs, increased market agility, cyber security, profitable growth and new customer management capabilities.

Platforms spur innovation by not only scaling collaboration between internal resources, but by doing so with huge numbers of external participants. This creates a more comprehensive pool of specialized skills and interests uniquely capable of delivering innovative solutions with unprecedented speed and at lower cost. These attributes combined with the regulated nature of the U.S. electricity generation industry mean that companies will increasingly choose to collaborate using digital platforms where they see clear value and as the collaborative efficiencies, innovation and value creation become evident. This idea is already gaining momentum as exemplified by the New York "Reforming the Energy" (REV) initiative that will spur the collaboration and build a platform-based ecosystem to transform the energy landscape for New York.

### Top 15 Market Cap Valuations — Internet vs. Platform Companies



Source: Accenture Technology Vision 2016, People First: The Primacy of People in a Digital Age



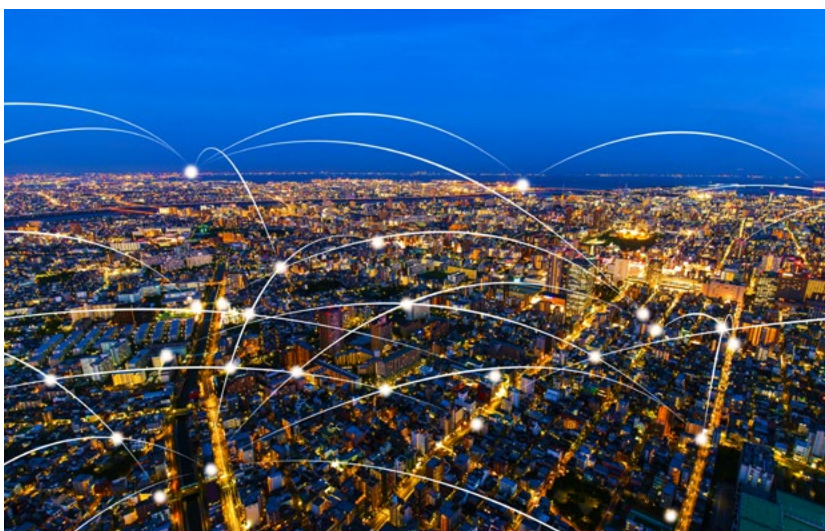
## 10

**Winners****Power Producers, Utilities and Grid Operators Who Employ New Business Models**

2017 will see more incumbent power producers, utilities and grid operators adopt strategic digital initiatives to change their business models to compete in a radically changing power market.

Distributed generation, renewables, smart grids, storage and the digitalization of power demand new capabilities and will boost innovation, generating a rapid-fire progression of new business models. Barclays predicts that the entire value chain in developed electricity markets will be turned upside down within the next 10 to 20 years as distributed power and storage go mainstream. By 2025, Barclays forecasts that “everybody will be able to produce and store power.” The fight for customers will only intensify as end users gain more choices and will seek out power providers that offer them control over their energy usage and costs via well-designed, customized digital experiences across all touch points, particularly mobile. All end users will soon be digital customers.

Competition is also increasing, both from independent power producers and non-traditional competitors. As noted earlier, IDC estimates that by 2020, non-utility companies and digital disruptors will seize 20% of the energy retail market, tripling the profitability gap between thrivers and survivors.



“Utilities’ traditional business models are under attack, directly and indirectly,” writes Roberta Bigliani, associate vice president, IDC Energy Insights. “Utilities are racing to reinvent their roles and have started a profound transformation journey. The industry will be reborn in 3D: decentralized, divergent, and digital.”

The exponential growth and increasing connectedness of industrial data together with advanced analytics and artificial intelligence offer extraordinary opportunities to improve nearly every segment of utilities’ business and operations, from power generation efficiency, flexibility and reliability to revenue, profit, the customer experience and workforce productivity. For example, IDC expects that by 2018, 70% of utility companies will be engaged in a digital initiative and that by 2020, 25% of utilities will integrate asset performance management investments with sensor data and cognitive capabilities, boosting asset efficiency and reducing maintenance costs.

Digitalization is also driving the adoption of transformative business models between utilities, power producers, grid operators and their partners. By connecting the physical assets of a plant with digital technology and Predix, GE can now provide guaranteed outcomes and give greater flexibility to its customers so they can achieve their near- and long-term operational and business goals while lowering risk.

The utility and power industry is moving to digital. First movers and aggressive digital adopters will be far more likely to thrive, not just survive.

**FOOTNOTES:**

<sup>1</sup> “Roadmap for a Renewable Energy Future,” International Renewable Energy Agency, 2016.

<sup>2</sup> Gartner, 2016 CIO Agenda: A Utility Perspective, 19 February 2016.

<sup>3</sup> Gartner, Predicts 2017: Energy and Utilities Get Ready for Digital Disruption, 21 November 2016.

<sup>4</sup> Industrial Internet Report for 2015, GE and Accenture.

<sup>5</sup> U.S. Senate Committee on Energy & Natural Resources.

<sup>6</sup> Platform Economy: Technology-driven Business Model Change from the Outside In, Accenture 2016.

<sup>7</sup> Global Platform Survey, The Center for Global Enterprises 2015.



For information on GE Power Digital Solutions:  
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