TAKE CONTROL OF YOUR FUTURE

NAVIGATING MEGATRENDS AND TIPPING POINTS IN THE UTILITIES INDUSTRY
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The pace and impact of change in the utilities industry is unrelenting. In this white paper, Navigant Consulting, Inc. (Navigant) discusses seven megatrends that are driving these changes. We also describe some of the key tipping points (current and future) that are clear indicators that a broad global industry revolution has started. Each of the megatrends discussed is changing the way we produce and use power globally. Together, these megatrends are revolutionizing the industry:

1. **The power of customer choice and changing demands**: More customers want to control their electricity usage and spend, as well as when and what type of power they buy. Customers want the ability to self-generate and sell that power back to the grid. Amazon, Apple, Cisco, Google, Honda, Walmart, and many other large energy buyers have increased their focus on sustainable energy solutions. This trend, in turn, is forcing new power purchase agreements with the incumbent utilities in order to minimize their risk of losing significant load. In addition, more residential customers around the world are installing rooftop solar, home energy management, and soon storage solutions.

2. **Rising number of carbon emissions reduction policies and regulations**: The impact of COP21 will be significant. Navigant believes that the “hold” on the U.S. Environmental Protection Agency (EPA) is temporary, and state governments and utilities are not waiting. They are taking actions now to be compliant. In fact, sustainability objectives between government, policymakers, utilities, and their customers are much more closely aligned than ever before.

3. **Shifting power-generating sources**: U.S. electric-generating facilities expect to add more than 26 GW of utility-scale generating capacity to the power grid during 2016. Most of these additions will come from three resources: solar (9.5 GW), natural gas (8.0 GW), and wind (6.8 GW), which together make up 93% of the expected total additions. Existing assets (coal, but also nuclear) are devaluing and are at risk of becoming stranded as source shifting continues and newer natural gas and renewable generation sources come online.
4. Delivering shareholder value through mergers and acquisitions (M&A): New industry ventures and M&A are happening at a rapid pace. Exelon’s acquisition of Pepco, Southern Company acquiring SoCoGas, Duke acquiring Piedmont Gas, Emera acquiring TECO, etc. In search for shareholder value through scale and increased synergies, this is a path that utilities will continue to explore.

5. Regionalizing of energy resources: In order to provide reliable and affordable power, more energy resources are being regionalized. For example, PacifiCorp, Puget Sound Energy (PSE), and later this year, NV Energy are joining California ISO (CAISO). One of the main drivers is to achieve the benefits to manage local differences with regard to renewables, wind, and solar. Another example is Florida Power & Light’s (FPL’s) investment in natural gas exploration and production companies in Oklahoma and gas transmission pipelines to secure fuels for its natural gas combined-cycle plants in Florida.

6. Merging industries, new entrants, and colliding giants: Several industries, including utilities, oil & gas (O&G), technology, manufacturers, OEMs, etc., are merging around areas like renewables, distributed energy resources (DER), energy management, smarter cities, and transportation. Navigant sees many cross-industry movements, and one of them is increased crossover investments between the electric utility and O&G industries. We see utilities investing in natural gas assets. And we see oil companies making investments in utilities. We also see both making investments in new areas of opportunity, like renewables, DER (distributed generation, energy efficiency, demand response, energy efficiency, etc.), transportation, smart infrastructure and cities, and energy management.

7. The emerging Energy Cloud: Old infrastructure is being replaced and geared toward an increasingly decentralized and smarter power grid architecture known as the Energy Cloud. The Energy Cloud is an emerging platform of two-way power flows and intelligent grid architecture expected to ultimately deliver higher quality power. While this shift poses significant risks to incumbent power utilities, it also offers major opportunities in a market that is becoming more open, competitive, and innovative. Fueled by steady increases in DER, this shift will affect policy and regulation, business models, and the way the grid is operated in every single region of the world.

These megatrends cannot be underestimated. They are accelerating transformation in the energy industry, enabling the entry of new players, putting pressure on incumbent players, and altering traditional strategies and business models. Organizations will need to adapt, and there will be winners and losers as this transformation takes shape.

1. THE POWER OF CUSTOMER CHOICE AND CHANGING DEMANDS

More customers want to control their electricity usage and spend, as well as when and what type of power they buy. Customers want the ability to self-generate and sell that power back to the grid. Amazon, Apple, Cisco, Google, Honda, Walmart, and many other large energy buyers have increased their focus on sustainable energy solutions. This trend, in turn, is forcing new power purchase agreements with the incumbent utilities in order to minimize their risk of losing significant load. For example, a second (Google was the first) major technology company, Cisco, has confirmed that it is using Duke Energy’s Green Source Rider to provide clean energy for its North Carolina operations.¹

Move from Big Power to Small Energy

Customer choice is driving a large move from big power to small energy. More and more customers are choosing to install distributed energy resources (DER) on their premises. DER solutions include distributed generation (DG), demand response, energy efficiency, distributed storage, microgrids, and electric vehicles (EVs). This year, DER deployments will reach 30 GW in the United States. According to the U.S. Energy Information Administration (EIA), central generation net capacity additions (new generation additions minus retirements) are estimated at 19.7 GW in 2016.² This means that DER is already growing significantly faster than central generation. On a 5-year basis (2015-2019), DER in the United States is growing almost 3 times faster than central generation (168 GW vs. 57 GW).
Customer Choice: Everything Is Changing

Customers want to self-generate and sell that power back to the grid. Customers also want new energy management products and services from their utility or other providers. The rise of the prosumer and active consumer movement is being fueled by three things:

- A growing number of customers care about how and where their energy is generated and about the impacts of global warming.
- Unprecedented and rapid technology advances are bringing greener energy choices directly to consumers.
- New and disruptive entrants are rapidly emerging that give customers meaningful energy usage insights and options related to their homes, businesses, and transportation choices.

Where we see this movement picking up pace is in the increased number of commercial and industrial (C&I) customers that are choosing to implement their own more sustainable energy solutions. Amazon, Apple, Cisco, Google, Honda, Walmart, and other large energy users have increased their focus on installing onsite solar. Walmart has 142 MW of solar PV capacity at 348 installations in the United States, according to the Solar Energy Industries Association’s (SEIA’s) Solar Means Business 2015: Top U.S. Corporate Solar Users report. The retail company has a 100% renewable energy target, together with 57 others currently as part of RE100. And then there is the “Power Forward” movement, where 215 Fortune 500 companies are pursuing their own investments in local greenhouse gas (GHG) reductions, sustainability, or renewable energy initiatives. Power Forward 2.0 states that if incumbent utilities are not proactive...
(e.g., offer power purchases agreements, financing, rates, or project development), then they will be bypassed in favor of third-party energy providers (including non-regulated subsidiaries of incumbent utilities).

**What Is New?**

The focus on customer engagement and improving the customer experience is not new. In recent years, utilities have tried to improve the customer experience by introducing broader self-service, multi-channel options, and advanced information on energy products and usage. Such improvements include offering energy management applications like **DTE’s Insight app**. The number of energy apps is growing; with more than 1.2 million energy-focused apps downloaded each year, savvy utilities need an app strategy to meet customer expectations.

What is new (and isn’t getting enough attention) are the actual implications of customer choice. With the increased availability of DER and new energy management technologies, the breadth and diversity of customer needs and interests that the utility will have to deal with are growing exponentially. Meeting diverse and changing customer demands is forcing utilities to rethink their role in the energy value chain. The range of possible services goes well beyond what they currently provide, including building energy management solutions, fast demand response, DG, storage, microgrids, etc. Utilities must understand the full impact of all this on their customer service processes and systems. They must also understand how DER and advanced energy management solutions will affect their strategy, product innovation, business models, and the way they operate the grid. Taking an integrated and holistic approach is key.

**Who Else Wants to Play?**

Besides the incumbent utility, we see new entrants coming into the market that are focused on meeting the changing demands of large energy users. In the last 6 months, we have seen several announcements of new business models going after this market. Some examples are described below:

- **Edison International** is launching a business that will help reduce energy costs, improve efficiency, and offer more environmentally friendly options for large energy users. The company’s new subsidiary, Edison Energy, aims to serve commercial buildings, data centers, retail centers, healthcare operations, and educational institutions nationwide.

- **Duke Energy**’s Commercial Portfolio president, Greg Wolf, has said, “In addition to utility-scale solar projects, we’ve also made investments in distributed generation and energy management systems for commercial and industrial companies.” Last year, Duke Renewables bought majority stakes in REC Solar (for commercial businesses) and Phoenix Energy (energy management systems and services for C&I customers).

- **“GE Current** combines GE’s products and services in energy efficiency, solar, storage, and onsite power with our digital and analytical capabilities to provide customers—hospitals, universities, retail stores, and cities—with more profitable energy solutions,” said Jeff Immelt, Chairman and CEO of General Electric (GE). Customers include Walgreens, Simon Property Group, Hilton Worldwide, JPMorgan Chase, Hospital Corporation of America, Intel, and Trane.

**What Does All This Mean for the Incumbent Utility?**

The incumbent utility (which includes the traditional competitive retailer not offering DER) has to adapt. Customers will look for better, greener, and cheaper alternatives, and more and more of these alternatives are becoming available. What’s more, the fight has started for the business of large C&I customers. If only a small percentage of large C&I customers switch over, the incumbent utilities will be in trouble. This will affect their revenue streams, roles, and the cost versus value of the centralized managed grid.

Facing declining revenue as customers consume less and produce more of their own power, utilities are faced with potential stranded generation (and eventually transmission and distribution) assets. This makes it even harder to make large investments (aimed at improving reliability and resilience) in their current grid while also making it more intelligent. And finally, they have to make investments in developing DER capabilities, offerings, and businesses. Given these challenges, utilities must play both defense and offense.
An updated defensive strategy will entail:

- Engaging with customers to understand their customer choices and changing demands vis-a-vis price and reliability.
- Engaging with regulators to find equitable ways to charge net metering customers for transmission and distribution services that fairly address the cost to serve.
- Improving customer service and grid reliability at the lowest prices possible.
- Developing utility-owned renewable assets to appeal to environmentally conscious customers.

Playing offense is even more important. Utilities must:

- Create new revenue streams through the development of new business models, products, and services.
- Transform their organizations and culture in order to fully integrate sales, customer service, and operations.
- Upgrade the grid and operations to facilitate the integration of DER.

The above objectives can only be accomplished by implementing new business models that include developing, owning, and operating integrated DER such as community solar, customer-sited storage, microgrids, charging stations, building energy management systems, and home energy management systems. These goals also require utilities to provide third-party financing for DER and offer new products and services focused on energy efficiency and demand response.

There is no going back to the old ways of doing business. Utilities must lead—by playing both defense and offense—or they run the risk of being sidelined.

2. RISING NUMBER OF CARBON EMISSIONS REDUCTION POLICIES AND REGULATIONS

The impact of COP21 will be significant. Navigant believes that the “hold” on the U.S. Environmental Protection Agency (EPA) is temporary, and state governments and utilities are not waiting. They are taking actions now to be compliant. In fact, sustainability objectives between government, policymakers, utilities, and their customers are much more closely aligned than ever before.

What’s Happening with Carbon Emissions Policies Globally?

The long-term impact of the Paris Climate Agreement will be significant. This agreement will focus on limiting global warming to well below 2°C (3.6°F) by the year 2100. Each nation sets its own target for reducing emissions and updates that mark each year. A record number of countries (175) signed the agreement on the first available day. Governments must now ratify and approve the agreement, which could take months or years. The agreement goes into effect once 55 countries representing at least 55% of global emissions formally join. It’s clear that the tone and tenor of the Paris Climate Agreement is providing a guiding light for nations to reduce emissions.

The biggest news was the full commitment of China. The country, together with the United States, was one of the first to sign the final Paris Climate Agreement. The United States and China account for nearly 40% of global carbon emissions. It does appear that China is serious about reducing emissions, since the country has made significant investments in renewables, EVs, green cities, and more. Already the world leader in wind power, China is set to overtake Germany this year in solar power (see following figure).
Renewable Energy Growth in Major Economies

We see that other countries are not waiting. Germany has announced a €17 billion ($19.2 billion) campaign—that’s right, billions—to boost energy efficiency. The ultimate goal is to cut the country’s energy consumption in half by 2050. This is part of meeting domestic and Paris Climate Agreement emissions reduction targets. The campaign could prove bearish for European Union (EU) carbon prices if it reduces demand for power and heating in Germany, the top economy (and emitter) of all the EU’s member states.

Many other initiatives at the regional, country, state, and local levels are currently being designed and implemented in support of carbon emissions reductions, accelerated by the agreement.

U.S. Carbon Regulation

And then we have the Clean Power Plan (CPP). The CPP has been stayed by the U.S. Supreme Court until a final resolution of the case passes through the federal courts. Litigation may not be resolved until 2018, although it’s possible a resolution could be reached sooner. There has been a great deal of discussion on compliance with the CPP. Our analysis continues to show that cost-effective compliance includes a variety of options that are tailored to regional characteristics. A recent deep dive by Navigant into a southeastern state with modest renewable resources showed that trading with other states and developing energy efficiency programs and portfolios are key strategies for reducing overall compliance costs. Compliance strategies depend on existing resources; older coal resources on the margin for retirement are able to get a large bang for their buck on the emissions balancing sheet through replacement with gas, renewables, and energy efficiency.

Navigant also investigated the effects of deploying additional energy efficiency resources in order to decrease CO2 emissions in two regions: California and PJM. We found that additional energy efficiency reduces CO2 emissions, overall cost of compliance, and system congestion. The cost to serve load is reduced by 3%-5% in California and PJM. System congestion relief is also likely to occur, which further reduces the cost to serve load. This last point is important, since large, urban utilities are focused on reducing congestion points—and energy efficiency can be used as a solution.

Other Ongoing Developments

Even though the CPP is on hold, many individual states, cities, and utilities continue to move toward the CPP goals to reduce carbon emissions, plan for an advanced energy economy, and meet cleaner generation goals. The CPP parameters are being used as a guide for emissions reductions:

(Sources: Bloomberg New Energy Finance and World Resources Institute)
• As part of the New York Reforming the Energy Vision (REV) proceedings, the New York Public Service Commission introduced an order that requires placing a value on carbon emissions, focusing on DG portfolios, and compensating customers for their distributed electricity generation.

• Over the past year, six states led by Tennessee (plus Georgia, Michigan, Minnesota, Oregon, and Pennsylvania), the U.S. Department of Energy (DOE), and a few other national organizations have been developing a National Energy Efficiency Registry (NEER) to allow states to track and trade energy efficiency emissions credits for CPP and emissions compliance purposes.

• The State of California, well-known for its clean energy leadership, has a cap-and-trade program that is linked to three Canadian provinces: Quebec, Manitoba, and Ontario. Cap-and-trade programs now cover 61.8 million people across North America—38.8 million in California, 13.6 million in Ontario, 8.2 million in Quebec, and 1.2 million in Manitoba. Each of these programs are designed to drive down emissions and set aggressive GHG reduction targets. Over 17% of the combined North American population (354.1 million people, with 318.9 million from the United States and 35.2 million from Canada) is now participating—knowingly or unknowingly—in a cap-and-trade program without any national or regional framework in place.

• The province of Ontario unveiled its new sweeping Climate Change Action Plan in June 2016. The initiative is expected to spend up to $8.3 billion on a range of clean technology programs, largely funded from the provinces’ cap-and-trade program. The Climate Change Action plan aims to quickly transition the province toward more energy efficient heating systems, electric and hybrid cars (via a rebate of up to $14,000), promote the conversion of diesel-powered trucks to natural gas, and help the industrial and agricultural sectors adopt low-carbon technologies.

• San Diego pledged to get 100% of its energy from clean and renewable power with a Climate Action Plan that sets the boldest citywide clean energy law in the United States. With this announcement, San Diego is the largest U.S. city to join the growing trend of cities choosing clean energy. Already, at least 12 other U.S. cities, including San Francisco, Georgetown (Texas), San Jose, Honolulu, Burlington (Vermont), Greensburg (Kansas), and Aspen, have committed to 100% clean energy. Globally, numerous cities have committed to 100% clean energy, including Copenhagen, Denmark; Munich, Germany; Vancouver, Canada, and the Isle of Wight, England.

• Cities and businesses have been showing tremendous leadership in reducing the emissions responsible for climate change and building resilience to climate impacts. That’s why the Center for Climate and Energy Solutions (C2ES) and The U.S. Conference of Mayors are teaming up to create the new Alliance for a Sustainable Future. This alliance will help mayors and business leaders develop concrete approaches to reduce carbon emissions, speed deployment of new technology, and implement sustainable development strategies.

• Meanwhile, many utilities are decommissioning or converting their existing coal plants and investing in utility-scale renewables, as well as DER. As an example, AEP is in the process of decommissioning 11 coal plants, representing approximately 6,500 MW of capacity. It is simultaneously making significant investments in renewables, with a total capacity of close to 4,000 MW by mid-2016.

What Does This All Mean?
The sustainability objectives of government, policymakers, utilities, and their customers are more closely aligned than ever before. Customer choice and changing customer demands are shifting toward supporting sustainability. States and regulators will continue to discuss how sustainable targets can be met without affecting jobs and the access to safe, reliable, and affordable power. And utilities will continue to evolve to support cleaner, more distributed, and more intelligent energy generation, distribution, and consumption.
Recommended action items for states and utilities include:

• Understand the possibilities, costs, and full impacts of low-carbon generation and DER (energy efficiency, demand response, and others).
• Implement a workable framework and develop an integrated plan to move toward lower emissions goals, since it’s likely that decreased emission requirements will be in place in the near future.
• Leverage existing state and neighboring utility designs and efforts to develop joint plans, policies, and goals.
• Implement (pilot) initiatives that include renewable energy and other low-carbon generation into a reduced emissions framework while also incorporating energy efficiency and distributed generation as resources into the decreased emissions planning process.

3. SHIFTING POWER-GENERATING SOURCES

U.S. electric-generating facilities that use oil, coal, but also nuclear, are devaluing and are at risk of becoming stranded as source shifting continues and newer natural gas and renewable generation sources come online.

Generation Fuel Mix Shift Is Accelerating

The electric grid in the United States has relied heavily on nuclear and coal-fired plants to serve as baseload generation for the overall system. According to the U.S. EIA, U.S. electric-generating facilities expect to add 26.1 GW of utility-scale generating capacity in 2016.¹² Most of these additions come from three resources: natural gas (8 GW), solar (9.5 GW), and wind (6.8 GW), which together make up almost 93% of total planned additions.

The Navigant Energy Market Outlook has projected this level of expansion in natural gas and renewable assets for several years. For 2016, Navigant expects higher natural gas (16.3 GW) and solar (13.2 GW) expansions than EIA is projecting. Navigant forecasts wind expansion will be lower at 6.1 GW, suffering a bit from extremely low natural gas prices and the ongoing decreases in installed costs for solar (decreasing faster than the installed cost of wind).

This shift toward natural gas and renewables will continue as many different factors affect generation fuel strategies, resource plans, and decision-making. Among these factors are sustained low natural gas prices (see Navigant’s natural gas price forecast), state and federal renewable incentives, the implementation of environmental regulations such as the Mercury and Air Toxics Standard, and the threat of new carbon legislation such as the CPP.¹³ Today, this shift is accelerating even more because of increased interest from customers in renewable power (customer choice) and the rapidly declining installed costs, which are making renewables more competitive with traditional fuel sources (including coal and nuclear).

What Does This Mean to Generators?

As a result, the economics have changed and some of the existing (coal and nuclear) assets are experiencing eroded profit margins. These margins, in turn, are resulting in challenging economics and, in some cases, significant devaluation. Increasingly more generation assets are at risk of becoming stranded investments, as the fuel mix is shifting more quickly than anybody envisioned. Coal-to-gas switching has caused coal plants to consider retirements and, with low gas prices and the impact of renewables off peak, there is more pressure to decommission nuclear assets. There have been several early shutdowns, confirmed announcements, and threatened early shutdowns in recent years, including the recommendation from Omaha Public Power District (OPPD) management on June 16 to discontinue operations at its Fort Calhoun nuclear station. In New England alone, more than 4,000 MW of nuclear, coal, and oil capacity is being retired in the next 3 years, including the 1,500 MW Brayton Point facility in 2017 and the 680 MW Pilgrim nuclear plant in 2019. Generators are reevaluating the role of each of their plants, as well as how and if the plants should fit into their portfolio, leading us to the following observations:

• Coal and nuclear plants operate at reduced revenue while still required to maintain system reliability/stability as long as their required economics are met.
• Coal plants (designed as baseload) are required to operate more as cycling units. This requirement drives up cost and reduces efficiencies, which may mitigate some of the environmental gains made as a result of more off-design operations.
• These economic pressures are driving numerous coal plants out of the market and increasing the possibility of stranded assets.

• Nuclear assets have been hurt as well and are requesting market assistance and incentives to keep operating. Savings measures such as Capacity Resource Adequacy payments and even state legislatures have been looking at approaches that can improve the economics for both nuclear and coal in order to maintain fuel diversity and keep these baseload plants running.

• Efficient gas plants are operating more in areas of ample gas supply and infrastructure.

• All generating plants are seeking ways to reduce operations and maintenance (O&M) costs while maintaining reliability.

As evidenced by Navigant’s Generation Knowledge Service (GKS), the average capacity factor of coal plants has declined by 20%-30%, which translates to a 20%-30% drop in gross revenue opportunity. Very few companies can easily adapt to this type of drop in gross revenue. At the same time, driven largely by increasing amounts of variable renewable generation, these coal plants have been asked to perform more as cycling plants, which drives up overall operating costs and reduces efficiency. To deal with the combination of lower realized revenue and higher operating costs, companies are evaluating their plants to determine if they can survive in the new world or if they should be repowered or retired. They are actively seeking new ways to reduce costs through fewer planned outages and higher operating efficiencies while maintaining high reliability to support the increased use of variable generation.

And to Make Things Worse: The Move from Big to Small Power

Additionally, with the rapid growth of DG, all central generation (coal, gas, nuclear, and wind) will face more changes in their role on the grid. DG installations are expected to reach 19 GW in 2016; thus, DG is growing faster than central station generation (26.1 GW additions, minus 7.9 GW retirements, using the referenced EIA forecast). On a 5-year basis (2015-2019), DG in the United States, with some variance by region, will grow almost twice as fast as central generation (98.4 GW vs. 57 GW).

Path Forward

As a path forward, generators must clearly define the mission of each generating unit to understand their new role and how to survive economically. To succeed, companies must do the following:

• Conduct a strategic review of generating assets and determine what, if any, changes need to be made in generation portfolio and/or in how these assets are managed under several regulatory and commodity pricing scenarios.

• Find ways to reduce O&M costs while maintaining the reliability required by the independent system operators during target operating periods (for plants that will continue to run in the near term).

• Have a strategy to manage significant reductions in staffing levels and loss of critical experience across the board, including dealing with the impacts on funding pensions and local economies when plants are retired.

• Plan for a changing workforce that will need to include deeper knowledge of digital technology and an understanding of how to optimize operations in a more variable power market.

• Aim to operate fossil assets globally, as companies that do so may find it easier to survive than generators focused solely on North America or Western Europe.

• Seek new sources of revenue to replace the capital-intensive position for large generating plants by considering investments in renewables and DER.

An understanding of the above data points and how they affect your company and the rest of the industry is crucial to shaping our energy future. Navigant can help you develop and use this information to influence the key decision makers, regional transmission organizations, and state agencies that are shaping the future of the industry. If you’re not sitting at the dinner table shaping a future that works best for your company and your customers, then you just might be the entrée.

4. DELIVERING SHAREHOLDER VALUE THROUGH M&A

It is no surprise that with so much change, mergers and acquisitions (M&A) are on the rise, with fascinating implications for the broader industry. We hear mostly about large acquisitions—Exelon’s acquisition of Pepco, Emera’s acquisition of TECO, Southern Company acquiring AGL Resources, and Duke Energy acquiring Piedmont Natural Gas Co, Inc.—but there is much more happening under the surface and on the periphery, underscoring the tectonic shifts reshaping the energy industry.
With the emergence of the Energy Cloud, which is driving broad and pervasive digitalization of the industry, utilities, manufacturers, technology companies, and other stakeholders are pursuing proactive initiatives such as M&A deals to retain customers, increase revenue, and improve market position. Recent activity points to three different flavors of M&A deals occurring with more frequency than others:

• Utilities acquiring other utility companies or assets
• Utilities acquiring energy technology companies
• Manufacturers or energy technology companies acquiring other manufacturers and energy technology companies

Utilities Acquiring Other Utility Companies or Assets

The table below shows that the value of utility deals more than quadrupled in 2014 and 2015 compared to 2012. In the first quarter of 2016 alone, 22 deals valued at more than $40 billion have already closed.

Utility M&A Deals: 2012-2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Deals</th>
<th>Value ($ Millions)</th>
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</thead>
<tbody>
<tr>
<td>2012</td>
<td>27</td>
<td>$13,355</td>
</tr>
<tr>
<td>2013</td>
<td>42</td>
<td>$30,439</td>
</tr>
<tr>
<td>2014</td>
<td>54</td>
<td>$67,731</td>
</tr>
<tr>
<td>2015</td>
<td>47</td>
<td>$66,822</td>
</tr>
<tr>
<td>2016</td>
<td>22</td>
<td>$41,362</td>
</tr>
</tbody>
</table>

(Sources: Navigant Consulting, S&P Capital IQ, Thomson Reuters)

The main driver for this increased level of M&A activity is a renewed search for growth, shareholder value, and diversification to offset some of the challenges facing the industry. Additionally, utilities are increasingly hedging against uncertainty and risk, as seen with Duke Energy and Southern Company acquiring natural gas companies as they pivot away from coal. As Southern Company stated after the acquisition was announced, “The addition of AGL Resources’ network of natural gas assets and businesses will provide a broader, more robust platform for long-term success and increase opportunities to invest in future infrastructure and energy solutions.”

Some utility analysts see these high-cost, high-debt acquisitions as unsustainable.

Although the acquisitions are in regulated, low-risk businesses, utilities have had to pay a premium for these acquisitions and utilize debt financing, which could potentially put pressure on their credit ratings.

Utilities Buying Energy Technology Companies

We have seen an even greater uptick in the acquisition of technology companies by utilities. In particular, acquisitions targeting renewables, storage, and DER are on the rise.

A couple noteworthy transactions include Engie (formerly GDF Suez) taking a majority stake in Green Charge Networks, a provider of C&I energy storage solutions, and Southern Company acquiring PowerSecure. According to a press release, PowerSecure, a provider of distributed energy, utility infrastructure, and efficiency solutions, gives Southern Company the capability to help meet C&I customers’ energy needs in the areas of individual reliability, energy efficiency, and green objectives.

Additionally, many utilities are acquiring and investing in companies offering information and operations technology (IT and OT) and data analytics solutions. One of the latest examples is a $20 million investment in AutoGrid Systems from Energy Impact Partners (EIP), a utility group that includes Southern Company, Xcel Energy, Oncor and National Grid, and Envision Ventures. According to Michael Donnelly of EIP, “Big data analytics and automated control of grid operations will allow utilities to adapt to the increasingly complex distributed energy environment.”

The rationale behind this wave of energy technology acquisitions by utilities reflects their willingness to play both offense and defense as the Energy Cloud takes shape. It also shows a willingness to protect their core business against new entrants looking to provide new products and services to their customers. At the same time, it suggests a willingness to look beyond their current customer base and target customers with a full suite of energy management solutions within the country and internationally.
In a recent announcement, Ted Craver, chairman and CEO of Edison International, stated that, “[within] the New Energy Future … large energy users increasingly need a strategic partner to help them navigate through the diverse energy marketplace. Edison Energy will provide the expertise that will enable large C&I energy users to explore the many options available to them and to select the best portfolio of alternatives to power their operations.”

Duke Energy’s acquisition of Phoenix, a provider of energy management systems and services for commercial customers, offers a similar view. In the announcement press release, Greg Wolf, president of Duke Energy’s Commercial Portfolio, stated: “Duke Energy will continue to expand its offering of on-site, advanced energy solutions for commercial customers as the company finds opportunities in this rapidly growing market.”

These are just a couple of examples, and we expect similar acquisitions to accelerate going forward.

Manufacturers or Energy Technology Companies Acquiring Other Manufacturers and Energy Technology Companies

Of the three categories described here, this is perhaps the most active. We have seen solar companies buying other solar companies, solar companies buying storage companies, and technology companies buying other technology companies—the list goes on. From Google buying Nest to Oracle buying Opower and many more, everybody wants to get into the game and is looking for unique, differentiating technologies and capabilities to stay ahead of the competition with a focus on technology synergies and customers.

Additionally, there’s a significant rise in the number of new companies entering the energy space, selling new and innovative energy technology products and services. We don’t expect this trend to slow anytime soon. On the contrary, with the scale of investment pouring into newer, greener ways of producing, managing, and using power, we are at the beginning of a greentech tsunami.

So What Does This All Mean?

My advice to all these players: Be alert and think out of the box. Your clients today can become your competitors tomorrow. Apple and Ikea have both announced that they want to sell surplus renewable energy into the energy wholesale markets. Technology companies have the potential to become network orchestrators and provide utility products and services. The risk for utilities is they end up with stranded, worthless assets.17

Balancing today’s business with tomorrow’s opportunities is key. Thinking through strategy and future case scenarios will help you understand the opportunities and threats as technology and customer choice drive new products, services, and business models. Stay close to your customers and innovate; partner where it makes sense and stay in the game. This is Energy Strategy 2.0 for the Energy Cloud 2.0.

5. REGIONALIZATION OF ENERGY RESOURCES

In order to provide reliable and affordable power, more energy resources are being regionalized and countries, states, cities and utilities are thinking through a more regional approach to solve supply and demand issues.

What Is Happening?

To get access to energy supply and resources, more regions, states, energy markets, and utilities are looking beyond the traditional borders of their energy business and territory. The main drivers playing out right now are:

- An accelerated shift of generation resources to cheaper gas and low-cost renewables.
- An increase in carbon reduction policies and targets.

Accelerated Shift of Generation Resources

Earlier I discussed the accelerated shift in power generation to natural gas and renewables. First, as a result of cheap natural gas—which will be the case for the foreseeable future19—investments in combined-cycle natural gas generation plants have increased. Major investments in gas pipelines by utilities have also increased (including from Florida Power & Light [FPL], National Grid, Spectra, and others), mostly supported by states and regions like Massachusetts, New York, and Texas. Some utilities (including FPL) have been investing in the exploration and production of natural gas.

These infrastructure investments still face challenges in getting the required approvals and expected returns. FPL initially received approval from the Florida Public Service Commission (PSC) to recover the costs related to its investment in upstream development in Oklahoma’s Woodford Shale through rates as part of its fuel expenses. However, on May 23, Florida’s highest court overturned
this decision and concluded that the PSC did not have the authority under state law to approve cost recovery for the joint venture as part of FPL’s rates. We will see how this plays out as utilities continue to look to secure access to natural gas and increase shareholder value.

Second, investments in renewables continue to increase. The Navigant Energy Market Outlook projects that in 2016, 19.3 GW of wind and solar generation capacity will be added in the United States, which is about 75% of total new generation additions in 2016. Besides the complexity of the duck curve, regions, states, energy markets, and utilities are also looking at how to get this renewable power (in places where sun and wind are favorable) to places where this power gets consumed. The transmission impacts are significant. Combined with Federal Energy Regulatory Commission (FERC) Order 1000, these impacts will drive new investments in transmission. This has been evidenced already in the Northeast, Texas, Massachusetts, and the western United States, among other places.

**Increased Carbon Reduction Policies and Targets**

We discussed the rising number of carbon emissions reduction policies and regulations. Even though the U.S. EPA’s CPP is on hold, many individual states, cities, and utilities are moving toward the CPP goals to reduce carbon emissions, plan for an advanced energy economy, and meet cleaner generation goals. Policymakers are setting clear targets to increase renewable generation in the Northeast. Recently, in order to meet the state’s 50x30 goal, the New York Department of Public Service (NYDPS) described a path forward in its Clean Energy Standard (CES) white paper. The paper outlines the principal policy objectives of the CES, which include increasing renewable electricity supply to achieve the ambitious goal of renewable energy meeting 50% of New York’s electricity needs by 2030 and promoting the progress of REV market objectives. Regions, energy markets, states, and utilities are looking for access to cleaner energy resources—mainly gas and renewables—either by building these generation assets and securing access to cheap natural gas or by bringing cleaner power into their territory through interconnection.

**How Does All This Play Out?**

There are many examples now of regional approaches for solving the challenges discussed above. One example is the creation of the western Energy Imbalance Market (EIM) by California ISO (CAISO), which is pursuing shared benefits for the participants. CAISO reported that the cost benefits of the EIM were $18.9 million during the first 3 months of 2016, saving 48,342 metric tons of carbon emissions by using 112,948 MWh of surplus renewable energy across the participants to meet demand. “The EIM is now firmly established and is providing considerable economic and environmental benefits,” said CAISO’s President and CEO Steve Berberich. “These successes are the result of the vision and hard work of many across the West.” Oregon-based PacifiCorp, which serves customers in six western states, was the first EIM participant, followed by NV Energy. Other utilities that have announced plans to join the EIM include Puget Sound Energy (PSE) and Arizona Public Service in October 2016, Portland General Electric in October 2017, and Idaho Power in April 2018.

A second example is the Regional Greenhouse Gas Initiative (RGGI), which was used by the EPA as an example of a flexible and multi-state carbon reduction program. Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont are members of the RGGI, which is a cap-and-trade program to curb CO2 emissions. To comply with the EPA’s final targets for carbon reductions from existing fossil fuel power plants, states may attempt to join the RGGI or establish similar programs that can then trade into and out of the RGGI. The Northeast—already one of the least carbon-intensive electricity generation regions—is expected to further reduce its power sector carbon intensity from 1,037 lbs of CO2/MWh in 2015 to 986 lbs of CO2/MWh in 2030.
Beyond the United States: Europe a Good Example?

Europe created the Energy Union, which is designed to help deliver Europe’s 2030 climate and energy targets and make sure that the EU becomes the world leader in renewable energy. Achieving these goals will require a transformation of Europe’s electricity system, including the redesign of the European electricity market, in order to meet consumers’ expectations, deliver benefits from new technology, facilitate investments in renewables and low-carbon generation, and recognize the interdependence of EU member states when it comes to energy security. A critical part of this initiative is connecting isolated electricity systems to secure supply and helping to achieve a truly integrated EU-wide energy market—a key enabler for the region. The EU has set an initial minimum interconnectivity level of 10% to be achieved by all member states by 2020. Depending on the geographical position of a country and its energy mix (e.g., the weight of renewables in a given country), achieving the required 10% minimum may not be enough. The EU is therefore looking into raising the target to 15% by 2030.

These are the underlying objectives as defined by the Energy Union:

- Electricity systems will become more reliable, with lower risk of blackouts.
- Money will be saved by reducing the need to build new power stations.
- Consumers’ increased choice will put downward pressure on household bills.
- Electricity grids will be able to better manage increasing levels of renewables, particularly variable renewables like wind and solar.

You could argue that these objectives would be very important for the United States, as well. Should we take a much more national, inter-regional approach like Europe?
So What Does This Mean?
First, regions, states, energy markets, and utilities have to adapt their long-term resource plans and incorporate regional scenarios for power supply. At the same time, they have to build in a rapidly changing mix in fuel resources toward renewables and natural gas. Second, they must think out of the box with regard to securing fuel security or access to renewables well beyond their traditional territory borders. Third, to effectively develop system plans, the planning processes need to take into account the entire regional transmission system. Regional entities should find a way to bring together players such as federal agencies, municipalities, and cooperatives so that their needs are also addressed and more holistic solutions are presented. Finally, to facilitate and enhance emerging market offerings such as the EIM, the planning toolkit needs to be expanded to better address the challenges of very large-scale renewables integration across multiple regions.

6. MERGING INDUSTRIES, NEW ENTRANTS, AND COLLIDING GIANTS
Several industries, including utilities, oil & gas (O&G), technology, manufacturers, OEMs, etc., are merging around areas like renewables, DER, energy management, smarter cities, and transportation. Navigant sees many cross-industry movements, and one of them is increased crossover investments between the electric utility and O&G industries. We see utilities investing in natural gas assets. And we see oil companies making investments in utilities. We also see both making investments in new areas of opportunity, like renewables, DER (DG, energy efficiency, demand response, energy efficiency, etc.), transportation, smart infrastructure and cities, and energy management.

What Is Happening?
The power energy industry (the generation, transmission, and distribution of electricity) is not the sole territory of the incumbent utility anymore. Several players from other industries, including O&G, technology, retail, telecom, security, and manufacturing, are trying to get into the game. Navigant sees many cross-industry movements, and one of them is increased crossover investments between the electric utility and O&G industries. Besides pursuing M&A, which I discussed before, we see investments in new areas of opportunity like renewables, DER (including DG, energy efficiency, demand response, storage, etc.), transportation, smart infrastructure and cities, and energy management.

As an example, in April, the French supermajor Total announced the creation of a Gas, Renewables and Power division, which it said will help drive its ambition to become a top renewables and electricity trading player within 20 years. According to a statement by the supermajor, “Gas, Renewables and Power will spearhead Total’s ambitions in the electricity value chain by expanding in gas midstream and downstream, renewable energies and energy efficiency.”

Fighting for Future Energy Positions
The large incumbent players in the energy industry are under pressure. And the way things are unfolding now, it doesn’t seem like this will change anytime soon. Time to make some minor tweaks? Change course more drastically? Or completely reinvent ourselves? These are discussions that are taking place more frequently at the board and executive levels of the incumbent players.

Electric utilities are under pressure because consumption growth is minimal and, in many cases, flat to slightly negative. The average consumption per customer (both residential and commercial) is declining due to self-generation, energy efficiency, demand response, etc. As a result, revenue is declining. Costs are increasing because of needed investments in a safe, reliable, cleaner, and more distributed and intelligent electric power grid. Utilities are identifying new revenue streams and thinking through new business models that will bring shareholder value going forward.

Oil companies are under pressure because of the continued low oil price. Ever since the oil price dropped to historic lows in 2014, the struggles of the industry have been daily news. Short-term hopes for a recovery were tempered significantly by the outcome of the recent OPEC meetings in Doha. Oil companies are looking for ways to survive by taking out costs, reducing their upstream capital investments, and shutting down unprofitable assets. They are also looking for new opportunities to grow revenue and future shareholder value.
Industry Giants Are Responding

In the last couple of months, I've attended several meetings with CEOs from large utilities and O&G companies. It is remarkable how their views on what is happening in the energy space are so similar. What is even more interesting is that their strategies to address the challenges and opportunities are almost identical.

Here is what they say is happening:

a. **Energy consumption and gross domestic product (GDP) growth**: Although population and GDP growth (at a slower pace) drive growing energy demand, the trend line between GDP and energy consumption growth has been broken. This is especially the case in developed countries. Energy consumption in the United States flattened from 2014 to 2015 even as GDP grew by 2.4%. Since 2007, energy consumption has fallen 2.4% while GDP has grown by 10%, according to the 2016 Sustainable Energy in America Factbook by Bloomberg New Energy Finance. At the level of individual utilities, we see this playing out. Utilities with no or limited customer growth see their overall revenue declining. Utilities that still see customer growth are reporting that demand (and revenue) is not growing at the same pace. This is creating an unsustainable situation, with flat or declining revenue, while the costs to serve their customers and investments in the grid are growing.

b. **Impacts of climate change**: Previously, we discussed the impacts of the growing number of policies and regulations to reduce carbon emissions. It is now clear that this impact is being felt. Beyond the COP21, CPP, and other global or federal policies and regulations, many initiatives at the regional, country, state, and local levels are being designed and implemented in support of carbon emissions reductions. Sustainability objectives between government, policymakers, utilities, and their customers are more closely aligned than ever before. States and regulators will continue to discuss how sustainable targets can be met without affecting jobs and the access to safe, reliable, and affordable power. And utilities and O&G companies will continue to evolve to support cleaner, more distributed, and more intelligent energy generation/exploration, distribution, and consumption.

c. **Big power to small energy and the rise of the prosumer**: Customer choice is driving a large move from big to small energy. More and more customers are choosing to install DER on their premises. DER solutions include DG, demand response, energy efficiency, distributed storage, microgrids, and EVs. On a 5-year basis (2015-2019), DER in the United States is expected to grow almost 3 times faster than central generation (168 GW vs. 57 GW). This trend varies by region because policy approaches, market dynamics, and structures differ. However, the overall move to small power will persist.

And here are the strategies of large utilities and O&G companies going forward:

- **Search for shareholder value**: Both utilities and O&G companies are looking across the entire energy value chain for future shareholder value. Right now, that value is not in exploration and production or power generation. Yet, shareholders are still interested in natural gas pipelines and transmission that support the movement of natural gas and electricity.

- **Attempts to develop new solutions and businesses**: There has been more than just interest from incumbent players in new energy solutions such as renewables and other alternative fuel sources (hydrogen, biofuels, etc.). DER, behind-the-meter energy management, electric transportation, smart cities, etc. With serious profitability and growth pressure on their core businesses, more serious attempts to build new, potentially transformational businesses in this space are increasingly evident.

For example, Total’s Chairman and CEO Patrick Pouyanné states, “The goal is to be in the top three global solar power companies, expand electricity trading and energy storage and be a leader in biofuels, especially in bio jet fuels.” To this end, Total announced on May 9 that it is acquiring Saft, a designer and manufacturer of high-tech batteries for the manufacturing, transportation, and civilian and military electronics sectors. The company reported sales of €759 million ($856 million) in 2015 and employs more than 4,100 people in 19 countries. “The combination of Saft and Total will enable Saft to become the group’s spearhead in electricity storage,” Chairman and CEO Pouyanné said in a news release. “The acquisition of Saft is part of Total’s ambition to accelerate its development in the fields of renewable energy and electricity.” In June, Total acquired the third-largest supplier in the residential energy market in Belgium, Lampiris. All this after Total acquired a majority stake in SunPower during 2011. The company is making significant investments in utilities assets, and a potential
future scenario is that Total will use the Belgium acquisition as a testing ground to bring distributed solar, storage, and alternative fuel infrastructure to its customers.

But there are others. Dong Energy’s CEO Henrik Poulsen says he expects more companies in the offshore O&G business to bid for a slice of the fast growing offshore wind market. The company highlights the fact that offshore wind is expected to have the highest relative growth rate in renewable energy technology in the Organisation for Economic Co-operation and Development (OECD) from 2014 to 2020. Poulsen told The Wall Street Journal (WSJ) that the offshore wind energy industry could soon be “flooded” by competition as big oil companies join utilities and small renewable players in the growing sector. He also stated that investment in offshore wind energy was coming from companies primarily associated with traditional O&G markets, like Royal Dutch Shell, Eni, and Total. “They have been hesitant,” he said, “but I think they’ve come to a point where they’re thinking ‘Gee, maybe we should start mobilising behind renewables, maybe the green transformation won’t slow down.” Poulsen said he was bracing for more competition from bigger companies. “We’re talking about huge companies with significant capital and execution power. We need to just keep sharpening our sword,” he added. Dong is bidding against Shell for a contract to develop two 350 MW offshore wind farms off the coast of the Netherlands and recently announced plans for an initial public offering (IPO) to raise funds for more offshore wind projects. “Oil and gas will remain important for decades to come, but growth in renewables will be steep and we believe we can take part in that growth and create value,” a spokesman for Statoil, Norway’s state oil company, shared.

Transportation and Smart Cities

Transport electrification, the increased use of biofuels (including bio jet fuels), and the use of hydrogen to fuel vehicles are all on the rise. In the graph below, see Navigant’s forecasted transportation electricity consumption for 2015-2035 in the United States, growing from below 2,000 GWh in 2015 to 16,000 GWh in 2035. These alternative fuel vehicles will slowly but surely replace existing carbon-based transportation fleets, which represent approximately 35% of the global demand for oil. Now there are reports of 500,000 committed purchases of the Tesla Model 3. If Tesla can produce 500,000 cars a year, with models that are in the $30,000-$40,000 price and 200-plus-mile range, this will be another tipping point and game changer for EVs. And finally, Apple has spent more money on the research and development of electric, autonomous vehicles in the last few years than it did on the development of the iPhone, iPad, and Apple Watch—combined.

Road Transportation Electricity Consumption, United States: 2015-2035

(Source: Navigant Consulting)
Meanwhile, as part of the smart city movement, cities are examining the sources and efficiency of their energy in order to reduce their GHG emissions and energy costs. In the process, cities are becoming more ambitious and proactive in setting energy strategy. They are seizing opportunities to work with utilities and other stakeholders to create new urban energy systems. The emerging vision is of a smart city with integrated large- and small-scale energy initiatives, including major infrastructure investments, citywide improvements in energy efficiency, and distributed energy generation. As a result, both utilities and O&G companies are increasingly interested in becoming even more engaged with new transportation concepts and innovation (well beyond fuel) and smart cities.

**So What Does This Mean?**

Do the above examples represent some isolated, small adventures in crossover investments, or do they mark a trend toward two mega-industries (electric utility and O&G) colliding across the entire energy value chain and looking for shareholder value? Time will tell. What is certain is that there will be winners and losers.

There is a clear push for new revenue streams and growth opportunities given the current oil price situation. But we see also new, longer-term threats that will force the incumbent players to reinvent themselves and become broader energy companies. The industry giants seem to be in the best position to be the winners—and ultimately, they have no choice. After all, these are still the biggest companies in the world, and they have a huge shareholder interest that needs to be fed into the future. They simply are not going to declare “game over,” return the equity to the shareholders, and then advise them to go find new companies to invest in.

**7. THE EMERGING ENERGY CLOUD**

Old infrastructure is being replaced and geared toward an increasingly decentralized and smarter power grid architecture known as the Energy Cloud. The Energy Cloud is an emerging platform of two-way power flows and intelligent grid architecture expected to ultimately deliver higher quality power. While this shift poses significant risks to incumbent power utilities, it also offers major opportunities in a market that is becoming more open, competitive, and innovative. Fueled by steady increases in DER, this shift will affect policy and regulation, business models, and the way the grid is operated in every single region of the world.

**What Is Happening?**

In the closing session of EEI’s Annual Convention, several utility CEOs spoke about the current state of this transformation and shared success stories. Although utilities will continue to focus on safe, reliable, and affordable power, they will also have to embrace clean, distributed, and intelligent energy. It was interesting to hear CEOs’ perspectives on customer engagement (“we now actually listen to our customers”), innovation (“we are all in”), and DER (“we want to play”).

While that’s great, we are faced with an enormous dilemma. It is hard to comprehend the complexity of what we are dealing with here. The Energy Cloud will be the product of accelerating innovation, the bulk of which lies beyond our immediate purview. Although we cannot predict or anticipate all the disruptions that will be triggered by emerging technologies, there is an inevitability to this transformation that cannot be ignored. These changes will penetrate all corners of the industry: customers, regulation and policy, technology, business models, and grid operations.

Meanwhile, there is limited or negative demand growth throughout the United States. And because of more efficient ways to use power and more prosumers taking the plunge to generate their own, less and less electrons will flow through the central power system (indefinitley). At the same time, in order to provide safe, reliable power, as well as support a tsunami of DER, exploding Internet of Things (IoT) capabilities at the edge of the grid, and rapid digitalization, significant grid investments are needed. The number one question is: Who will pay for this evolution? The search for new value and pricing models (and there will be many) has begun.

We are at the beginning of the transformation, and I don’t think we have seen anything yet. I predict we will enter a 20-year period of uncertainty, trial-and-error, and both successes and many failures. Along the way, we will figure out ways to transform our power generation, delivery, and consumption system into an orchestrated, flexible, open, and efficient Energy Cloud platform.

**The Emerging Energy Cloud**

We are moving away from a centralized hub-and-spoke grid architecture based on large centralized generation assets toward a more decentralized grid with an increased role for renewables, DER, grid-edge IoT, and digitalization. The Energy Cloud is an emerging platform of two-way
power flows and intelligent grid architecture. While this shift poses significant risks to incumbent power utilities, it also offers major opportunities in a market that is becoming more open, competitive, and innovative. Fueled by steady increases in DER, this shift will affect customer relationships, shape policy and regulation, change business models, propel continuous technology innovation, and overhaul grid operations in every single region of the world.

In the Energy Cloud, revenue allocation across the electric value chain shifts significantly downstream toward the customer, where current costs and revenue associated with generation and retail effectively swap. Customer acquisition costs and revenue recovery represent more than two-thirds of revenue. Utility-scale and distributed renewables account for 50%-100% of total generation. DER uptake is accelerated, driven in part by robust market demand and prosumer engagement. Grid operations are fully distributed and autonomous, and grid devices and networks are self-organizing and self-healing. Utilities will likely own traditional assets such as poles and wires. And they will have an opportunity to forge a new vital role as an enabling platform for diverse market-based offerings. Critical will be to have a foundational transactive energy platform that enables and facilitates transactions between and among market. Block chain technology will play a critical role as the enabler for agile pricing schemes, grid signals, complex transactions, settlements, and trusted relationships between parties.

The Energy Cloud

TODAY: ONE-WAY POWER SYSTEM

EMERGING: THE ENERGY CLOUD

North American utilities are at various stages of integrating DG, demand response, energy efficiency, EVs, and electric storage. Navigant expects this integration trend to accelerate. According to our analysis, DER is projected to grow almost 3 times faster than new central station generation in the next 5 years. That makes DER one of the most disruptive factors affecting the grid today and in the future. From a recent Public Utilities Fortnightly-Navigant survey among 400 utility stakeholders, 90% of survey respondents believe that the growth of DER will force a major shift in utility business models. We believe it is critical that utilities have an integrated DER (iDER) strategy and approach.
Path Forward: The Energy Cloud Playbook

The paths that utilities will follow to transition toward the Energy Cloud will be different. More importantly, the pace by which they move through iDER maturity levels will differ greatly. But understanding the North Star and taking the right steps at the right time are vital to making the transition successful. At an advanced iDER maturity level, utilities have addressed issues arising from high DER penetration such as intermittency, reverse flows, and power quality issues. Utilities are using both IT and OT and have aligned their business processes, operations, and organizations appropriately. DER management systems (DERMSs) and advanced distribution management systems (ADMSs) are managing DER output at the feeder and substation levels. At this advanced iDER maturity level, the utility has augmented its role as a supplier of electricity and has become a platform provider and network orchestrator that enables prosumers to market their DER assets on an open market. This role is critical to fully maximizing the benefits of DER—and it will be key to providing future value to customers and shareholders.

<table>
<thead>
<tr>
<th>MATURITY LEVEL</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Level 5</td>
<td>Fully mature iDER business&lt;br&gt;Full set of value-added DER products and services, significant revenue, fully integrated into IRP, markets, and operations</td>
</tr>
<tr>
<td>Level 4</td>
<td>Managed iDER at scale&lt;br&gt;Full implementation, DER at scale, fully integrated into IRP, markets, and operations, limited value-added DER products and services</td>
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<tr>
<td>Level 3</td>
<td>Integrated pilot DER&lt;br&gt;Piloting, DER at scale, initial integration of some DER into IRP, markets, and operations</td>
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<tr>
<td>Level 2</td>
<td>Fragmented DER at scale&lt;br&gt;Planning, DER at scale, not integrated</td>
</tr>
<tr>
<td>Level 1</td>
<td>Inactive DER&lt;br&gt;Inactive, no significant DER at scale, not integrated</td>
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What’s Next?

While the Energy Cloud is in its infancy today, its evolution will be both pervasive and highly disruptive to stable electric industry revenue streams for the next 30 years or more. Navigant projects that the Energy Cloud’s evolution could result in nearly $1 trillion worth of global investment shifting downstream to the retail segment of the value chain. What’s more, it could add an additional $1 trillion to 1.5 trillion in new value from investments in digital infrastructure and associated services by 2030.

The direction is clear: We are moving away from one-way grid architecture powered solely by large centralized generation assets like fossil fuel, hydro, or nuclear power plants toward a platform of distributed energy, two-way power flow, and intelligent grid architecture. Navigant calls this the Energy Cloud.

To help navigate our clients in this changing landscape, Navigant has developed an Energy Cloud Playbook. The first step in the Energy Cloud Playbook is an assessment of your current status and level of preparedness. Navigant’s multifaceted iDER Maturity Model provides an assessment of a utility’s progress in DER integration capability. We start with a blueprint for what a fully integrated DER system looks like, and then define five levels of iDER maturity based on that blueprint. We will assess your strategy, organization, and operations against these maturity levels.

Energy Cloud Playbook

- Assess
- Create Strategy
- Design Architecture
- Develop Roadmap
- Demonstrate & Iterate
- Implement
- Stakeholder Engagement
- Change Management
- Value Enhancement
8. **FINAL ADVICE: TAKE CONTROL OF YOUR FUTURE**

The tipping points are clear and the megatrends discussed in this white paper cannot be underestimated. They are accelerating transformation in the energy industry, enabling the entry of new players, putting pressure on incumbent players, and altering traditional strategies and business models. Organizations will need to adapt, and there will be winners and losers as this transformation takes shape. My advice to senior leadership of energy companies is to take an integrated, holistic view of the opportunities and challenges that are flowing from these megatrends. Only then will you be able understand the full impacts and path forward. And that is the only way you can really take control of your future.

Learn more about our clients, projects, solution offerings, team, and the Energy Cloud Playbook at [navigant.com/Energy](http://navigant.com/Energy).

**REFERENCES**


4. www.where100.org/e100.


