Utility DIVE

2016 STATE OF THE **ELECTRIC UTILITY SURVEY**

in association with TENDRIL®

EXECUTIVE SUMMARY

By now, it's become cliche to suggest the utility sector is in the midst of a transformation.

For years, analysts warned that the declining price of alternative energy technologies — paired with clean energy policies driven by climate change — would upend the way electric utilities do business.

If there's one overarching takeaway from Utility Dive's third annual State of the Electric Utility industry survey, it's that the transformation has arrived — but a standardized approach on how to adapt to it has not.

While the traditional model of centralized generation and one-way power flows down to the customer served the industry well for more than a century, the vast majority of electric utility executives surveyed by Utility Dive recognize their companies have to change the way they do business — both to maximize future revenue opportunities and comply with some of the most profound regulatory changes sweeping the industry in its history.

But if respondents are largely in agreement that the utility business model is in flux, what exactly it will look like in the future is the subject of much more debate.

While some strong nationwide trends are present among U.S. utilities, opinions on investment opportunities, pressing challenges and overall business strategy varied greatly.

To better understand the perspectives of those in the electric utility industry during this period of historic transition, Utility Dive conducted an online survey of 515 U.S. electric utility executives at the end of 2015 and the beginning of 2016. Although not every respondent answered every question, there were at least 300 respondents to each question in the survey.

The survey was designed as a news-oriented questionnaire to illustrate the perspectives of utility executives toward the challenges and opportunities facing the industry and should not be considered a scientific survey. The survey was sponsored by energy intelligence software firm Tendril. The sponsor had no influence over the content in this report.

KEY FINDINGS

1 Business models

Nearly every respondent to the survey believes their utility's business model needs to change, with only 3% indicating no change is necessary. Utilities see their regulatory model, internal resistance to change and technological integration as the biggest impediments to the evolution of their business models.

2 Most pressing challenges

The most pressing challenges for utilities in 2016 are the aging of their workforces, the existing utility regulatory model, and aging of their infrastructure — all legacy issues.

3 Emerging revenue streams

The most popular emerging revenue opportunities among respondents are energy management and efficiency services, community solar, and electric vehicle charging infrastructure, while green pricing programs and rooftop solar offerings were also popular. Only 9% of respondents indicated their utility is not pursuing any emerging revenue streams.

4 Investment opportunities

Utility respondents indicted they are most heavily invested today in utility-scale renewables, demand side management, distributed generation and natural gas power plants. In the future, respondents indicated their companies should invest more in energy storage, distributed generation and utility-scale renewables.

5 Power mix

Respondents believe utility-scale renewables, distributed generation and natural gas will increase in their utility's power mix, while coal and oil will decline and nuclear will remain stagnant. Utilities expect stronger growth for large-scale solar and distributed generation than they do for wind or gas. The biggest challenges associated with the changing power mix are integrating renewables and minimizing cost to the consumer, respondents indicated.

6 Clean Power Plan

More than two-thirds of respondents think the Environmental Protection Agency should either strengthen the Clean Power Plan or hold to its current emissions targets and timetable. Less than 15% want the plan scrapped entirely and opposition was greatest among electric cooperatives.

7 Distributed energy resources

Respondents see revenue opportunities emerging around DERs but are unsure about how to build a business model to capture them. The two most popular models for deploying DERs were partnering with third-party providers and rate-based investments through a regulated utility — a strategy whose legality remains in question in most states.

8 Rate reform

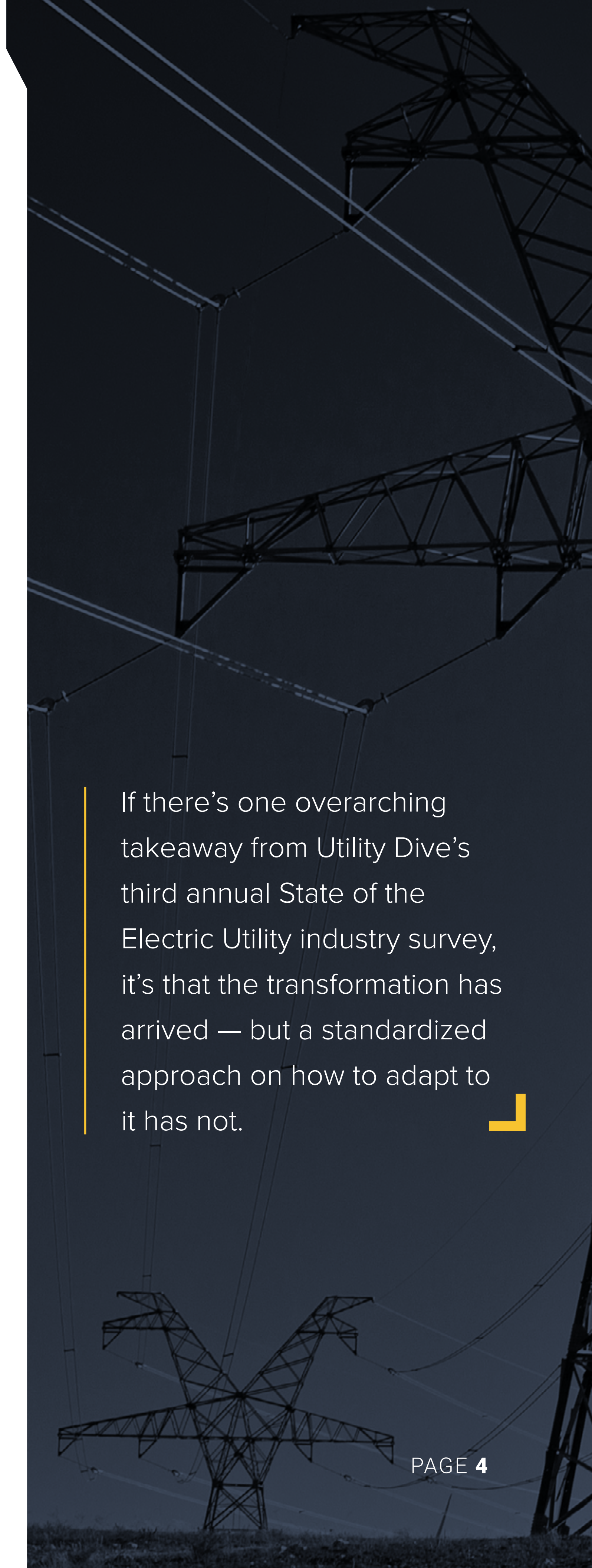
Utilities respondents believe time-of-use rates, fixed charges and residential demand charges are the best rate reforms to enact in response to load defection from DER proliferation. Few respondents indicated a preference for solely lowering remuneration rates for distributed generation under net metering programs.

9 Customer engagement

Utilities expect to increase customer engagement across all digital platforms — especially mobile apps, social media and utility websites — while paper interactions will decrease. Utilities anticipate engaging their customers more about new service offerings, conservation tips, green pricing programs and community outreach.

10 Policy and regulation

The most popular utility regulatory structure identified by respondents was the traditional vertically integrated model. This was followed closely by the New York REV model, which focuses on transforming the utility into a distribution system platform provider to enhance DER deployment.



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DEMOGRAPHICS

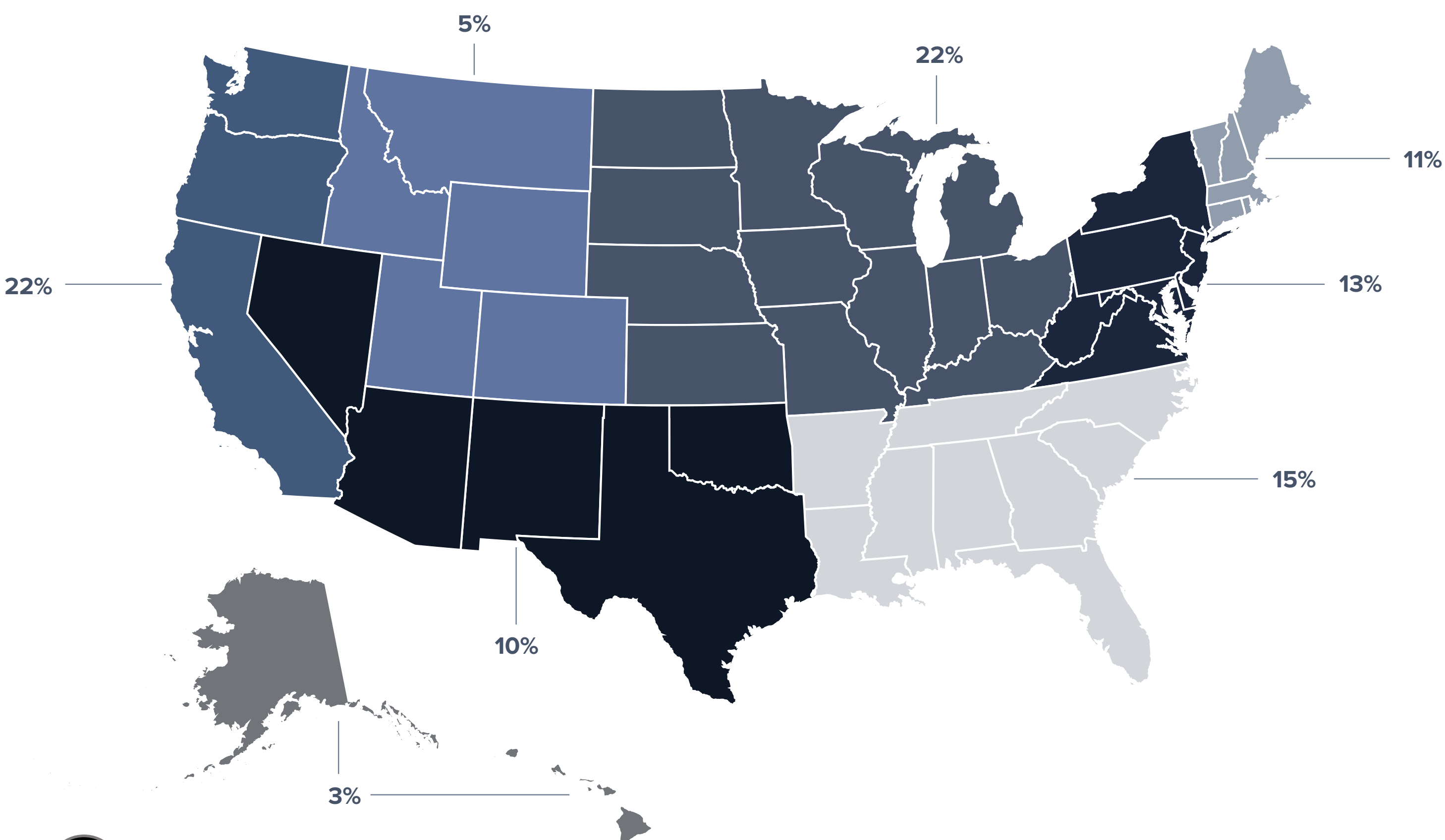
Every electric utility and its service territory is different, so we asked those surveyed to provide information about the type of utility they work for and the region in which they operate.

The 515 U.S. utility respondents to the survey come from every region of the United States. While the survey attracted more respondents from the Midwest and Pacific Coast than other regions, the size and population of each respective region largely accounts for the higher number of responses.

What type of utility employs you?

61%	Investor-owned utility
15%	Municipal utility
14%	Electric cooperative
10%	Public power agency

Where is your utility's service territory located?



How large is your utility's customer base?

28%	Under 250,000 customers
22%	250,000 - 1 million
28%	1 million - 4 million
23%	4 million or more

Which business operations is your regulated utility engaged in? Check all that apply.

89%	Distribution
77%	Transmision
69%	Generation

The majority of respondents to the survey are employed by investor-owned utilities (IOU), with municipal utilities, public power agencies and electric co-operatives making up the rest. The demographics roughly reflect the industry at large, according to data from the American Public Power Agency.

Respondents from co-ops, munis and public power providers tended to represent smaller utilities than their IOU counterparts. Taken together, more than 80% of the respondents from co-ops, munis and public utilities came from companies with 1 million customers or less, while less than 30% of IOU respondents did.

The vast majority of respondents (89%) work at utilities that are engaged in distribution system operations, while 77% are involved in transmission system operations and 68% are in the generation business. Vertically integrated utilities typically own and operate all three infrastructure categories, while utilities in deregulated, organized markets are typically divested from generation assets, which are operated by independent companies. By contrast, some electric cooperatives, especially in the Midwest and plains states, only operate generation and transmission infrastructure.

The diversity of responses suggests a relatively representative cross section of utility regions, business models and regulatory regimes.

BUSINESS MODELS

The traditional utility business model served the industry well for over 100 years.

After the development of bulk power generation in the late 19th century, progressive era reformers began a push for oversight of the booming electricity industry. Spurred by the idea that electricity service constituted a “natural monopoly,” states began setting up regulatory bodies to ensure universal access to reliable power and reasonable rates for consumers. In 1907, New York and Wisconsin formed the first state regulatory entities for electric utilities; by 1914, 45 of the 48 states had similar oversight bodies.

Under this system, regulated utilities and their municipally-owned counterparts typically owned all facets of the electricity system. Aimed at achieving economies of scale, that model persisted until the final decade of the 20th century, when policymakers began to question whether more competition would be good for consumers.

The restructuring of the industry began in the 1990s, with many states deregulating the generation business. The restructuring was never completed nationwide as significant price increases, combined with the California energy crisis of the early 2000s, stalled deregulation in many states. Today, the traditional verticall integrated utility model persists largely in the South, while most other states have enacted some form of competition in generation, retailing, or both. In total, 23 states and the District of Columbia have deregulated at least parts of their electricity markets.

Differences in regulatory regimes have resulted in a number of different business models. While some utilities still own the system from power plant to the meter on the side of the customer’s house, others only own transmission and distribution systems. In some states, such as Texas, independent companies even market power to consumers.

> Utility executives are in near-consensus that the traditional utility business model needs to change.

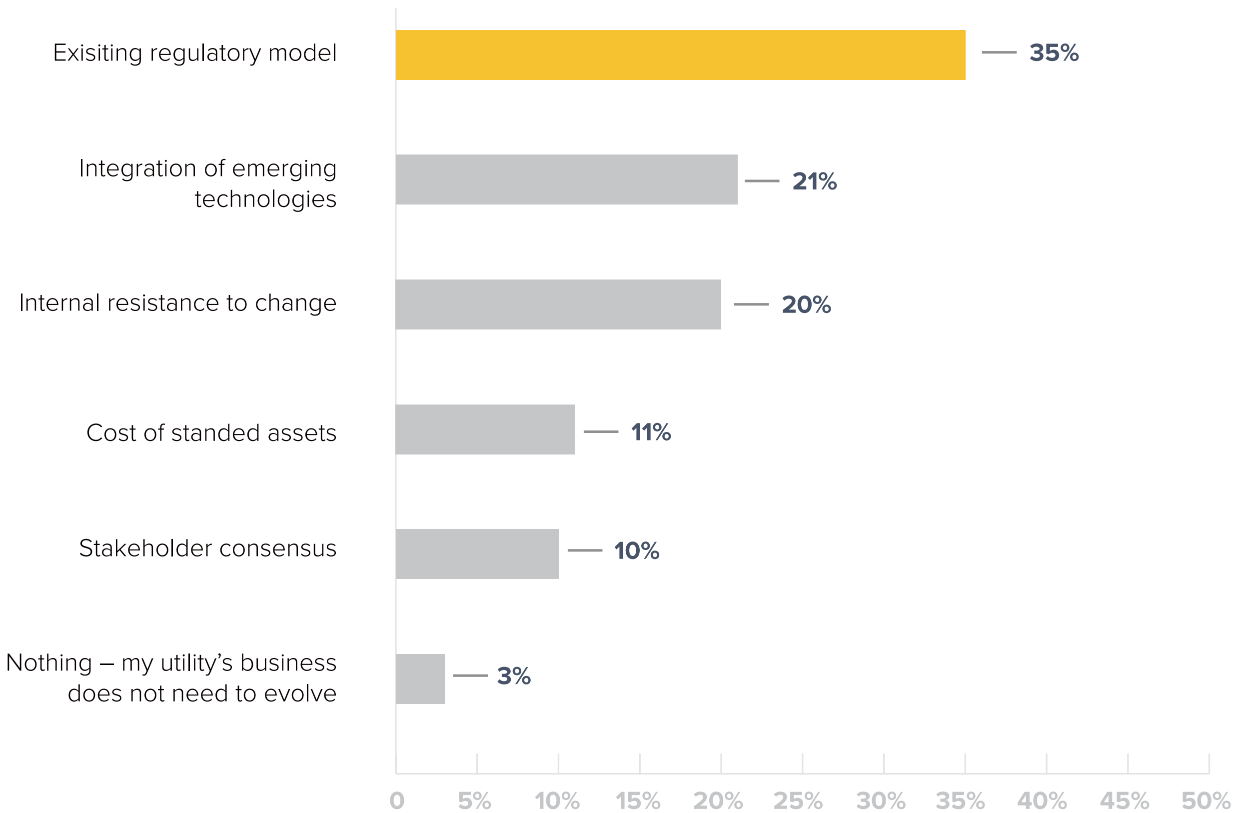
But no matter which business model they have, utilities and company officials are in near consensus that it needs to change. Today, the growing accessibility of new customer-sited energy technologies, such as rooftop solar and distributed storage, are enabling more customers to generate their own electricity for the first time.

According to the results of our survey, utility executives very much recognize the need to evolve their business models in light of this disruption — only 3% of respondents indicated they think the utility business model does not need to evolve — but they also see major obstacles in the way of change.

The existing regulatory model is the biggest challenge to business model evolution, according to 35% of respondents to the survey. It appears to be a particular concern for respondents from investor-owned utilities, 41% of whom named it their greatest obstacle. The regulatory model is less of a challenge for electric cooperatives, munis and public power agencies, which all typically operate under different models of oversight. Instead, respondents from these companies named the integration of emerging technologies as their greatest obstacle to business model change.

The tension between the existing regulatory setup and the fast pace of technological innovation points to an industry wary of disruptive forces entering the market. While electric utilities were long the sole power providers for their customers, new technologies are enabling consumers to challenge the "natural monopoly" of the utility grid from the other side of the meter. While there are many ways for utilities to respond to this phenomenon, nearly all require change to existing regulations and the integration of new technologies onto the electricity system.

What is the greatest obstacle to the evolution of your utility's business model?



CHALLENGES

The challenges utilities face in 2016 would have been unrecognizable a generation ago.

Utilities have always been tasked with ensuring the safe and reliable delivery of power to consumers, but the 21st century has brought on the emergence of the smart grid, renewable portfolio standards, federal carbon regulations, new disruptive market players and more.

> Utilities have always had to worry about their workforce, infrastructure and regulatory models -- but in the 21st century, new technologies, market entrants and regulations have given these legacy challenges a new face.

But despite the new challenges facing the utility sector, survey respondents were most concerned about more familiar ones. The three most pressing challenges for utilities are the aging of their workforces, the existing regulatory model and the aging of their infrastructure, according to the survey.

The regulatory model was especially unpopular with respondents from investor-owned utilities, with 50% of them naming it as a top-three concern. Less than 30% of respondents from co-ops, munis and public power agencies agreed that the regulatory model was a top-three challenge.

What are the three most pressing challenges for your utility? Choose three.

43%	Aging workforce
41%	Existing Regulatory model
38%	Aging infrastructure
37%	Renewables integration
35%	Stagnant load growth
26%	Physical and/or cyber grid security
20%	Clean Power Plan compliance
16%	Grid reliability
16%	Load defection
15%	Compliance with state renewables and/or efficiency mandates
13%	Plant retirements

In all, the responses demonstrate an industry that is still shackled with legacy concerns. IOUs are wary that their regulatory models will not serve them well in an age of growing DERs and stagnating load. Co-ops, munis and public power agencies appear concerned that their smaller size and resource pools will inhibit their ability to integrate renewables and new grid technologies. And utilities of all stripes worry that their existing assets — both human and mechanical — are aging beyond their useful lives.

These challenges are not new to the utility sector, though how they manifest themselves has changed dramatically. Utilities have always had to worry about their workforce, infrastructure and regulatory models, but in the 21st century, new technologies, market entrants and regulations have given these legacy challenges a new face. And although utility stakeholders are cognizant of the challenges they face, the end result of the utility transformation underway remains elusive. While a single model of “Utility 2.0” isn’t likely to emerge in 2016, a closer look at new revenue streams and investment opportunities shows where the sector thinks it will be headed.

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EMERGING REVENUE STREAMS

The vast majority of utilities still make their money through the traditional model — rate-based capital investments. But as new technologies enter the marketplace and consumers and regulators seek more clean energy options, utility business models are changing.

The 2016 survey reveals that the vast majority of regulated utilities are pursuing at least one new revenue stream beyond traditional generation and grid infrastructure and many are looking at a number of new and emerging options.

Energy management and efficiency services — such as demand response programs, smart thermostats and retrofit rebates — is the top emerging revenue stream for utilities, according to the respondents of the survey. Community solar, the popular shared renewables model, was second, while electric vehicle charging infrastructure came in third.

The popularity of utility efficiency offerings reflects a widespread change in the orientation of the power sector. While the legacy utility model was predicated on building out infrastructure, utilities today are more focused on the optimization of their grids. New customer-facing technologies, decoupled ratemaking and energy efficiency mandates in many states are pushing utilities

Which new and emerging revenue streams is your regulated utility pursuing? Choose all that apply.

66%	Offering energy management and efficiency services to customers
56%	Offering community solar to customers
52%	Deploying electric vehicle charging infrastructure
47%	Offering green pricing programs to key accounts
40%	Deploying distributed energy storage
36%	Offering rooftop solar to customers
31%	Developing distributed system platform
19%	Offering microgrids-as-a-service to customers
10%	Selling system usage data to third parties
9%	My utility is not pursuing any of these new revenue opportunities

> New customer-facing technologies, decoupled ratemaking and energy efficiency mandates in many states are pushing utilities to consider new levels of personal engagement in energy management.

to consider new levels of personal engagement in energy management. Utilities large and small are contracting with third-party providers to offer tool and resources to help consumers save power and money. Such offerings not only enhance the customer relationship, but can often help utilities reduce consumption enough to avoid costly investments in new infrastructure.

Throughout the nation, utilities expressed greater interest in community solar than rooftop solar as a revenue stream. This may be due to the regulatory uncertainty surrounding utility investments in rooftop solar. While regulators and utilities have been largely amenable to utility involvement in the shared renewables sector, regulated utilities are typically barred from rate-basing rooftop solar. As third-party providers such as leading residential installer SolarCity give consumers an alternative to traditional utility service, community solar is a way for utilities to provide customers with many of the same benefits as rooftop solar while preserving the customer relationship.

Electric vehicle infrastructure was most popular with respondents from the West Coast and non-contiguous states, places where electric vehicle penetration is the highest in the U.S. (with the exception of Alaska).

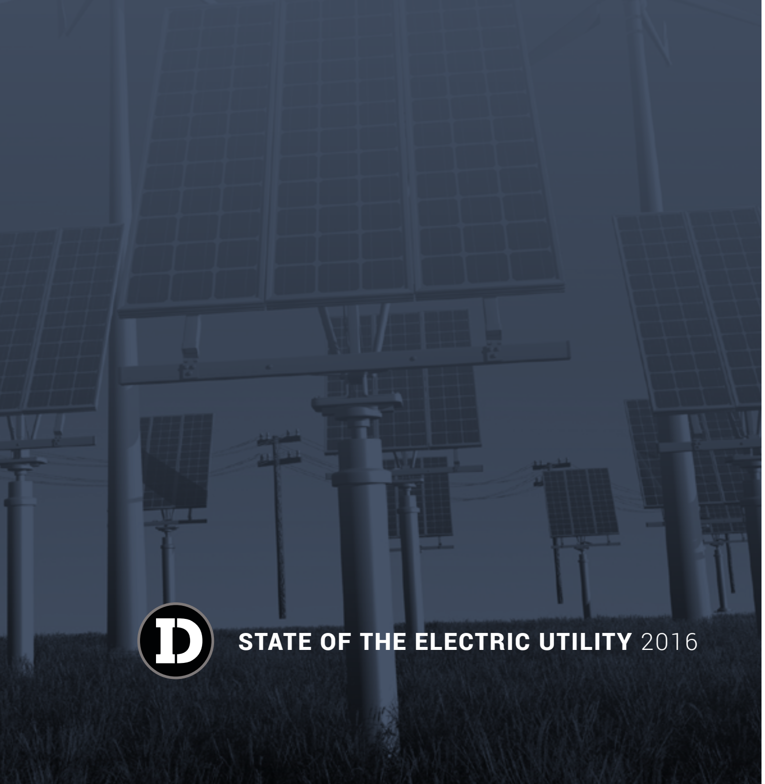
Utilities from those regions also showed the highest interest in deploying distributed energy storage, likely due in large part to California's leading storage market and Hawaii's unique need for storage solutions. Utilities from the Northeast and Mid-Atlantic states showed the next most interest in distributed storage, with over 40% of respondents' utilities pursuing it in each region. The presence of a vibrant storage market in the Mid-Atlantic PJM region and New York's Reforming the Energy Vision (REV) initiative likely play into utility interest in storage in those regions.

Nationwide, about half of utilities indicated they are offering green pricing programs to key customer accounts. These programs normally involve the utility arranging to provide a set amount of clean generation to a large customer in exchange for a small premium. For utilities, connecting their customers with green power offerings can prevent revenue from otherwise being lost to third party providers offering non-utility solutions, such as distributed energy resources.

Across the survey, more than 30% of utility respondents nationwide indicated they are constructing distributed resource platforms, which are critical for coordinating DERs on the distribution grid. This indicates that while utilities are in the process of developing revenue streams for distributed resources such as solar and storage, many are not yet planning for how to operate a variety of DERs in conjunction on the grid. Regulatory regimes in states like New York and California are pushing utilities to devise holistic practices for DER deployment, interconnection and management — practices that could set the standard for utilities in other states.

In which technologies is your utility most invested? Choose three of the following.

66%	Utility-scale renewables (solar & wind)
64%	Demand-side management
50%	Distributed generation
50%	New natural gas-fired generation
22%	Energy storage
21%	Electric vehicle infrastructure
12%	Microgrids
9%	New nuclear generation
6%	Carbon capture and storage and/or coal gasification



INVESTMENT OPPORTUNITIES

Historically, utility investments were relatively simple.

While a utility traditionally would respond to the need for capacity by petitioning regulators to build a centralized power plant or transmission line, today they can choose from other options. Moreover, utilities are finding ways to avoid making these investments through the use of demand response, energy efficiency programs and other alternatives to traditional infrastructure.

That means a look at the utility industry's top investment opportunities in 2016 looks remarkably different from what it would have even just a decade ago.

Utilities today are most invested in four technologies, according to the survey respondents — utility-scale renewables, demand side management, distributed generation and natural gas plants.

Utility-scale renewables are most popular in regions with good renewable energy potential — such as the wind resources in the Midwest and Rocky Mountain states and the solar resource in the Southwest and California — but more than half of respondents in every region except the Mid-Atlantic ranked it among their top three. New natural gas fired generation was least popular in New England — a region already heavily reliant on gas and attempting to relieve supply constraints — and the Pacific West, which has strong renewables mandates present in California, Oregon and Washington. It was most popular among respondents from the Midwest and Southern regions, where utilities are building out natural gas capacity to replace coal power retiring under EPA emissions mandates.

If utilities across the nation are already heavily invested in demand-side management, utility-scale renewables, distributed generation and gas plants, where they want to put their money in the future is a bit different. Energy storage was the most popular opportunity in which executives believe their utilities should invest more. Distributed generation came in second, while utility-scale renewables ranked third. Beyond that, demand-side management, microgrid and electric vehicle infrastructure were popular options among respondents.

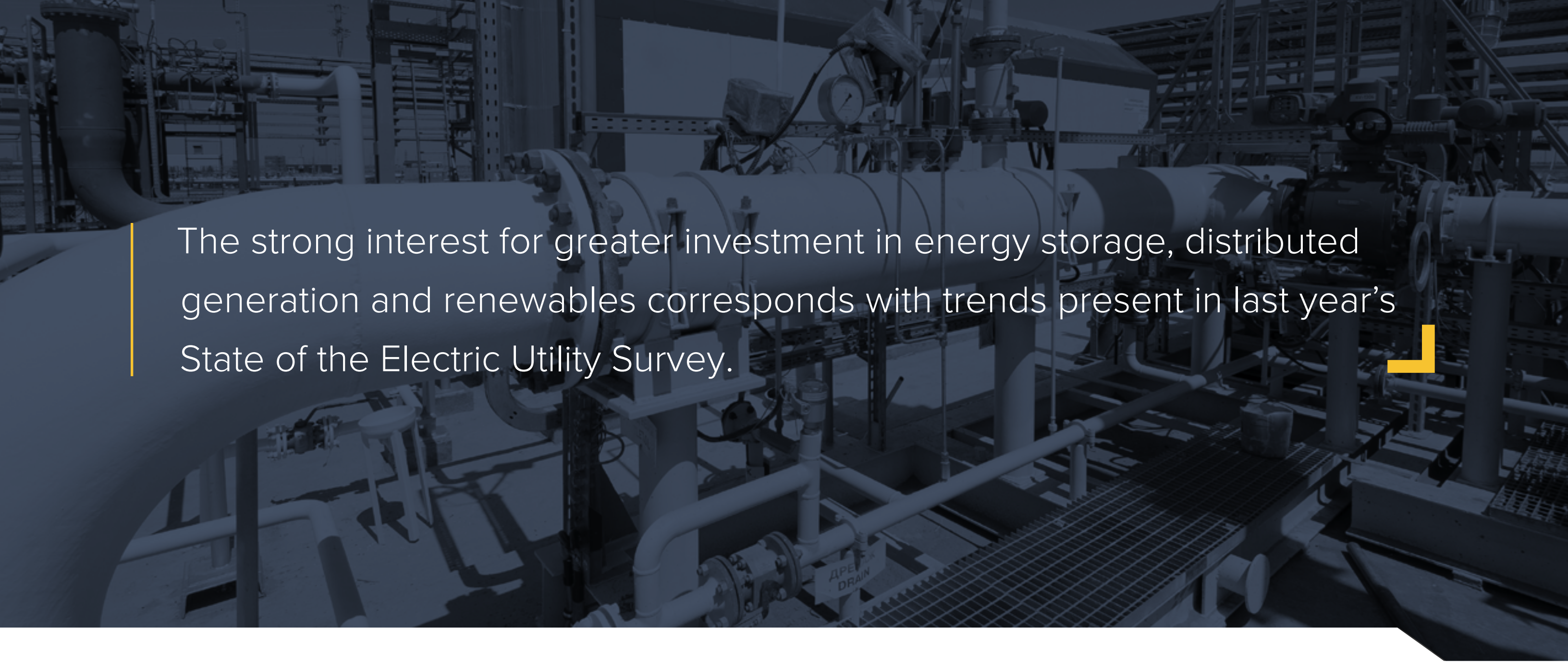
The strong interest for greater investment in energy storage, distributed generation and renewables corresponds with trends present in last year's State of the Electric Utility Survey.

The interest in energy storage in particular should not come as a surprise, as many sector analysts widely regard 2015 as the year that energy storage went "mainstream." High-profile announcements like the unveiling of Tesla's battery products increased the attention paid to storage, while deployment rates, especially in key markets, largely kept pace with the hype. While final numbers have not been published for the year, GTM Research estimates utilities added a cumulative 192 MW of storage in 2015, which would be triple the 2014 deployment figure.

Few respondents believed their utility should invest more in natural gas plants, while even fewer chose nuclear and "clean coal" technologies such as carbon capture-and-storage and coal gasification.

In which technologies do you think your utility should invest more? Choose three of the following.

65%	Energy storage
52%	Distibution generation
47%	Utility-scale renewables (solar & wind)
35%	Demand-side management
34%	Electric vehicle infrastructure
34%	Microgrids
17%	New natural gas-fired generation
11%	New nuclear generation
5%	Carbon capture and storage and/ or coal gasification



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The low interest in "clean coal" technologies is likely a symptom of an industry that has moved past new coal-fired plants for its generation needs. A series of emissions regulations — such as the Mercury and Air Toxics Standards and the Clean Power Plan — have made it virtually impossible to construct new coal plants without such technologies and their high price has made them a less lucrative option for utilities than new gas plants or renewables.

The bearish view on future gas investment is more notable. Natural gas prices throughout 2015 remained near historic lows due to enhanced U.S. production and limited export capability and gas plants can be built relatively cheaply and quickly when compared to other baseload options such as coal or nuclear. But importantly, interest in new gas-fired generation decreased between the questions on current and future investments, suggesting that while utilities are heavily invested in new gas plants now, many respondents see less of a need for future investments in the resource.

This may be due to the greater focus on sustainability the 21st century, especially in the fight against climate change and the emergence of clean energy technologies. While many utilities can meet their Clean Power Plan goals by replacing coal generation with gas and efficiency programs, an overreliance on natural gas could expose utilities to gas price and supply volatility and inhibit their ability to cut carbon emissions beyond the targets set by the Clean Power Plan. While replacing retiring coal plants with modern combined cycle gas plants is likely sufficient to meet most emission reduction targets by 2030 — combined cycle gas plants emit about 60% of the carbon pollution of coal generation — they could prove a liability if stronger regulations are enacted in an effort to cut U.S. emissions even further.

Since gas plants and other electricity infrastructure have decades-long lifespans, the investment decisions utilities make today will likely play a part in determining the costs of carbon reduction years down the line. An anticipation of the need for further carbon reductions in the decades to come could help explain the enthusiasm for renewables and storage, as well as the relatively tepid response toward future gas generation.

POWER MIX

The attitudes of utility respondents toward their changing fuel mixes would have been unthinkable in decades past.

Throughout most of their existence, utilities relied almost exclusively on centralized generation to produce electricity and the vast majority of that came from fossil fuels. As recently as 2000, coal made up 52% of electricity generation in the United States, followed by nuclear (20%), natural gas (16%), hydropower (7%) and oil (3%), according to World Bank data. Renewables, biomass and waste-to-energy accounted for only 2% combined.

But due to emissions regulations and clean energy incentives at the state and federal level, along with steady price declines in natural gas and renewable generation, the utility fuel mix is undergoing a profound shift. In 2015, natural gas generation outpaced coal for the first time, with coal power falling to 29% of the U.S. generation mix.

Renewable generation is booming as well. In 2015, wind accounted for 47% of new generation capacity, followed by natural gas (35%) and solar (14%). The U.S. added 8,598 MW of wind and 2,010 MW of solar throughout the year and in many regions, renewable generation is beginning to challenge fossil fuels on price. Experts anticipate the recent extension of key federal tax credits for both wind and solar to keep growth strong through the end of the decade, after which Clean Power Plan compliance and state mandates are expected to drive further growth.

The dramatic growth in renewables presents integration challenges for utilities and grid operators, who must handle greater penetrations of intermittent generation resources. And while the vast majority of renewables still come in the form of centralized facilities, resources on the customer side of the meter — particularly rooftop solar — are forcing utilities to rethink their systems to accommodate two-way power flows.

These trendlines are reflected in respondents' attitudes toward their changing fuel mixes.

As in last year's survey, most utility respondents see natural gas, utility-scale renewables and distributed generation as the biggest winners in the future power mix. All told, 91% of utilities expect both distributed generation and utility-scale solar to increase in their future fuel mixes, the most of any resource.

Distributed generation and utility-scale solar were especially popular in the Southwestern and Pacific

How do you think your utility's power mix will change over the next 20 years?

	Significantly increase	Moderately increase	Stay about the same	Moderately decrease	Significantly decrease
Natural Gas	28%	**44%**	23%	4%	2%
Wind	25%	**52%**	20%	1%	1%
Utility-scale solar	42%	**49%**	7%	1%	<1%
Hydro	3%	13%	**75%**	7%	2%
Coal	1%	2%	16%	28%	**54%**
Nuclear	3%	7%	**57%**	17%	17%
Oil	1%	1%	**39%**	23%	36%
Distributed energy resources	42%	**49%**	7%	1%	<1%

West regions of the country, likely due to the strong solar resources in Arizona, New Mexico, Nevada, California and other states. 52% of Southwest respondents predicted a significant increase for distributed generation in their fuel mixes, eclipsed only by New England, where 66% of respondents predicted a significant increase for distributed generation, perhaps due to the region's high electricity prices and existing reliance on natural gas generation.

Utility attitudes toward wind generation, while clearly positive, were less pronounced than those for large solar and DERs. While over 50% of respondents in the Pacific West, Rocky Mountains, Gulf Coast, Mid-Atlantic and New England regions anticipated a moderate increase in wind generation, no more than 28% of respondents in each of those regions anticipated a significant increase. This may be due to the greater penetration of wind relative to solar in the present U.S. fuel mix. Wind currently provides about 5% of the nation's electricity capacity — mostly in the middle regions of the nation — while solar provides about 1% of capacity (not including distributed solar), concentrated mostly in the Southwest and California.

Trends for natural gas generation were similar, with more respondents in each region anticipating moderate growth than significant increases. This corresponds with sentiments toward natural gas investment, with significantly fewer respondents indicating they would invest in gas infrastructure in the future than those who indicated it is an important investment opportunity today. The expectations for moderate gas increases may be fueled by concerns over future emissions regulations and the potential volatility of gas supply and prices.

> While analysts expect utilities will continue to generate a significant portion of their power from conventional coal plants through 2030, utilities are steadily reducing their reliance on coal plants and replacing them with gas, efficiency and renewables.

What is the most compelling reason for utility executives to invest in clean energy, such as renewables, efficiency and energy storage?

37%	Sustainability
28%	Renewable energy targets or mandates
17%	Emissions standards
12%	Low prices
6%	There is no compelling reason to invest in clean energy

Coal and oil generation attracted the least interest in the survey. The vast majority of respondents predicting the role of coal and oil in the fuel mix will decline or stay the same in the coming years.

In all, the perspectives on fuel mix correspond well with the perspectives on changing investment decisions. While analysts expect utilities — especially in coal-heavy regions — will continue to generate a significant portion of their power from conventional coal plants through the end of Clean Power Plan compliance in 2030, utilities are steadily reducing their reliance on those resources and replacing them with cleaner gas and renewables. If the U.S. moves toward deeper decarbonization in midcentury and beyond as many analysts expect, more stringent greenhouse gas goals could make gas plants increasingly unappealing, enhancing the appeal of long-duration energy storage to store renewable generation on the grid.

But while policy and regulation may be driving utility interest in renewables, some in the sector appear to genuinely want to address environmental issues. When asked about the best reason to invest in clean energy technologies, 38% of respondents chose sustainability, while compliance with state renewable standards or emission regulations were less popular answers.

Utility respondents largely expect clean energy to grow as a part of their power mixes, but the shift does not come without costs and challenges. While the power system was designed around baseload generation facilities, renewable resources generate only intermittently and distributed resources often deliver power back to the grid. These characteristics present unique challenges to utilities that are reflected in responses to our survey.

When asked about the single biggest challenge associated with their changing fuel mixes, nearly the same number named reliably integrating renewables and minimizing customer costs as their biggest challenge. Certainly, these responses and others are related, since integrating renewables, dealing with stranded assets and building out transmission lines have clear cost implications. But the question does emphasize that as utilities move to a lower-carbon future, two of their biggest challenges will be the reliable integration of renewable resources and minimizing the cost of change to the customer.

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These concerns — like the top-three challenges identified by respondents — can be viewed as new variants on legacy concerns for the power sector. Ensuring reliability and minimizing costs have always been central to the utility mission, but in the 21st century, new technologies, regulations and environmental challenges are transforming the face of these concerns — and the utility industry's power mix.

What is the single greatest challenge associated with your changing power mix?

32%	Reliably integrating variable renewables and distributed resources
31%	Minimizing cost of change to the customer
12%	Uncertainty over future market conditions for new generation resources and fuels
9%	Financial impacts of stranded assets
9%	Building new transmission & distribution lines to serve new or existing assets
7%	Building new generating capacity to meet demand or compensate for plant retirements

THE CLEAN POWER PLAN

In August 2015, the U.S. Environmental Protection Agency finalized the Clean Power Plan, the nation's first set of federal regulations aimed at reducing carbon emissions from the power sector.

Under the rule, states must start cutting carbon emissions from the power sector beginning in 2022. By 2030, they must be reduced 32% nationwide from their 2005 levels. States can choose to either calculate emission reductions by mass (tons of carbon emitted) or by rate (carbon emissions per unit of electricity) and must submit preliminary plans for compliance in September 2016. If they do not, or their plans are rejected by the EPA, the states could be forced to accept federal implementation plans for compliance.

The impact of the plan on the power mix remains an open question — market forces and other policies are also pushing utilities to retire coal generation — but it and other EPA air regulations have made it virtually impossible to deploy new coal generation without costly pollution control technologies.

Political opposition to the plan has been intense, with over half of U.S. states joining with fossil fuel generators and producers to file lawsuits against the EPA, arguing it is overreaching its mandate under the Clean Air Act. Despite the political and legal debate around the plan,

How should the EPA proceed with the Clean Power Plan, which sets a goal to reduce carbon emissions from the power sector 32% nationwide by 2030?

41%	EPA should hold to its current emissions standards and timetable
29%	EPA should make the emissions reduction targets more aggressive leading up to 2030
17%	EPA should lessen emissions reduction targets and timetables
13%	EPA should scrap the plan altogether

last year's Utility Dive survey found utility executives were largely at peace with the regulations, with 62% of respondents indicating they thought the EPA should maintain the policy as is or make it even more aggressive. A year later, the sector appears even more comfortable with the now-finalized Clean Power Plan, with 70% now saying the policy should be maintained or be made more aggressive.

Opposition to the Clean Power Plan was strongest among respondents from electric co-ops, with 32% of those respondents indicating they would want the plan thrown out entirely and 29% wanting emissions standards and timetables lessened. Co-op sentiment against the CPP could be due to their size and institutional structure, as 68% of co-op respondents hailed from organizations with fewer than 250,000 customers. Small organizations such as these may find it more difficult to raise the capital necessary for upgrades to meet emissions mandates and co-ops may not have all of the financial options for infrastructure financing that are available to munis, public power agencies and investor-owned utilities. The National Rural Electric Cooperative Association and 37 of its member co-ops filed suit against the federal emissions regulations in October, citing excessive costs of implementation.

But even if most utility executives are largely comfortable with the emissions package, just how they would like to see it implemented is up for more debate. About the same amount of respondents said they support a mass-based compliance scheme, which would set a cap for the amount of carbon emitted from a state each year, as did for a rate-based scheme.

Editor's note:

After Utility Dive conducted the survey and completed its analysis of the results, the Supreme Court ordered the Obama administration to hold off on any efforts to implement the Clean Power Plan (CPP) until a federal appeals court reviews the plan and any subsequent appeals are exhausted. A hearing is scheduled for June 2, 2016.

It's not yet clear what effect the stay — or even a decision to overturn the CPP — will have on the sector. Even if the rule is ultimately upheld, the stay would likely push back compliance timelines. As it stands, the EPA will be unable to enforce its September deadline for states to submit compliance plans.

Of those who opted for a mass-based approach, 31% also chose a price on carbon and 32% chose joining for forming an organized carbon market. There may have been some confusion among respondents, however, as 15% of those who chose a mass-based plan also indicated preference for a rate-based plan — even though states must choose one or another. This could be due to the complex nature of the compliance options, show that utilities have not all settled on a preferred plan, or indicate that utilities with operations in multiple states may prefer different compliance strategies in each. Stakeholders in most states continue to meet and discuss how they will write their compliance plans .

The EPA provides a number of options for states to comply with the emissions requirements. How should your state go about implementing the Clean Power Plan? Choose all that apply.

35%	Put a price on carbon, either legislatively or in electricity markets
34%	Choose a mass-based approach to compliance (calculating pollution by number of tons emitted) with emissions trading capabilities
33%	Choose a rate-based approach to compliance (calculating pollution by emissions per kWh of generation)
25%	Found or join a formal carbon trading scheme, such as the Regional Greenhouse Gas Initiative (RGGI)
17%	Adopt the EPA's proposed Federal Implementation Plan when it is finalized
8%	My state should not design or file an implementation plan for the Clean Power Plan

DISTRIBUTED ENERGY RESOURCES

Since the advent of centralized generation, the utility industry has almost exclusively relied on a one-way system that delivers electricity from the power plant all the way down to the customer. But now, with costs falling for distributed energy technologies, the paradigm of centralized generation is beginning to shift closer to the customer. Residential and commercial customers are installing rooftop solar panels and other distributed resources like never before and while some regions have seen more activity to date than others, respondents from each region expect distributed generation to grow significantly.

The booming growth of DERs presents both opportunities and risks for utilities. The same customers that are considering bypassing their utilities to contract directly with renewable energy developers, for example, could present a new revenue opportunity for utilities with green pricing programs or an unregulated generation business.

But while utilities recognize these new distributed technologies present new revenue opportunities, they are not sure of how best to take advantage of them. This was reflected in the survey results last year, when 56% of survey respondents said they saw an opportunity in DERs, but were unsure how to build a business model around them.

This year, two DER business models came out as clear winners for utilities — choosing to partner with third party providers to deploy DERs and installing DERs by rate-basing investments through the regulated utility.

How do you believe your utility should build a business model around distributed energy resources? Choose all that apply.

60%	Partnering with third party providers to deploy DERs on the grid
59%	Owning and operating DERs as a regulated utility through rate-based investments
39%	Procuring or aggregating power from DERs owned by third party providers
29%	Owning and operating DERs through an unregulated subsidiary
5%	I do not believe my utility should have a business model around DERs

Importantly, the choices were not mutually exclusive and many respondents chose more than one business model for DERs. This suggests that utilities are still weighing a variety of options for DER-centric business models and may even be pursuing multiple opportunities at the same time, especially as rules and regulations are still evolving.

Interestingly, more respondents favored rate-based investments in DERs from a regulated utility than making investments through an unregulated subsidiary. For utilities, direct ownership of DERs can allow greater visibility and control over the resource, as well as the opportunity to rate-base the investment.

At present, however, few DERs are deployed in by regulated utilities; instead, DERs are often deployed through third-party providers, who install rooftop solar systems or other technologies for the consumer and finance them through loans, leases or other arrangements.

National solar companies often view utility involvement in the residential rooftop market as anti-competitive due to the utility's monopoly status, existing customer relationship and potential ability to rate-base rooftop DER investments. While the ability of regulated utilities to rate-base such investments remains unresolved or prohibited for many utilities, Arizona Public Service and Tucson Electric Power have received approval to commence pilot programs from regulators and utilities in other states have begun offering rooftop solar through unregulated subsidiaries.

If questions remain among regulators and installers over the utility role in DER markets, it is largely settled among the respondents to Utility Dive's survey: 65% indicated that utilities should be able to own and rate-base distributed resources through their regulated utilities in most or all circumstances. Another 17% indicated that rate-based investments should be allowed, but only when the competitive market fails to deploy DERs — the model that New York regulators envision under their REV reforms.

Should utilities be allowed to own distributed energy resources?

65%	Yes, regulated utilities should be able to own and rate-base DER investments in all/most circumstances
17%	Yes, but only in specific instances where the competitive market fails to deploy DERs that would benefit the grid
12%	Yes, but only through unregulated subsidiaries
6%	No

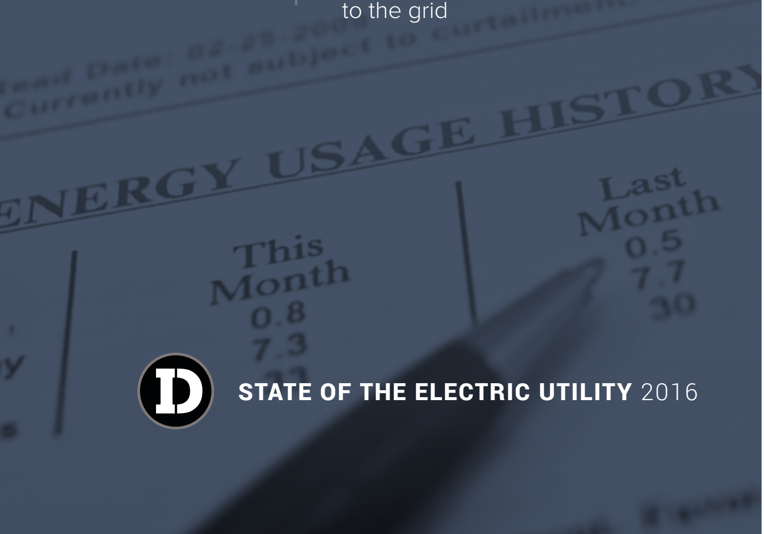
While last year's survey revealed that many utilities were unsure of how to best build a business model around DERs, respondents to this year's survey saw two models as clear winners: Partnering with third parties and offering DERs directly through the regulated utility.

Which load growth trend do you see in your utility's service territory?

74%	Minimum or stagnant load growth
18%	Significant load growth
9%	Declining load growth

What is the best way for utilities to deal with decreases in utility revenue as a result of load defection (customers decreasing their demand by generating their own electricity or purchasing it from a third party)?

38%	Reform rate structures to better recover fixed costs
27%	Offer customers renewable energy options from utility (i.e., green pricing or community solar programs)
26%	Petition regulators to change the traditional utility revenue model
6%	Lower the remuneration rate for distributed generation
3%	Cap the amount of distributed generation that can interconnect to the grid



RATE REFORM

A central question for utilities in the 21st century is how to respond to the rapid growth of distributed resources. While DER deployment has the potential to eliminate the need for costly grid and generation upgrades, DERs are currently being leveraged by third-party providers to lower customer bills on an individual basis — not as resources for the grid.

High penetrations of DERs have the potential to reduce utility revenues. While the sheer volume of electricity sales lost to DERs in most regions of the nation is still small, stagnant or declining load growth can make even small increases in DER penetration significant for utility earnings.

The vast majority of utility respondents in 2016 report stagnant or minimal load growth in their service territories. Load growth appears strongest in the Southwest, where 33% indicated significant growth and the Southeast portion of the country (Gulf Coast, South Atlantic and Mid-Atlantic regions), where 26% indicated significant growth. It is weakest in the non-contiguous regions (Alaska and Hawaii), where 36% indicated declining load and 55% indicated stagnant or no growth. In all other regions (Midwest, Pacific Coast, Rocky Mountains and New England), at least 75% of respondents indicated stagnant load growth.

Altering rate structures — especially through fixed charge increases — has been a common utility response to DER growth and a significant portion of respondents to the survey endorsed it. When asked how to manage the growth of DERs, 38% chose reforming rate structures, which can encompass fixed fees, demand charges, TOU rates and more.

But if utilities are unable to manage the rapid growth of DERs through rate design reforms, it appears they want in on the DER business. Many respondents (27%) chose offering renewables from the utility — either through direct sales, PPAs or green pricing programs — as the best option to combat load defection from DERs. A similar number (26%) preferred to petition regulators to change the utility revenue model so that DER deployment does not harm utility finances. The best way to do that is up for debate in many states, with high-profile regulatory reforms in both New York and California leading the way on reshaping utility models to incentivize DER deployment.

Interestingly, very few respondents indicated a preference for solely lowering remuneration rates for distributed generation, which has recently occurred in states like Hawaii and Nevada, where retail rate net metering has been eliminated by regulators. While one explanation may be to conclude that respondents want to preserve the retail rate credits received by net metered rooftop solar installations across most of the nation, it may be the case that respondents envision net metering rate cuts as a part of larger rate reforms that are necessary for utilities in an age of increasingly distributed resources.

When asked to identify the residential rate design reforms they would pursue, most utility respondents chose time-of-use (TOU) rates. Nearly half indicated they would increase fixed charges, with 29% opting to raise them on all customers and 20% just for customers

In response to the growth in distributed energy resources, how should your utility change its residential rate design? Choose all that apply.

55%	Institute time-of-use rates to charge more during peak hours
29%	Increase fixed charges for all residential consumers
28%	Increase demand charges for all residential customers
24%	Group customers and charge different rates based on usage (inclining block rates)
21%	Increase demand charges for residential customers with distributed generation only
20%	Increase fixed charges for residential customers with distributed generation only
11%	Our utility should not change its residential rate design
6%	Increase volumetric charges for all residential customers

with distributed generation. Another 49% indicated interest in raising residential demand charges (28% for all customers and 21% for DG customers only).

As with the business models around DERs, the answers surrounding rate reforms were not mutually exclusive. Many of those who favored TOU rates also want to pursue increased demand and fixed charges. The tendency of respondents to choose multiple rate design reforms suggests that utilities are pursuing multiple options. In other words, utility executives do not believe there is a silver bullet for rate design in response to growing levels of DERs.

A more balanced strategy to residential rate reform corresponds with emerging sector trends. While many utilities continue to respond to stagnant load growth and DER proliferation with calls for significantly higher fixed charges, a growing number of companies and regulators are opting for a more diverse approach, such as pairing small fixed charge increases with TOU rates and residential demand charges. In the end, all of these approaches are intended to reorient rate structures to account for the new realities of electric service in 2016.

> The survey shows that utility executives do not believe there is a silver bullet for rate design in response to growing levels of DERs.

CUSTOMER ENGAGEMENT

Traditionally, utilities only engaged with customers when it was time to collect payment or something was wrong, like a power outage. Now, new customer-facing technologies make it possible for consumers to take a more active role in managing their power consumption, saving both money and energy. For utilities, new channels unlocked by the Internet and mobile technologies provide the opportunity to strengthen the customer relationship, lower the risk of load defection, offer new products and services and even alleviate constraints on the electric system.

These trends — and utilities' awareness of them — are clear from the responses to the 2016 Utility Dive survey. First and foremost, utilities are attempting to increase engagement with their customers on just about every occasion. Over 70% indicated they would attempt to engage customers more through community education and outreach, conservation and energy usage tips and new service offerings in the next five years. A majority said they would increase engagement on billing and customer support, demand response events

How will the ways in which your utility interacts with customers change over the next 5 years?

	Increase	Stay about the same	Decrease
Billing and customer support	**57%**	39%	4%
Community education and outreach	**71%**	27%	2%
Conservation tips and energy usage analysis	**72%**	27%	1%
New service offerings	**72%**	27%	1%
Power outages	20%	**50%**	30%
Discount and rebate promotions	26%	**67%**	7%
Demand response events	**56%**	41%	3%
Green pricing programs	**61%**	35%	4%

and green pricing programs. The only engagement opportunity that a substantial proportion of respondents (30%) indicated would decrease in importance is power outages, perhaps due to the promise of enhanced reliability.

As engagement opportunities grow and evolve, the mediums that utilities use to engage with their customers are changing as well. While paper billing and inserts are by far the most common channels for utilities today, two-thirds of respondents expect that their usage will decrease over the next five years. By contrast, two-thirds of respondents expect more customer engagement with their utility's website.

The most striking results, however, come from the mobile app and social media categories. The majority of respondents (83%) indicated they would increase mobile app engagement in the coming years and a similar percentage (79%) indicated the same for social media. The inclination of utility companies to move toward more digital and mobile communications with their customers mirrors the rapid shift toward these devices by consumers themselves.

In particular, new mobile apps in use by many utilities can track customer usage based on household appliances, recommend energy saving tips and connect customers with new products and services offered through the utility, a partner or subsidiary. As customers take more interest and ownership in their energy usage and DERs grow in penetration, these communication channels appear poised to become the cornerstones of utility-customer interaction in the future.

How will the mediums you use to interact with customers change over the next 5 years?

	Increase	Stay about the same	Decrease
Paper billing and inserts	3%	30%	**67%**
Utility company website	**67%**	32%	1%
Utility mobile app	**83%**	16%	1%
Customer phone calls	7%	**64%**	29%
Email	**48%**	47%	5%
Social media	**79%**	19%	2%
In-person education and outreach	34%	**52%**	15%

POLICY AND REGULATION

If there's one overarching theme to the 2016 Utility Dive survey, it's that a confluence of trends are all putting pressure on the legacy utility business and regulatory model. Carbon regulations and clean energy mandates are pushing utilities to transform their power mixes, DERs and other new technologies are reshaping how the grid operates and the way that utilities interact with their customers is being quickly changing.

This comes at a time when utilities are less financially secure than at any other time in recent decades. Load growth is stagnant throughout most of the nation, renewables and DERs are capturing demand typically served by utilities and the growth in energy storage threatens to exacerbate both trends, potentially resulting in widespread load defection.

But while all those new technologies and regulations present unprecedented challenges for utilities, they are also unlocking new opportunities. To succeed in these new opportunities, utilities and the regulators who approve their investments need to be on the same page — attuned to the unique demands placed on utility companies in the 21st century.

For instance, regulators in a few key markets across the nation have begun to rethink how utilities are compensated so they can take advantage of DER technologies, rather than be harmed by them. The highest-profile proceeding is taking place in New York, where regulators envision remaking the regulated utility as a distribution service platform (DSP) provider — an entity that operates a DER marketplace, enables the optimal deployment of DERs and earns revenues from system integration and operations.

That model is still very much a work in progress, with New York utilities scheduled to file their first distribution system implementation plans — models for utility practices as DSP providers — in summer 2016. But already it seems to have attracted some attention and goodwill from the respondents to the survey.

> High profile regulatory reforms in New York and California are paving the way for the utility business and regulatory models of the future.

When asked which regulatory model is most appropriate for utilities in the 21st century, 24% of respondents opted for the New York REV model, making it the second most popular response behind the traditional vertically integrated utility model. The RTO/ISO model came in third, while utilities expressed the least support for the retail electricity model and the IDSO model, which envisions an independent RTO-like entity to coordinate DERs on the distribution system.

The REV model was the most popular in the New England region and was also popular in the Mid-Atlantic region, perhaps due to New York's presence nearby. Interestingly, the REV model was also the most popular option among utilities from the Pacific West region. This may be due to the fact that California has enacted a series of reforms focused on accelerating DER adoption and is quickly becoming a leading market for both distributed solar and storage. While not under one overarching regulatory reform like the REV docket, California is seeking to align utility incentives with increased DER deployment and require utilities to file plans with regulators on how they plan to do so. Those similarities may make the REV model more appealing to California respondents. The regulatory model that REV envisions likely gains some of its appeal from its strategy to put the utility at the center of the distribution system in the age of DERs — as opposed to an independent entity as with the unpopular IDSO model — and recreate the largely successful wholesale market model at the distribution level.

What do you believe is the most appropriate market structure for the utility sector in the 21st century?

28%	The vertically integrated utility model: Fully-regulated utility owns generation, transmission, distribution and monitors reliability.
24%	The NY REV model: The RTO/ISO model as outlined above, plus the regulated utility acts as the platform provider for distributed resources on the distribution system.
24%	The RTO/ISO model: Regulated utility owns transmission and distribution grid, unregulated companies supply generation and RTO/ISO operates the transmission grid and monitors reliability.
13%	The retail electricity market model: The RTO/ISO model as outlined above, plus unregulated companies provide electricity retailing services.
11%	The IDSO model: The RTO/ISO model as outlined above, plus an independent distribution system operator (IDSO) operates the distribution grid and monitors reliability.

But while broad regulatory reform envisioned by REV proved popular among respondents, it lost out to a model that and other electricity market reforms have looked to supplant — the traditional vertically integrated utility model, which dominated the industry until the wave of deregulation in the 1990s.

The popularity of the vertically integrated model, however, should not be taken as an endorsement of the status quo. Of those who picked that model, only 3% indicated they thought their business model did not need to evolve, suggesting that while many respondents see the need to change how they do business, they would prefer to do so within the parameters of the vertically integrated utility construct. That model is both familiar to many utilities and preserves their role as a monopoly provider of electricity on their grids, diminishing the threat of load defection.

The outcome of the regulatory reforms in California, New York and elsewhere is still very much an open question and one that's not likely to find a conclusive answer in 2016. Regulatory reforms, even under one banner like the NY REV, are often piecemeal undertakings, with dozens of white papers and proposals inspiring countless separate comment filings that can span years and even decades. So while utilities may be enamored with such broad reforms today, the next year could yet see changes to these reforms, even if their long-term goals are already set.

OUTLOOK

The utility sector in 2016 is on the precipice of a new era.

After a century of reliance on centralized fossil generation, the industry is being pushed by policymakers and regulators to decarbonize and reorient its system to accommodate deployment of and demand for distributed resources.

Many of the issues faced by utilities in this new era are new iterations of legacy challenges. Utilities have long been charged with resource planning, integrating new technologies and managing regulatory expectations. They have not, however, faced an environmental challenge as significant or widespread as climate change, nor an increasingly viable alternative to their status as a “natural monopoly” for electricity delivery, as they do with DERs.

The problem of climate change influences virtually every challenge and emerging business practice respondents identified in this year’s survey, adding urgency to environmental efforts, exacerbating grid reliability issues and stoking demand for more renewables and distributed energy resources among utility customers. The resulting push for a cleaner, more decentralized grid is pushing utilities into a brave new world of power generation and delivery.

For many companies, the transition presents challenges to their financial health and business models. Enhanced efficiency measures and DER growth threaten revenue recovery, clean air regulations are transforming the fuel mix and utility assets, from hardware to personnel, are aging beyond their useful lives.

> Many of the issues faced by utilities in this new era are new iterations of legacy challenges.

But just as the new era of decarbonized, decentralized energy presents challenges to utilities, it also provides ample opportunities. Utilities that find proactive approaches to deploy new technologies and services may find emerging revenue opportunities even as traditional ones diminish.

Utilities facing load defection due to DERs and third party sales of renewable energy, for instance, may seek to derive revenue by offering green pricing programs, shared renewables and their own distributed generation — three of the popular emerging revenue streams identified by respondents to the survey.

> The central narrative for electric utilities in the coming years will be how to decarbonize their systems and integrate new energy technologies while preserving grid reliability and minimizing cost to the consumer.

Realizing these opportunities is easier said than done. Integrating more distributed energy and intermittent renewables onto utility grids requires investment in new smart grid technologies to manage the resources and many new revenue utility opportunities, especially in distributed energy, must first pass muster with regulators.

Additionally, utilities in 2016 must also anticipate regulations that could be enacted decades in the future — especially concerning climate change — as investment decisions today could limit the ability to adapt to new policies and market trends. And they must do all this while at the same time ensuring reasonable rates for consumers.

Given those realities, the central narrative for electric utilities in the coming years will be how to decarbonize their systems and integrate new energy technologies while preserving grid reliability and minimizing cost to the consumer.

Respondents to this survey largely recognize that challenge, but exactly how to reform the utility business model remains an open question — one that takes different forms depending on utility size, type, location and a litany of other factors.

With all of these changes taking place, 2016 won't be the year that the pace of reform slows down. The disruptive forces affecting the utility industry — from the impacts of climate change to the growth of DERs — are only becoming more significant. For an industry that historically has been slow to evolve, the ability to become much more nimble and adapt to widespread change will be the sector's greatest challenge in the coming years.