



2017

STATE OF THE **ELECTRIC UTILITY SURVEY**

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About the Survey

The 2017 State of the Electric Utility Survey is based on an online questionnaire administered to Utility Dive readers in January 2017. Over 600 electric utility employees from the U.S. and Canada took the survey.

The survey was designed to illustrate the outlook and opinions of utility executives. The project was sponsored by the consulting and research firm PA Consulting; the sponsor had no control over the content in this report.

Executive Summary



he electricity industry has been the foundation of modern life for more than a century.

Since Thomas Edison flipped the switch on the nation's first fossil power plant in 1882, the industry has tasked itself with a dual mandate: the reliable delivery of electricity at affordable prices.

Since its establishment in the early 20th century, the traditional model of vertically-integrated utilities electrified virtually the entire nation. Under the model, utilities petition state regulators to make investments in the bulk grid system using revenues collected from customers, and regulators allow the companies to earn a modest rate of return so long as projects are completed cost-effectively.

That model still serves as the foundation for investments in the grid today. But beginning in the 1970s, policymakers began to question whether more competition — particularly in generation — could lower costs for consumers. In the 1990s, a number of states began the process of deregulating their power sectors, splitting competitive generation businesses away from transmission and distribution utilities. The nation's first wholesale power markets were born.

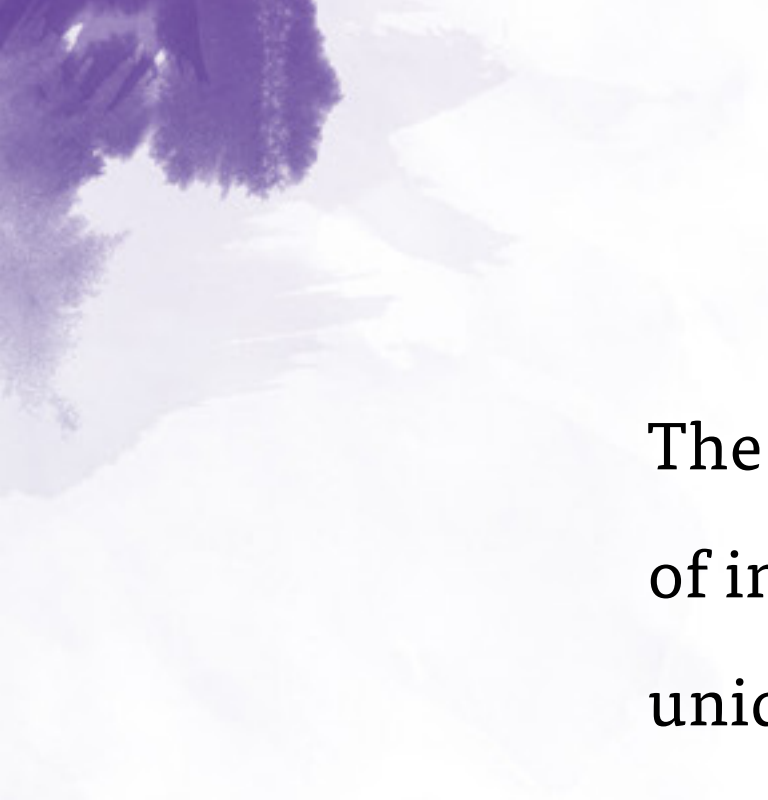
IN RECENT YEARS, A NEW ENERGY TRANSITION HAS TAKEN HOLD AS PUBLIC SENTIMENT, SCIENTIFIC RESEARCH AND GOVERNMENT POLICY HAVE DRIVEN ELECTRIC UTILITIES TO ADD A NEW ELEMENT TO THEIR MANDATE: **SUSTAINABILITY**.

But deregulation was never completed in many parts of the nation. Facing rising prices and with the California energy crisis looming large in the early 2000s, a number of states halted deregulation efforts, leaving the nation with a wide variety of market structures and utility business models. Today, the vertically-integrated model

persists largely in the southern, central and northwestern regions of the U.S., while 23 states and the District of Columbia have enacted some form of competition in generation, energy retailing — or both.

In recent years, a new energy transition has taken hold as public sentiment, scientific research and government policy have driven electric utilities to add a third element to their mandate: sustainability.

As awareness of climate change rose in the early 2000s, a number of states instituted policies to limit carbon emissions from the power sector. After his election in 2008, President Obama's Environmental Protection Agency pushed the industry further by issuing new regulations on carbon, mercury and other pollutants that would push some of the oldest and least efficient fossil fuel power plants offline. Meanwhile, consumers seeking to reduce their environmental footprint, save on power bills and establish energy independence increasingly began to install their own distributed energy resources — most notably, rooftop solar.



The retirement of aging baseload generators and the influx of intermittent renewable energy onto the grid system present unique challenges for utilities, which are typically accustomed to operating large central-station plants. But as grid operations improve and costs decline for renewables and natural gas, many companies have come to see the transition toward a decarbonized power system as an opportunity: In 2016, 94% of utility respondents to this survey indicated they saw a compelling reason to invest in renewable energy.

The latest Utility Dive survey shows that those themes of power sector transformation are still largely in play: Utilities overwhelmingly expect to source more power from low-carbon generation and retire baseload plants, while preparing for rapid growth of emerging distributed technologies like rooftop solar and energy storage.

But the election of President Donald Trump has thrown into question the policy and market trends that have guided utility investments for a decade. While concrete policy plans have yet

to materialize, Trump has pledged to revive the coal industry, increase domestic production of fossil fuels and scale back federal emissions regulations.

In an industry that values predictability in both its policies and markets, the expectation of major changes at the federal policy-making level has significantly increased feelings of uncertainty within the sector. Respondents to this year's State of the Electric Utility survey named regulatory and market uncertainty as the most pressing challenge for their generation mixes, for example.

But despite the uncertainty, the industry remains in near-consensus that utilities are moving to a cleaner and more distributed grid — and that state and federal officials have an important role to play in facilitating that transition. Nearly all agree that realizing that future requires significant changes to the traditional utility business model that was set up a century ago.

Primary Takeaways

- Physical and cyber grid security, distributed energy policy, rate design reform, aging grid infrastructure, and reliable integration of renewable and distributed energy resources are the top five issues of immediate importance to utilities in 2017.
- Utilities are most confident in the growth of utility-scale solar, distributed energy resources, wind energy, and natural gas generation over the next 10 years. They expect coal power to decline significantly, while nuclear generation will stagnate or retire, depending on the region.
- Among distributed energy resources, utilities were most bullish about the growth of rooftop solar in their service areas, followed by demand-side management and behind-the-meter storage.

MOST UTILITY EXECUTIVES DO NOT EXPECT THE ELECTION OF DONALD TRUMP TO CHANGE THE OUTLOOK FOR GENERATION RESOURCES WITH ONE EXCEPTION — **COAL.**

- Most utility executives do not expect the election of Donald Trump to change the outlook for generation resources in their service areas. The lone exception was coal — nearly half of respondents indicated they now have a “more positive outlook” on the future of coal after the election. Still, few expect to deploy more coal capacity at their own utilities.
- Uncertainty over future energy policies and market conditions is considered by utilities to be the most significant challenge associated with the changing power mix, followed by minimizing customer costs and reliable integration of new generation technologies.
- Few utility executives indicated a desire to preserve traditional cost-of-service utility regulation as is; instead, the industry overwhelmingly indicated they would like at least some performance-based regulation.
- Utility executives largely want the federal government to pursue a policy of decarbonization, with a carbon tax emerging as the most popular policy mechanism.
- Fixed cost recovery is the utility industry’s greatest concern with state regulatory models, followed by justifying emerging investments and managing distributed resources.
- Time-of-use rates and fixed charge increases are the industry’s most popular rate design solutions to recover fixed costs and compensate for the growth of distributed energy resources.
- Utilities overwhelmingly believe they should be allowed to own and rate-base distributed energy resources, despite rules against the practice in most markets.
- Utility executives would primarily like to compensate rooftop solar and other distributed resources at the avoided cost of generation, expressing little support for emerging options like location-based rates.

Demographics

ORGANIZATION TYPE

In the United States, electric utilities typically fall into one of four organization types.

Investor-owned utilities are public, for-profit companies regulated by state utility commissions. Under traditional cost-of-service regulatory models, they are awarded the right to earn a rate of return for investments made on the bulk power system, enabling them to deliver value to shareholders.

Not all utilities are private companies: Electric cooperatives, common in rural areas, are owned by ratepayers and typically overseen by an elected board of governors. Municipal utilities are owned and overseen by local governments, while federal power agencies like the Tennessee Valley Authority and Bonneville

What type of utility employs you?



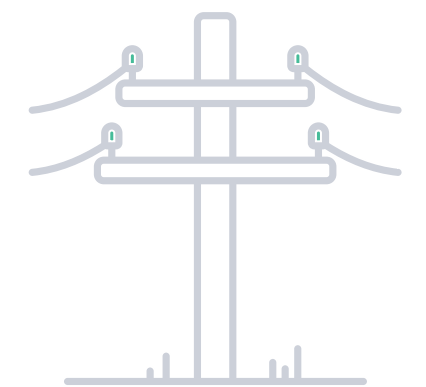
54%

Investor-owned
utility



32%

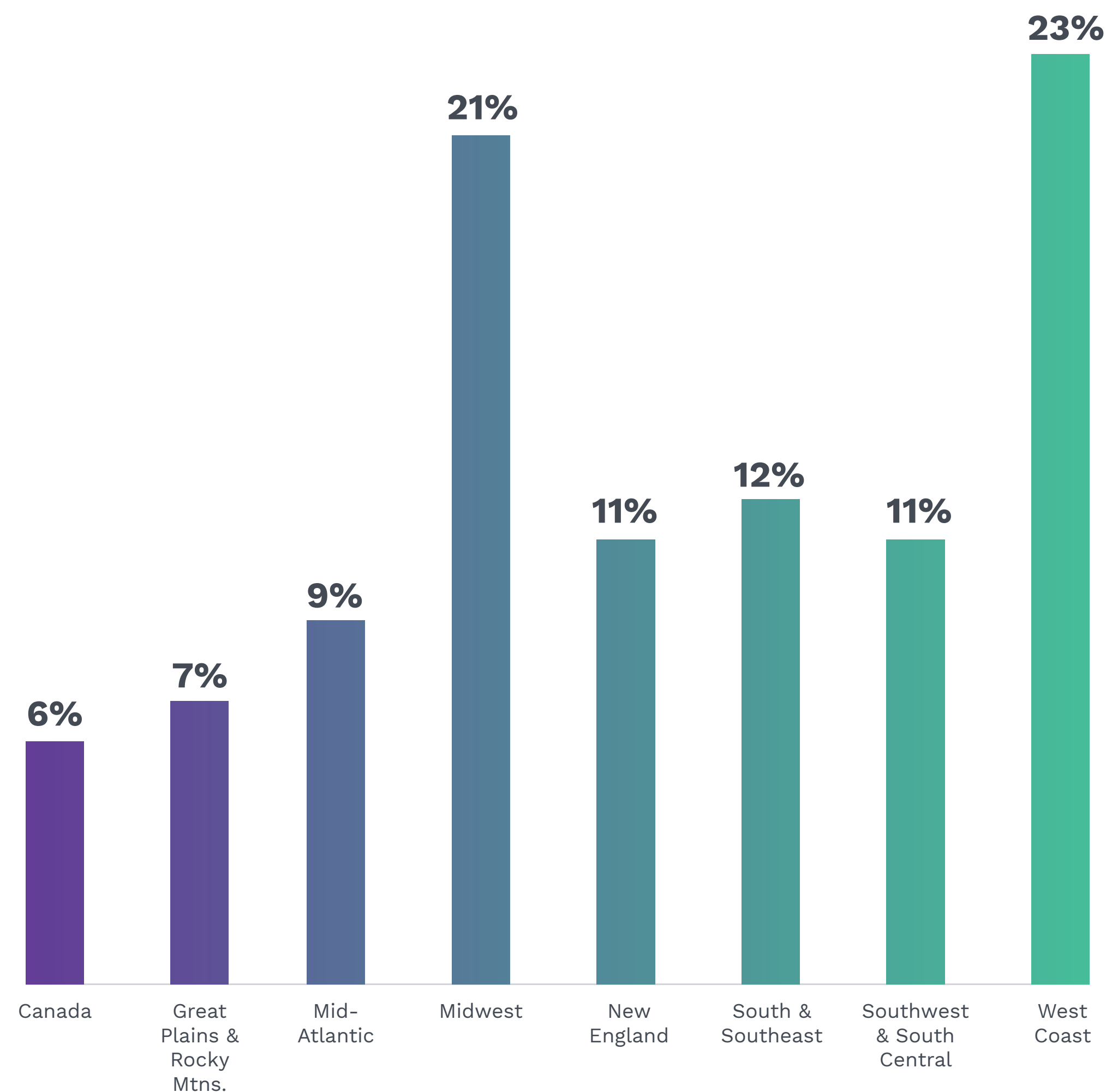
Municipal or public
power utility



14%

Electric
cooperative

In which regions does your company operate?



Power Administration are governed by federal statutes. For simplicity, municipal utilities and federal power agencies were grouped together in this survey.

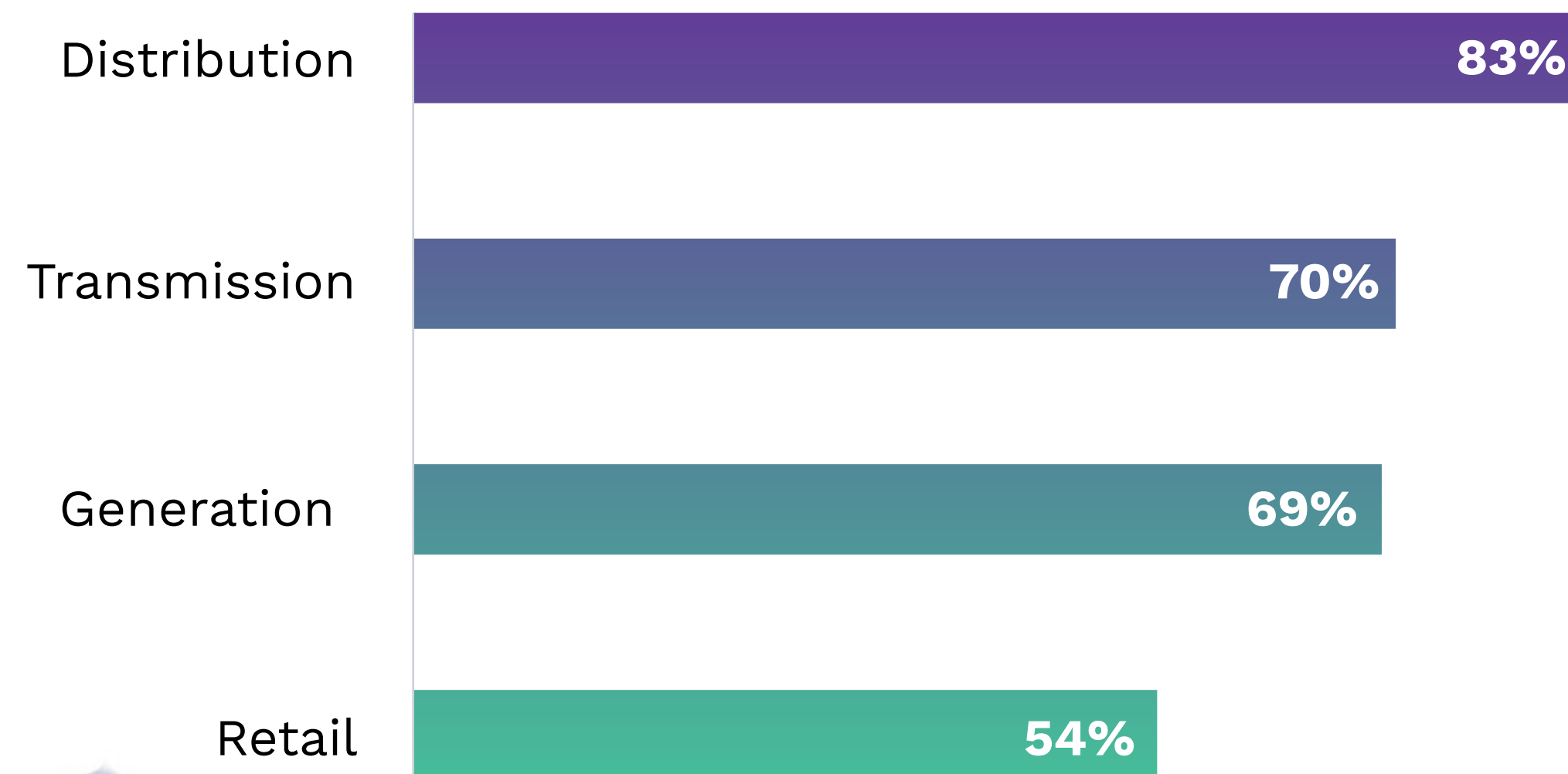
While the number of investor-owned utilities in the U.S. is small compared to cooperative and municipal utilities, they serve more than two-thirds of the population.

SERVICE TERRITORY

Just as electrical load follows population growth, power sector jobs typically track population statistics in the United States.

Respondents to the 2017 survey largely reflect this reality, with respondents hailing from every region of the United States, as well as Canada. The West Coast (including Hawaii) and Midwest saw particularly high response rates, reflecting the relative territory size and large populations of both regions.

Which services does your regulated utility, co-op or muni provide?



REGULATED UTILITY BUSINESS MODEL

Before electric sector restructuring in the 1990s, most electric utilities were vertically-integrated, meaning they owned the power system from the generation plants to the transmission and distribution lines all the way to the meter on the customer's building.

Beginning in 1995, about half of U.S. states deregulated parts of their electricity systems, separating generation from transmission and distribution and, in some cases, electricity retailing.

Today, the vertically-integrated model persists in the southern, northwestern and central parts of the nation, while the northeast, Texas and the West Coast largely have deregulated parts of their power sectors.

Responses to the 2017 survey indicate a diversity of utility business models and jurisdictions. While nearly all said they operate the distribution system, nearly 30% indicated they did not operate transmission or generation, respectively, and nearly half did not offer energy retailing.

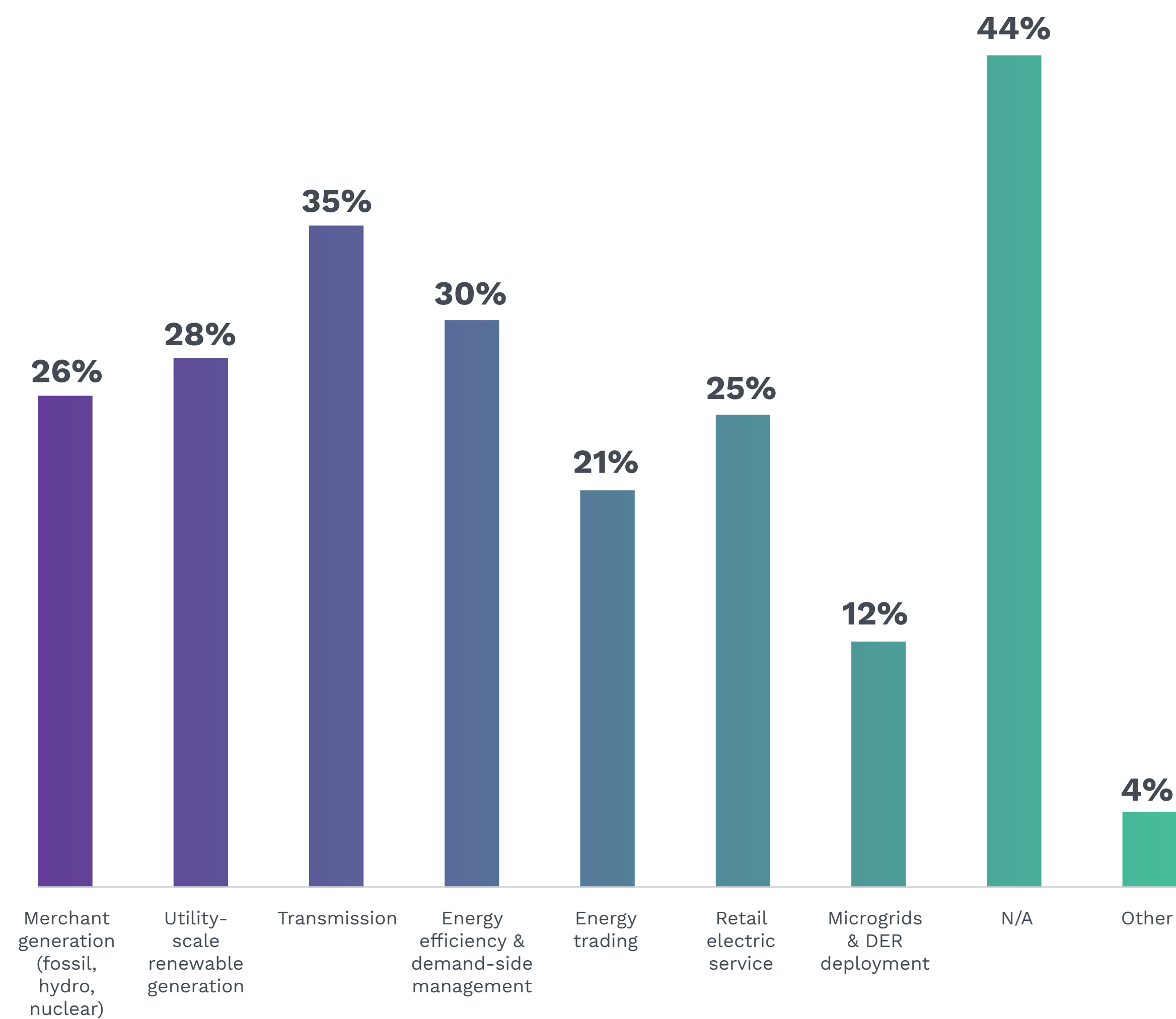
PARENT COMPANY BUSINESS MODEL

In states with deregulated electricity markets, regulated investor-owned utilities are often owned by parent companies that offer unregulated services, such as generation, retailing, transmission building and more.

The concept is less applicable to municipal and cooperative utilities, which are typically owned by the communities they serve. However, cooperatives that operate only the distribution system are often members of larger generation and transmission cooperatives that supply them power.

In the 2017 survey, nearly half of respondents indicated they do not have a parent company. For those that did, their parent companies most commonly offered transmission, efficiency and generation services.

If your utility has a parent company, which services does it provide?




CUSTOMER BASE


Electric utilities vary in size across the nation, from large investor-owned utilities serving over 10 million customers to rural co-operatives with just a few thousand ratepayers.

Electric utility respondents in 2017 represented companies of varying sizes. Investor-owned utilities were much more likely to be large, with two-thirds of those respondents indicating they serve a million customers or more. By contrast, more than 60% of executives at co-ops said they serve fewer than 100,000 customers. Municipal utility responses reflected larger customer bases, though more than half said they serve fewer than 500,000 customers.

How many customers does your electric utility serve?

19% 
Fewer than 100,000

18% 
100,000 - 500,000

15% 
500,000 - 1 million

26% 
1 - 4 million

22% 
4 million +

Utility Transformation

MOST IMPORTANT ISSUES FACING UTILITIES

Electrical utilities are incumbent players in a century-old industry dealing with disruption driven by new technologies, regulations and market realities.

According to our survey, the top five issues facing utilities in 2017 are physical and cyber security, distributed energy policy, rate design reform, aging grid infrastructure, and reliable integration of renewables and DERs. State regulatory model reform, the aging utility workforce, changing consumer preferences, compliance with state power mandates, and stagnant load growth rounded out the top ten responses.



72%

OF UTILITY PROFESSIONALS SAID PHYSICAL AND CYBER SECURITY IS EITHER “IMPORTANT” OR “VERY IMPORTANT” TODAY, **MAKING IT THE MOST PRESSING ISSUE FOR THE SECTOR IN 2017.**

Survey responses this year represent both continuity as well as a gradual shift in priorities. In 2015, respondents listed aging infrastructure, the aging workforce and their current regulatory models as the three most pressing challenges for their utilities, followed by stagnant load growth and federal emissions standards. At the time, physical and cyber security ranked sixth.

In 2016, responses followed a similar pattern: Utilities ranked the aging workforce, existing regulatory model and aging infrastructure as their top three concerns, followed by renewables integration and stagnant load growth. Physical and cyber security again ranked sixth.

Concern about those same issues persisted in 2017, but a large number of respondents indicated they are not as pressing as the issues of grid security, DER policy and rate design.

The increased focus on grid security can be attributed to federal efforts to coordinate utility cybersecurity initiatives, as well as a number of recent news about cybersecurity. In addition to Russian hacking of the U.S. presidential election and an electric utility in Ukraine in 2016, reports surfaced in January 2017 that a Vermont utility may have been targeted by Kremlin malware. Though further examination showed the hack was likely not of Russian origin, the incident reflected a

deep unease in the utility industry over the state of its cyber protections.

The emphasis on rate design and DER policy shows that an increasing number of utilities are seeing growth of distributed energy resources in their service areas and are attempting to adapt and build business models around them. DER growth affects both utility operations and revenues, as resources like rooftop solar reduce customer power consumption and necessitate grid upgrades to deal with two-way power flows.

THE GROWING COMPLEXITY OF THE POWER SECTOR AND A RAPID INFLUX OF EMERGING TECHNOLOGIES ARE COMBINING TO CREATE NEW CONCERNS FOR ELECTRIC UTILITIES, WHILE **LONG-STANDING ISSUES REMAIN UNRESOLVED.**

It's important to note that just because some power sector issues fell lower on the priority list in 2017 than in past years does not indicate that utilities are unconcerned about those issues, or that they have been resolved. A majority of respondents indicated that each of the top nine issues ranked in the survey are either "important today" or "very important today."

That suggests the growing complexity of the power sector and a rapid influx of emerging technologies are combining to create new concerns for electric utilities, while long-standing issues remain unresolved.



| Rate the following power sector issues according to immediate importance to your company. | | Not important at all | Potentially important in the future | Somewhat important today | Important today | Very important today |
|---|--|----------------------|-------------------------------------|--------------------------|-----------------|----------------------|
| | Physical and/or cyber grid security | 3% | 7% | 17% | 36% | 36% |
| | Distributed resource policy (net metering, microgrids, rate basing DERs, etc.) | 6% | 9% | 19% | 33% | 32% |
| | Rate design reform | 4% | 11% | 25% | 31% | 29% |
| | Aging grid infrastructure | 4% | 13% | 22% | 34% | 28% |
| | Reliable integration of renewable and distributed resources | 8% | 14% | 23% | 32% | 28% |
| | State regulatory model reform | 7% | 18% | 16% | 27% | 32% |
| | Aging workforce and worker transition to new technologies | 6% | 11% | 25% | 36% | 21% |
| | Changing consumer preferences | 7% | 13% | 22% | 36% | 23% |
| | Compliance with state renewable and clean energy mandates | 11% | 14% | 22% | 26% | 27% |
| | Stagnant/negative load growth | 12% | 17% | 24% | 24% | 23% |
| | Compliance with federal clean air standards | 15% | 14% | 24% | 26% | 22% |
| | Wholesale market reform | 8% | 20% | 32% | 26% | 14% |
| | Generation retirements and/or stranded assets | 14% | 18% | 29% | 22% | 18% |
| | Fuel policy and costs | 10% | 22% | 32% | 25% | 12% |

UTILITY TRANSFORMATION

Key Findings

- Utility respondents ranked physical and cyber security, distributed energy policy, rate design reform, aging grid infrastructure and reliable integration of renewables and DERs as the top five sector priorities.
- Physical and cyber security, DER policy and renewable energy and DER integration were national concerns, with a majority of respondents from every U.S. region (Canada excluded) indicating they are “important” or “very important” today
- Rate design reform and aging infrastructure were also national concerns, listed as “important” or “very important” a majority of respondents in every U.S. region except one.
- Physical and cyber security concern was greatest in the South & Southeast, where 84% indicated it is either “important” or

PHYSICAL AND CYBER SECURITY, DISTRIBUTED ENERGY POLICY, RATE DESIGN REFORM, AGING GRID INFRASTRUCTURE AND RELIABLE INTEGRATION OF RENEWABLES AND DERS HAVE EMERGED AS **THE TOP FIVE UTILITY SECTOR PRIORITIES IN 2017.**

“very important,” followed by the Southwest & South Central (73%).

- Physical and cyber security was a concern for all utility types, with 75% IOUs indicating it is either “important” or “very important,” followed by munis (72%) and co-ops (64%).
- DER policy concern was greatest among respondents from the West Coast, where 79% indicated it is “important” or “very important,” followed by the Great Plains & Rockies (77%), and New England (77%). Those regions feature states with

DER POLICY CONCERN WAS GREATEST AMONG RESPONDENTS FROM THE WEST COAST, WHERE 79% INDICATED IT IS “IMPORTANT” OR “VERY IMPORTANT.”

both robust DER growth and utility reform dockets to reshape power sector business models for DER deployment.

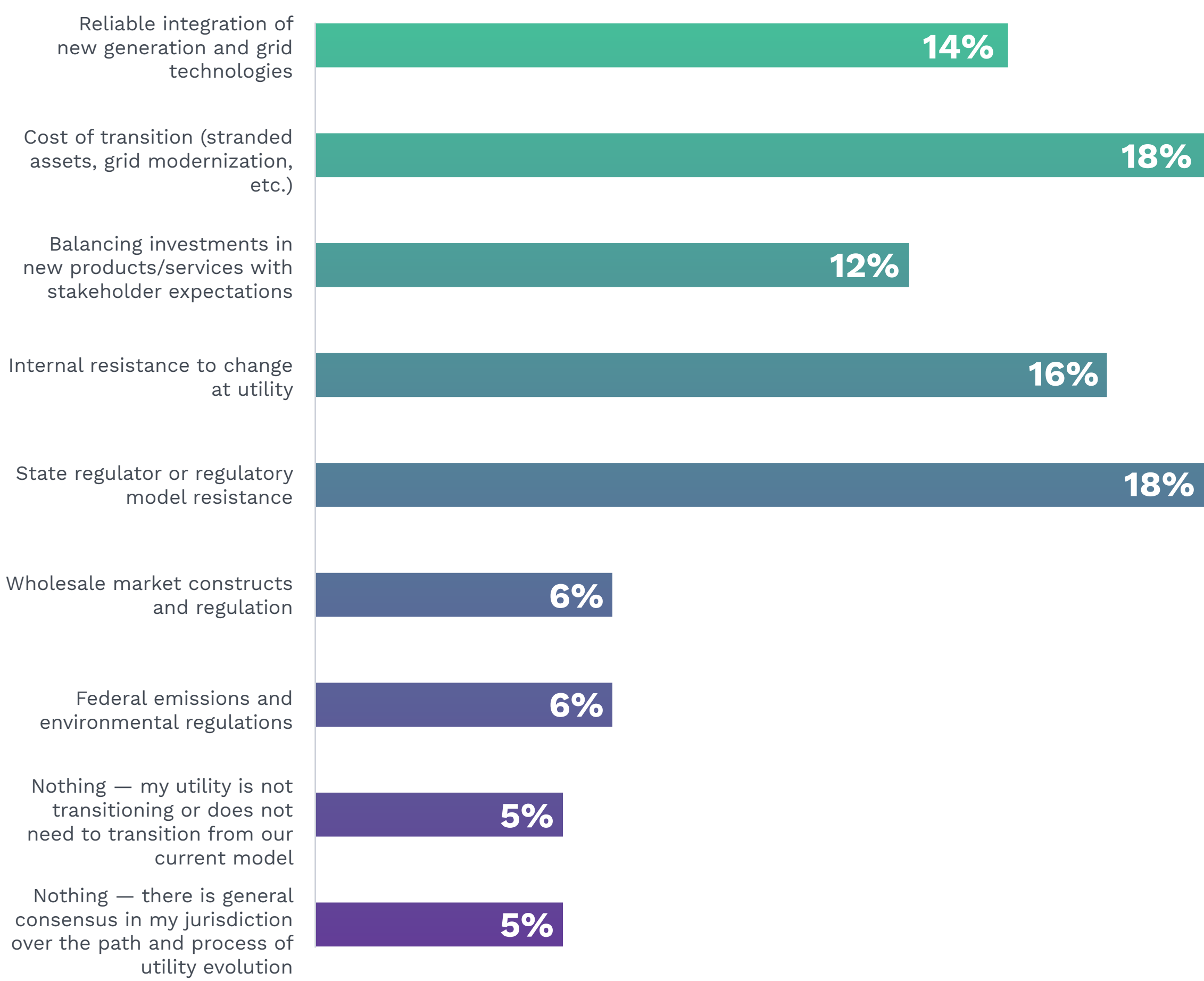
- At least 60% of respondents from all utility types indicated DER policy is either “important” or “very important” today. 71% of co-op respondents chose one of those options, followed by IOUs (67%) and munis (61%), indicating that many cooperatives are seeing DER growth in their service areas.
- Rate design reform was of most concern to the West Coast, where 71% indicated it was “important” or “very important”, followed by those from the Great Plains (66%). Respondents from the Midwest (49%) were the least concerned.
- 63% of IOUs and 61% of munis indicated they consider rate design reform to be “important” or “very important,” compared with 49% of co-ops. Responses imply that co-ops are not as concerned about recovering fixed costs through rate design or the rate impacts of distributed energy.

- Aging infrastructure of most concern to West Coast respondents, 75% of whom listed it as “important” or “very important,” followed by New England respondents (67%). Those from the Southwest and South Central (48%) were the least worried, indicating aging infrastructure is more of a concern in jurisdictions with DER growth and utility reform efforts.

71% OF IOU RESPONDENTS SAID STATE REGULATORY MODEL REFORM IS **“IMPORTANT” OR “VERY IMPORTANT,”** COMPARED WITH 47% OF MUNIS AND 42% OF CO-OPS.

- Renewable energy and DER integration was of most concern to respondents from New England, 72% of whom said it is “important” or “very important,” followed by the West Coast (71%), two regions with high DER and renewables growth.
- 71% of IOU respondents said state regulatory model reform is “important” or “very important,” compared with 47% of munis and 42% of co-ops. IOUs are typically regulated by state utility commissions, while munis and co-ops are overseen by boards elected from their ratepayer-members.
- 40% of IOUs indicated aging grid infrastructure is “very important” today, compared to 27% of munis and 24% of co-ops. Fewer than half of muni respondents said aging infrastructure was “important” or “very important.” Responses indicate that IOUs have more difficulty replacing aging infrastructure under their regulatory commission oversight model than munis or co-ops, which are typically regulated by elected boards.

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



OBSTACLES TO UTILITY TRANSFORMATION

As utilities face disruptive change on a number of fronts, they are seeking to transform their business models in order to adapt to shifting market trends. But while utilities know their current models need to change, it's easier said than done.

Utility executives' attitudes about business model reform have remained relatively constant over the last year. For the second year running, state regulatory models and integration of emerging technologies top the list of obstacles to the evolution of utility business models. Consumer costs and internal resistance to change again rounded out the top four, though respondents were more concerned about the cost of change this year than last.

Utility business model reforms are overseen and facilitated by state regulatory commissions, making it unsurprising that respondents have consistently identified them as an obstacle to change. But sentiment may be shifting somewhat. In 2016, utility regulators were named the biggest impediment to change by a wide margin,

beating out emerging technology integration 35% to 21%. This year, regulators and cost concerns tied for the top spot, each receiving 18% of the vote. (Editor's Note: Three more voting options were provided in the 2017 survey.)

This suggests that utilities are becoming less dissatisfied with state regulators as more states take up reform dockets similar to the REV in New York or California's DER proceedings. It also indicates some of the frustration expressed at regulators in past surveys may be related to new choices offered to respondents in the survey, such as wholesale market constructs or federal environmental regulations, each of which received 6% of the total vote this year.


FOR THE SECOND YEAR RUNNING, **STATE REGULATORY MODELS AND INTEGRATION OF EMERGING TECHNOLOGIES TOP THE LIST OF OBSTACLES** TO THE EVOLUTION OF UTILITY BUSINESS MODELS.

OBSTACLES TO UTILITY TRANSFORMATION

Key Findings

- The top three choices across all respondents — state regulatory model (18%), cost of transition (18%) and integration of new technologies (16%) — were unchanged from 2016, though they tracked closer than in past surveys.
- Respondents from investor-owned utilities were much more likely to choose the state regulatory model (26%) than munis (9%) or co-ops (6%), which are typically regulated by elected boards.
- Balancing investments with stakeholder expectations was the most popular option among co-ops (21%), but was far less popular with munis (9%) and investor-owned utilities (12%).

IOU
RESPONDENTS
WERE **MORE
LIKELY TO CITE
THEIR STATE
REGULATORY
MODEL AS
AN OBSTACLE**
THAN THOSE
FROM MUNIS
OR CO-OPS.

- 
- Internal resistance to change was the most popular option with munis (23%), but was less so with co-ops (16%) or investor-owned utilities (11%).
 - Frustration with state regulators was most prominent in New England, where 27% of respondents chose the option. The option also polled highest of the options in the Mid-Atlantic (21%), Midwest (21%) and Southwest & South Central (22%).
 - Cost concerns were most prominent on the West Coast, where 27% of respondents chose the option. The option also led polling in the South & Southeast (19%).
 - Reliable integration of new technologies polled highest in the Southwest & South Central (20%), but still tracked behind the regulatory model (22%) in that region.
 - Respondents from the Great Plains and Canada were particularly concerned with internal resistance to change, with 29% of them in each region choosing the option. The option did not break 20% or lead responses in any other regions.

Power Generation

Utility executives expressed fewer worries with power mix issues in 2017 than in the past, ranking generation retirements and fuel policies as the least of their concerns this year.

Expectations of President Trump's energy policies may contribute to that notion, as the loosening of environmental regulations could relieve regulatory pressure on existing utility fleets. But while the sector broadly anticipates less strict federal regulation under Trump, utility executives do not expect his election to precipitate significant changes to new capacity added to the U.S. power mix.

Instead, the reduced concern can be attributed to the combination of reduced regulatory pressures on the existing generation fleet

THE LOOSENING OF ENVIRONMENTAL REGULATIONS UNDER TRUMP COULD **RELIEVE REGULATORY PRESSURE ON EXISTING UTILITY FLEETS.**

and an industry that has been on the same trajectory to transform its fuel mix for nearly a decade.

Pushed by state-level policies, federal tax credits and environmental regulations issued by the Obama administration, utilities have steadily added renewable energy capacity to their fuel mixes over the past decade, along with transmission lines and natural gas generation to support the influx of intermittent renewables.

Along with policy initiatives, advances in natural gas drilling at the beginning of the last decade have lowered the costs of gas plants, helping ease the shift away from baseload coal generation. Meanwhile, the steady cost declines of renewable technologies like wind and solar have made them an appealing option to hedge against volatile gas prices.

That context explains why utilities indicated they are moving toward a decarbonized and more distributed grid in each State of the Electric Utility survey for the past three years.

Despite Trump's election, utility executives expect that transition to continue. Renewable energy is now cost-competitive with gas generation and cheaper than coal-fired plants across much of the nation, and utility executives are most confident about the growth of utility-scale solar, distributed energy resources, and wind over the next ten years. Because these resources do not generate around the clock, utilities also expect to add significant gas and storage capacity in the years to come.

DESPITE THE ELECTION OF DONALD TRUMP, OUR 2017 SURVEY REVEALS A SECTOR TRANSITIONING TOWARD A **CLEANER ENERGY FUTURE MORE STEADILY THAN EVER BEFORE.**














POWER MIX OUTLOOK


Utility executives held largely similar attitudes about their generation mixes this year as in past Utility Dive surveys: Renewables, natural gas, distributed generation and storage are all expected to increase across the nation, while coal and fuel oil generation decline. Sentiment on nuclear generation was more pessimistic than in the past, particularly in regions where the plants are struggling to compete in wholesale electricity markets.

Utility executives were most confident about the growth of utility-scale solar and distributed generation in their service areas, followed by distributed and grid-scale storage, wind and natural gas. They were most pessimistic about coal, oil and nuclear.

This stands in stark contrast to the policy aims and rhetoric of President Trump, who has expressed skepticism over the effectiveness of renewable energy and called for a revival of the

How do you think your utility's power mix will change over the next 10 years?

| | | Decrease significantly | Decrease moderately | Stay about the same | Increase moderately | Increase significantly |
|---|----------------------------|------------------------|---------------------|---------------------|---------------------|------------------------|
|  | Utility Scale Solar | 2% | 1% | 16% | 43% | 39% |
|  | Distributed generation | 2% | 2% | 14% | 50% | 33% |
|  | Distributed energy storage | 2% | 1% | 18% | 52% | 27% |
|  | Grid-scale energy storage | 2% | 2% | 18% | 49% | 29% |
|  | Wind | 2% | 3% | 24% | 48% | 23% |
|  | Natural Gas | 2% | 9% | 25% | 42% | 22% |
|  | Hydro | 2% | 4% | 73% | 17% | 4% |
|  | Biofuels | 8% | 6% | 61% | 23% | 3% |
|  | Nuclear | 20% | 18% | 54% | 4% | 4% |
|  | Oil | 35% | 19% | 42% | 3% | 1% |
|  | Coal | 52% | 27% | 18% | 2% | 2% |



domestic coal industry. Despite anticipated changes in federal policy, however, utilities indicate they will continue moving to a cleaner, more distributed energy system.

POWER MIX OUTLOOK

Key Findings

- Utilities were most confident about the growth of utility-scale solar, with at least two-thirds of respondents in each region expecting either moderate or significant growth of the resource. Solar sentiment was strongest in the West Coast, Rocky Mountain and Southwest regions, with more than 80% expecting moderate-to-significant growth, reflecting the abundant solar resource in those areas as well as the declining costs of photovoltaic technology.
- More than two-thirds of respondents in every region expect moderate or significant growth in distributed energy resources over the next 10 years. Respondents from New England were the most confident, with 94% expecting moderate-to-significant growth, followed by the Great Plains & Rockies (89%) and the West Coast (86%). In each region, key states such as California, Massachusetts and Colorado have struck agreements with solar advocates to either preserve retail rate net metering or replace it with a successor tariff.
- More than two-thirds of respondents from each region expect moderate-to-significant growth in distributed storage. Respondents from New England (88%) and the West Coast (84%) were the most bullish — both regions where high electricity prices and clean energy policies make it more appealing for end-users to deploy storage.

- A majority of respondents in every region expect moderate-to-significant growth in grid-scale storage. New England respondents were once again the most bullish, with 88% expecting moderate or significant growth, followed by the West Coast (86%). Both regions include states with ambitious renewable energy goals and carbon regulations, making energy storage an appealing option to integrate intermittent generation.
- A majority of respondents in almost every region expect growth in wind energy, reflecting that the resource is at grid parity with fossil fuels across much of the nation. In the South & Southeast, 58% of respondents expect wind capacity to stay about the same, however, reflecting a low wind resource in the region as well as the absence of aggressive renewable energy goals.
- A majority of respondents in every region except one expect natural gas capacity to moderately or significantly increase. The Midwest (81%) and South & Southeast (79%), two regions

where utilities are increasingly turning to gas as coal plants retire, were the most bullish. Meanwhile, the West Coast (31%) was the least confident in gas, reflecting the region's ambitious renewable energy mandates and climate goals.

- Respondents from the West Coast and New England were most pessimistic about nuclear power, with 44% and 30% of respondents, respectively, indicating it will decrease significantly. In both regions, large nuclear plants are slated for retirement because they are no longer economic in wholesale power markets.
- In no region did more than 10% of respondents indicate an expectation of any coal growth in the fuel mix, reflecting more competitive economics for natural gas and renewable energy across the nation.

IMPACTS OF PRESIDENT TRUMP

Just as utility expectations of their own fuel mixes largely remained consistent with years past, a majority of respondents indicated that the election of President Trump will not have a significant impact on the outlook for most generation resources in their service areas.

In part, the results reflect that many decisions regarding utility power mixes are made at the state level, and Trump is expected to eliminate a number of federal regulations on utilities and devolve more authority to the states. Utilities plan most generation capacity additions or major changes to power procurement many years in advance, meaning that changes in federal policy may not derail many existing long-term plans for clean energy.

Even so, Trump's election marks a change in philosophy from the stricter emissions regulations of the Obama administration, which were expected to be strengthened if Hillary Clinton was elected president. That is reflected in the significant minority of

respondents who indicated the election will positively affect the general outlook for various generation resources, particularly fossil fuels.

TRUMP IS EXPECTED TO ELIMINATE A
NUMBER OF FEDERAL REGULATIONS
ON UTILITIES AND DEVOLVE **MORE**
AUTHORITY TO THE STATES.



In your opinion, how has the election of Donald Trump affected the outlook for various resources at your utility?

| | More negative | About the same | More positive |
|--|---------------|----------------|---------------|
|  Utility Scale Solar | 35% | 57% | 8% |
|  Distributed generation & storage | 22% | 66% | 12% |
|  Grid-scale energy storage | 23% | 64% | 13% |
|  Wind | 32% | 60% | 8% |
|  Natural Gas | 5% | 55% | 41% |
|  Hydro | 11% | 80% | 9% |
|  Biofuels | 18% | 72% | 10% |
|  Nuclear | 6% | 68% | 26% |
|  Oil | 7% | 64% | 29% |
|  Coal | 7% | 45% | 49% |

IMPACTS OF PRESIDENT TRUMP

Key Findings

- A majority of respondents indicated an unchanged outlook for every resource except one — coal, which 48% said now has a more positive outlook. While U.S. utilities are not expected to build new coal plants due to the low cost of natural gas and renewable energy, the expected elimination of federal emissions regulations issued by the Obama administration may allow existing coal fleets to operate longer into the future.

Respondents from the Midwest (68%) and Great Plains (60%)
 - were most confident about a more positive outlook for coal under Trump, while the West Coast (30%) was the least. Many utilities in the central part of the country have existing coal generators that could benefit from diminished federal emissions regulations.
- A more negative outlook was most associated with renewable energy and distributed resources. Respondents from New England and the West Coast were the most pessimistic about Trump's impacts on wind, utility-scale solar, storage and distributed energy, resources prioritized by renewable energy mandates and strong state climate policies in those regions.
- A majority of respondents from each region indicated an unchanged outlook for nuclear, but those from the South & Southeast (42%) were most confident of an improved outlook. The region is the only one with new nuclear generating units slated to come online in the coming years.

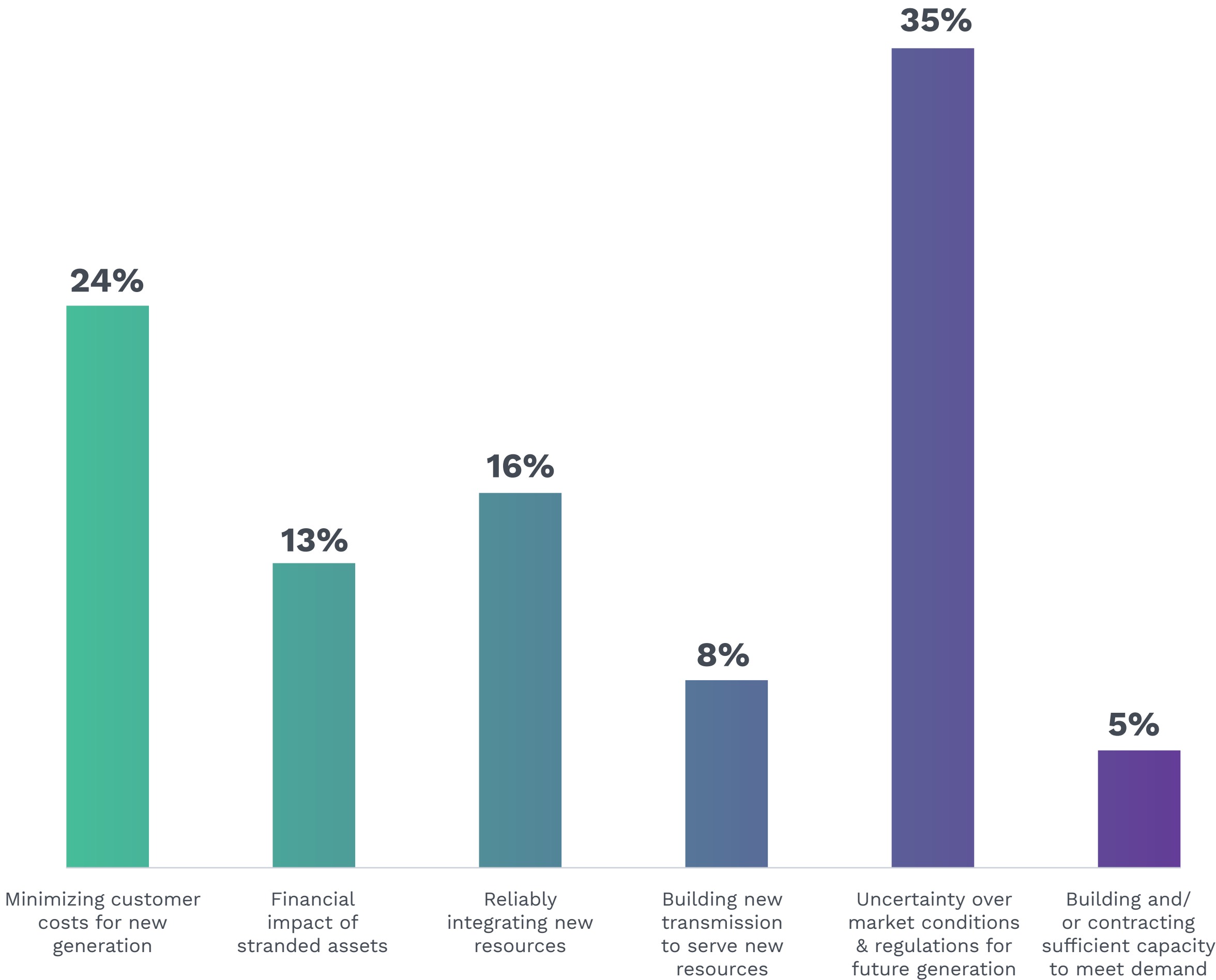
CHALLENGES OF THE CHANGING FUEL MIX

Though U.S. utilities have been planning the transformation of their power mixes for years, the transition to a cleaner grid continues to present a number of challenges.

In recent years, as the Obama administration stepped up emissions standards and gas prices slumped, many utilities have dealt with stranded assets — plants forced offline due to regulatory or market conditions before they are fully depreciated in value. Stranded assets are typically coal and nuclear plants, and can add to ratepayer bills and affect utility borrowing costs.

Utilities don't plan to retire power plants prematurely, but are often pushed into those decisions by previously unforeseen regulations or market forces. That points to the biggest challenge indicated by utility executives in the 2017 survey — regulatory and market uncertainty. Whether it relates to federal emissions rules, state regulatory reforms or ongoing upheaval in wholesale electricity markets, increased uncertainty has become front of mind for utilities considering the future of their power mixes.

What's the single greatest challenge associated with your changing fuel mix?



Utilities were more certain about their ability to adapt to new technologies than in past surveys, however. In 2016, reliable integration of renewable resources was named the most pressing challenge associated with the changing fuel mix, but the percentage of respondents who chose that option was cut in half over the last year. This reflects a growing comfort level with new technologies and resources as utilities adapt to their integration into the system.

IN 2016, **RELIABLE INTEGRATION OF RENEWABLE RESOURCES WAS NAMED THE MOST PRESSING CHALLENGE** ASSOCIATED WITH THE CHANGING FUEL MIX, BUT THE PERCENTAGE OF RESPONDENTS WHO CHOSE THAT OPTION WAS CUT IN HALF OVER THE LAST YEAR.

CHALLENGES OF THE CHANGING FUEL MIX

Key Findings

- More than a third of all respondents (35%) indicated uncertainty over future market conditions and regulations as the most significant challenge associated with their changing power mixes. In 2016, only 14% of utilities selected the option, highlighting that anticipated federal policy changes have increased sector uncertainty.
- 16% of respondents chose reliable integration of new generation technologies as the most significant challenge, indicating a growing confidence in the operation of intermittent wind and solar generation. In 2016, reliable integration was named the most pressing challenge, with 32% of respondents choosing it.
- 24% of respondents chose minimizing customer costs as the greatest challenge, making it the second-most popular option

across all utility types. In 2016, the option was also the second-most popular, garnering 31% of responses, reflecting a persistent concern among respondents.

- Concern about market and regulatory uncertainty was the most popular choice across all utility types, though it tied with customer cost concerns among electric co-op respondents, with both options garnering 31% of responses. Co-ops are typically elected by regulated boards, which may remove some uncertainty from the state regulatory process.

- Regulatory and market uncertainty was the most popular option across all regions, except for the South & Southeast and Great Plains & Rockies. There, the prevalence of vertically-integrated utility regulatory models removes the uncertainty of wholesale power markets.
- Utility respondents across all regions and business models expressed relatively little concern with transmission connections, stranded assets and obtaining or building adequate capacity, reflecting the decade-long push toward cleaner power mixes.



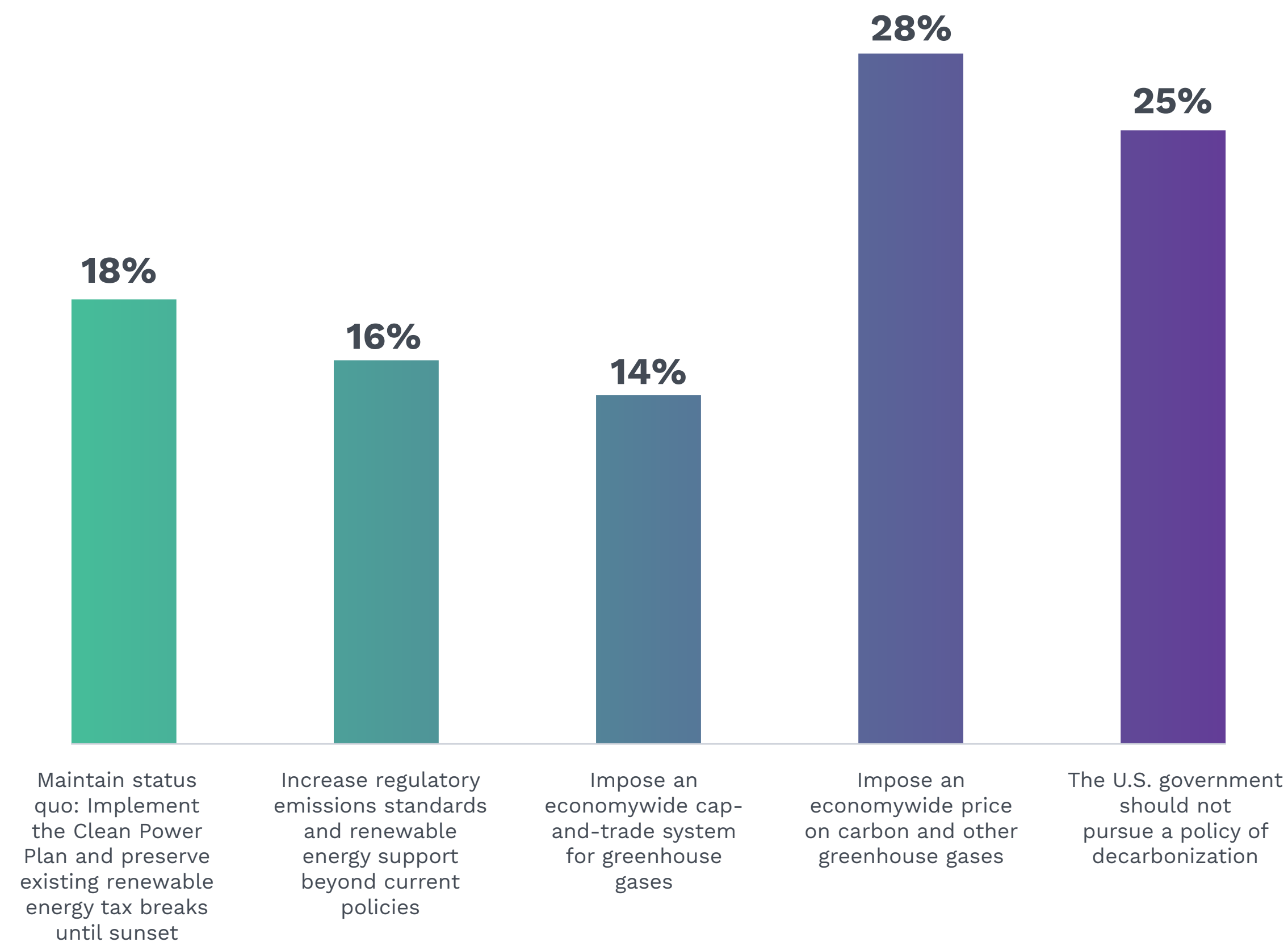
U.S. DECARBONIZATION POLICY

The industry may not be entirely sure precisely how President Trump will shape federal energy and environmental policy, but it's clear many utility executives do not want him to eliminate federal climate policies altogether.

While the EPA regulates a number of power sector emissions, carbon dioxide rules became a high-profile proxy case for the agency's jurisdiction as a number of states and fossil fuel interests challenged the Obama administration's Clean Power Plan, which seeks to limit greenhouse gas emissions from existing power plants.

In this survey, more than three quarters of respondents indicated they want some sort of federal carbon policy, though they split on whether it should be the status quo — the Clean Power Plan, at the time of the survey — an expansion on the CPP, or some other emissions reduction scheme.

In your opinion, how should the U.S. federal government approach decarbonization policy?



The responses reflect a sector largely opposed to Trump’s stated intention of eliminating federal climate policies. For years, the industry has prepared for carbon regulation by investing in a cleaner fuel mix and greater energy efficiency. From these responses, it’s clear that utility executives would rather see that transition continue than deal with the uncertainty inherent in a repeal of the Clean Power Plan and other climate initiatives.

U.S. DECARBONIZATION POLICY

Key Findings

- A quarter of respondents indicated they believe the federal government should not pursue a policy of decarbonization, reflecting a sector that largely believes climate change is a problem and that government and industry have a responsibility to mitigate it.
- A carbon tax was the most popular emissions policy, garnering 27% of responses and reflecting an affinity in the sector for the simplicity and predictability of the policy. It beat out enhancing existing climate policies (19%), maintaining the status quo (18%), and instituting a nationwide cap-and-trade system (13%).
- No decarbonization policy was the most popular option in four politically conservative regions — the Midwest (32%), South & Southeast (39%), Southwest (32%), and Great Plains & Rockies (45%). In every other region, a carbon tax was most popular.
- A carbon tax was most popular among investor-owned (30%) and municipal (27%) utility respondents, but not electric co-operatives (20%). More cooperative respondents (36%), many of whom still have aging coal generation on their systems, indicated they want no federal climate policy at all.

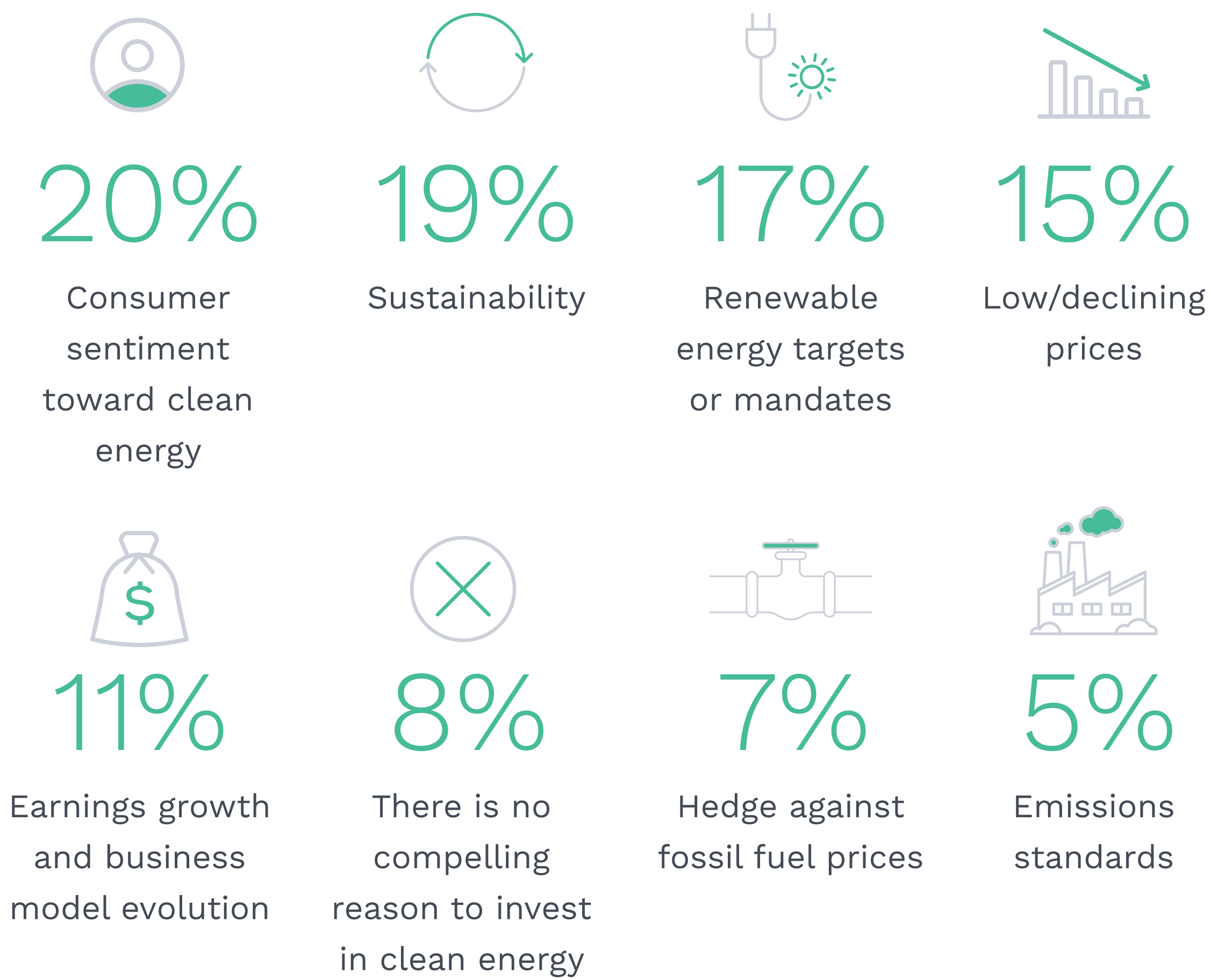
BUSINESS CASES FOR CLEAN ENERGY

Even if some utility professionals — particularly at electric co-operatives — do not want a federal carbon policy, nearly all see compelling reasons to invest in clean energy technologies.

Renewable energy used to be more like window dressing to many utilities — resources they built to satisfy mandates, not meet significant system needs. But over the past decade, as the cost of wind and solar have dropped, utilities have started to see them as opportunities, rather than obligations.

Besides satisfying consumer sentiment for clean energy, these resources offer predictable purchase prices and are valuable hedges against fluctuations in natural gas prices. But while respondents indicated those attributes are valuable, more of them indicated clean energy investments are important simply on the grounds of sustainability.

What is the most compelling reason to invest in clean energy technologies such as renewables and storage?



Fewer than 7% of respondents indicated they see no compelling reason to invest in renewables, storage and other clean technologies, once again coming into contrast with the attitudes of President Trump, who has expressed skepticism about the viability of wind and solar energy.

BUSINESS CASES FOR CLEAN ENERGY

Key Findings

- Consumer sentiment (20%) and sustainability (19%) topped the list of reasons for investing in clean energy for all respondents. Compliance with renewable mandates (17%) and low prices (15%) followed.
- Sustainability was most popular among respondents from the Mid-Atlantic (29%), New England (28%) and the West Coast (22%), all politically liberal regions where environmentalism is prominent.



- Clean energy mandates were of most concern to respondents from the West Coast (27%) and New England (22%), two regions where a number of states have ambitious renewable energy standards.
- Consumer sentiment was the most popular response among Great Plains (33%) and Midwestern (32%) respondents, indicating that while many states in those regions do not have ambitious RPS standards, consumers there clamor for clean energy.
- Sustainability was the most popular response for both investor-owned (18%) and municipal utilities (23%), while 13% of electric cooperative respondents chose it. Many cooperative utilities have service areas in more conservative regions of the country, where environmentalism is less prominent.
- Consumer sentiment was particularly compelling for respondents from electric cooperatives, with 38% choosing it as the top reason for investment. Low prices (23%) followed in popularity for cooperatives, indicating that while those respondents may not be as concerned about environmental impact, they still see strong financial reasons for clean energy investment.
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Distributed Energy Resources & Rate Design

For a century, the basic model of the utility grid remained relatively constant. Electricity was generated at a central station plant and moved through transmission and distribution wires to the customer's home or business.

That model of centralized, one-way power flows buttressed the idea that utilities should be natural monopolies in their service areas, thanks to high fixed costs and steep barriers to entry.

Allowing more than one power provider in a service area would create inefficient redundancies in grid infrastructure, policymakers reasoned, while authorizing regulated monopolies would help achieve economies of scale.

The advent of distributed energy resources (DER) is quickly changing that equation. Since the early 2000s, U.S. consumers have increasingly deployed rooftop solar and other DERs to satisfy environmental concerns, reduce their utility bills, achieve energy independence and ensure reliable access to electricity. Whereas utilities were the only option before, everyday consumers can now choose to generate their own power.

The emergence of DERs popping up on the grid has caused new challenges for utilities: Distributed generation feeds power back into the utility system, meaning utilities must adapt the grid to handle two-way power flows. Distribution circuits designed for one-way flows can get overloaded by solar systems, threatening reliability when they feed back into the grid. While that problem

is urgent only in high-DER territories like California and Hawaii, the resources can have serious impacts on utility revenues at much lower penetrations.

Typically, rooftop solar has been compensated for the power it send back to the grid with retail rate net metering, a mechanism that pays solar owners the same rate for electricity exports as they pay for consumption. However, utilities say solar owners do not pay their fair share for grid upkeep under this scheme, shifting those costs to other ratepayers. For utilities already dealing with stagnant or declining load growth, the revenue losses can be significant.

As distributed resources spread, a growing number of utilities see opportunities in addition to challenges. Utility executives in our 2017 survey expressed confidence in the growth of distributed energy resources in their service areas and overwhelmingly want to invest in those resources themselves.

But just as in years past, utility executives revealed little consensus when considering the business model changes needed to take advantage of the growth of DERs. While a majority indicated their utilities have some level of investment in distributed resources, respondents showed interest in a variety of ownership models for DER deployment.

This year's survey illustrates an industry that recognizes the high potential of DERs to supplement utility revenues and replace traditional grid investments, but is still working through the details with regulators and third party vendors to put that vision into

practice. Of all respondents, those from regions known for DER growth and regulatory initiatives to adapt utility business models to the new resources expressed the most confidence in utility DER investments as well as general outlook for the resources.

AS DISTRIBUTED
RESOURCES SPREAD,
**A GROWING NUMBER
OF UTILITIES SEE
OPPORTUNITIES**
IN ADDITION TO
CHALLENGES.

OUTLOOK FOR DERS





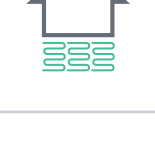
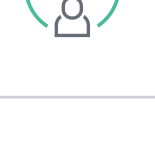
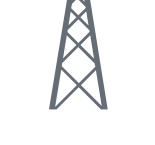
Utility executives from across the nation expressed confidence in the growth of a variety of distributed energy resources in their service areas — particularly in regions where the resources have already started to take hold.

ALL TOLD, A
MAJORITY OF
RESPONDENTS
INDICATED THEY
EXPECT **MODERATE-
TO-SIGNIFICANT
GROWTH IN
NEARLY EVERY
DISTRIBUTED
ENERGY RESOURCE
LISTED.**

All told, a majority of respondents indicated they expect moderate-to-significant growth in nearly every distributed energy resource listed. The exceptions were distributed wind and geothermal energy — minor resources in most service areas — and combined heat & power, a common resource commercial and industrial customers use that most expect will stay constant in the near future.

Grid communication technologies like smart inverters attracted the most confidence, followed by rooftop and other distributed solar resources. Grid communication technologies help increase utilities' visibility and control over distributed resources on their grids, and can be a facilitator for distributed PV and other DERs. Respondents from regions that include regulatory dockets to encourage DER adoption — New England, the Mid-Atlantic and the West Coast, in particular — expressed higher confidence in DER growth than other regions. California opened its first DER-related regulatory docket in 1998 and has led the mainland U.S. in adoption, while regulators in New York are folding many DER reform initiatives into the ongoing Reforming the Energy Vision docket, which seeks to create the nation's first distributed energy markets.

Please indicate your expected outlook for the following distributed resources in your service territory, deployed both by private parties and utilities.

| | | Decrease significantly | Decrease moderately | Stay about the same | Increase moderately | Increase significantly |
|---|---|------------------------|---------------------|---------------------|---------------------|------------------------|
|  | Rooftop & other distributed solar | 2% | 4% | 16% | 51% | 27% |
|  | Behind-the-meter storage | 1% | 3% | 28% | 51% | 19% |
|  | Distributed wind | 2% | 7% | 59% | 27% | 5% |
|  | Demand response & demand-side management | 2% | 3% | 21% | 58% | 17% |
|  | Combined heat & power | 2% | 6% | 56% | 31% | 5% |
|  | Distributed geothermal resources | 2% | 7% | 74% | 15% | 3% |
|  | Community shared renewables | 2% | 3% | 29% | 51% | 15% |
|  | Smart inverters & other grid communication technologies | 2% | 1% | 15% | 49% | 32% |

OUTLOOK FOR DERS

Key Findings

- More than 80% of respondents expect at least moderate growth in grid communication technologies, with 32% indicating growth will be significant. West Coast and New England respondents were the most confident in the technologies' growth — both regions where state regulators have initiated grid modernization proceedings for utilities.
- 78% of respondents expect growth in rooftop solar, with 27% indicating it will be significant. New England respondents were the most bullish, with 58% expecting significant growth, reflecting consumer interest and recent state solar incentive settlements. South and Southwest respondents were least confident, but the majority in each region still expects moderate growth.



66%

OF RESPONDENTS EXPECT **MODERATE-TO-SIGNIFICANT GROWTH** IN COMMUNITY SHARED RENEWABLES.

- 75% of respondents expect to see growth in demand-side management. Respondents from the West Coast, Great Plains & Rockies and New England were most confident, with more than 80% in each region expecting moderate-to-significant growth.
- 70% of respondents expect growth in behind-the-meter storage. New England and the West Coast — two regions with high retail electric prices — again led the way, with about 80% in each region expecting growth. The Midwest and South & Southeast, with lower electricity rates, were the least confident, but a majority still expected moderate-to-significant growth in both regions.
- Two-thirds (66%) of respondents expect moderate-to-significant growth in community shared renewables. Respondents from New England, the Great Plains & Rockies and the West Coast were most confident, reflecting strong policymaker support for shared renewables in states like Massachusetts, Colorado and California.

UTILITY INVESTMENT IN DERS







Expected utility investments in distributed resources largely mirror their expectations for DER growth in their service areas.

Respondents were most confident about plans to deploy more demand-side management, both in pilot projects and in core utility operations. Unlike rooftop solar and distributed energy storage, demand-side management is a long-standing power sector resource, and utilities in most states can recover revenue lost to demand management and energy efficiency programs. That ability removes a key disincentive to utility deployment that persists in most jurisdictions for rooftop solar and other DERS.

For most DERS (excluding distributed wind and CHP), respondents were more likely to indicate an expectation of future investment or a move into DER pilot projects than to indicate the technology has already been deployed in core utility operations. This suggests that most utilities are still learning how to integrate these emerging resources into the grid and build sustainable business models around their growth.

THE SURVEY REVEALS MOST UTILITIES ARE **STILL LEARNING HOW TO INTEGRATE DERS INTO THE GRID** AND BUILD SUSTAINABLE BUSINESS MODELS AROUND THEIR GROWTH.

Please indicate your utility’s level of investment in the following distributed energy technologies either through utility ownership or third party partnerships.

| | No Investment | Expected Investment | Currently deployed in pilot projects | Currently deployed as part of core utility operations |
|---|---------------|---------------------|--------------------------------------|---|
|  Rooftop & other distributed solar | 37% | 17% | 28% | 18% |
|  Behind-the-meter storage | 46% | 27% | 24% | 4% |
|  Distributed wind | 62% | 14% | 9% | 14% |
|  Demand response & demand-side management | 16% | 24% | 19% | 41% |
|  Combined heat & power | 55% | 24% | 10% | 11% |
|  Distributed geothermal resources | 77% | 13% | 6% | 4% |
|  Community shared renewables | 31% | 31% | 23% | 15% |
|  Smart inverters & other grid communication technologies | 23% | 34% | 27% | 16% |



UTILITY INVESTMENT IN DERS

Key Findings

- 60% of respondents indicated some investment in demand response and demand-side management, either in pilot projects or core operations. Respondents from New England and the Mid-Atlantic were the most advanced, with a majority in each region indicating demand management is already deployed in core operations, reflecting the well-developed capacity markets in ISO-NE and PJM that allow demand response participation.
- 43% of respondents said their utilities are already invested in smart inverters and other grid communications technology, with another 34% indicating they expect to invest. New England and the West Coast were the most bullish on the technology, reflecting expected growth in distributed resources that will require communications technologies to control.
- 46% of utilities said they have deployed rooftop solar either in pilots or in core utility operations, and another 17% indicated expected investment. Sentiment for rooftop solar investment was strongest in the Southwest, New England and West Coast, areas with strong solar growth. It was weakest in the Midwest, where 44% indicated no investment.
- Most respondents indicated no investment in distributed geothermal (77%), distributed wind (62%) and CHP (55%). Though CHP is a common power sector resource, it is typically installed independently by end users without utility investment.

COMPENSATION FOR DERS

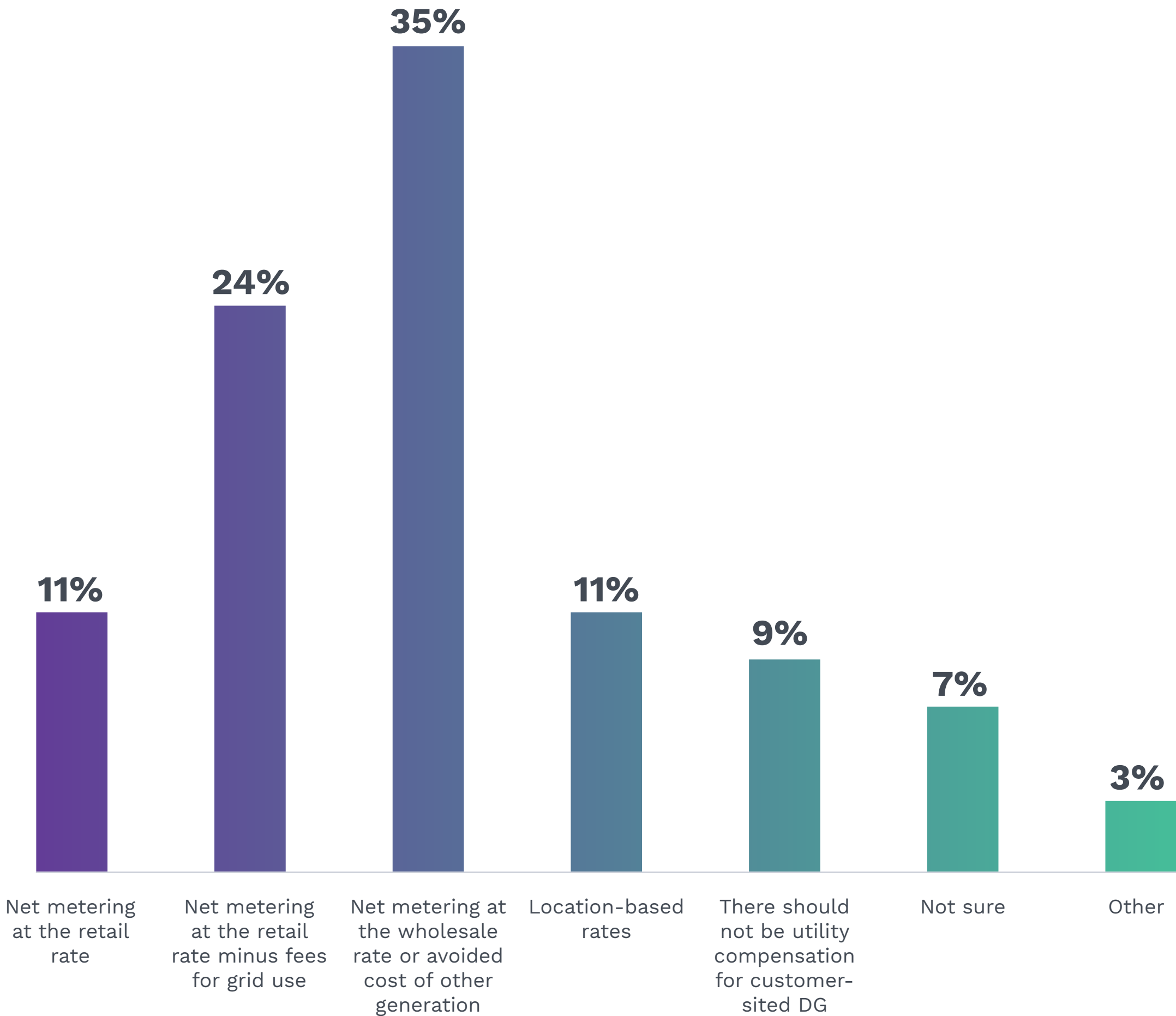
In virtually every jurisdiction to see substantial growth in distributed energy resources — especially rooftop solar — debates about their compensation have quickly followed.

In most of the nation, rooftop solar and other distributed generation is compensated with retail rate net metering, which pays solar customers the retail rate of electricity for any power exported back to the grid.

Utilities say rooftop solar customers under that model do not pay their fair share of grid upkeep and shift those costs onto other consumers. The solar industry, meanwhile, says distributed systems offer benefits to the grid that utilities are unwilling or unable to recognize. The issue has led to contentious debates in key states like Arizona, Nevada and California.

In 2016, many debates over net metering evolved into more complex regulatory dockets aimed at finding the locational and

In your service territory, what is the most appropriate compensation mechanism for distributed generation, particularly rooftop solar?



temporal value of DERs — a complicated proposition no jurisdiction has completely achieved. While models for these Value of Solar tariffs or other net metering successors vary, utility executives prefer a simpler answer.

A plurality of respondents indicated they would simply lower DER compensation to the level of the wholesale power price, or the avoided cost utilities pay for other generation. This position highlights a common utility argument that they should not pay more for distributed generation than they would for power from a central-station solar array or any other power plant. DER vendors counter that this perspective ignores the grid support and investment deferral benefits that DERs can provide.

Notably, utilities expressed little confidence with the idea of location-based rates, supporting even retail rate net metering over the yet-unproven option. Their skepticism reflects the fact that no jurisdiction has yet devised a functional locational rate for DER compensation.

A PLURALITY OF RESPONDENTS INDICATED THEY WOULD SIMPLY **LOWER DER COMPENSATION TO THE LEVEL OF THE WHOLESALE POWER PRICE**, OR THE AVOIDED COST UTILITIES PAY FOR OTHER GENERATION.

COMPENSATION FOR DERS

Key Findings

- 35% of respondents believe net metering at the wholesale or avoided cost rate is the best way to compensate rooftop solar and other DERs. Sentiment was strongest in the Midwest (44%) and West Coast (38%). In every U.S. region, the option garnered at least 30% support.
- A majority of respondents from cooperatives (54%) chose net metering at the wholesale or avoided cost rate as their preferred way to compensate DERs, compared with 33% of municipal and 32% of investor-owned utility respondents.
- 24% of respondents favored retail net metering minus grid usage fees. The option was most popular in the West Coast (31%) and Great Plains & Rockies (29%).

35% OF RESPONDENTS BELIEVE NET METERING AT THE WHOLESALE OR AVOIDED COST RATE IS THE BEST WAY TO COMPENSATE ROOFTOP SOLAR AND OTHER DERS.

- More respondents indicated a preference for retail rate net metering (11%) than location-based DER rates (10%). Location-based rates were most popular in New England (27%) and the Southeast (21%).
- Retail rate net metering was the most popular in the Southeast, with the same percentage of respondents as location-based rates (21%).



ELECTRICITY SALES

The traditional utility revenue model assumed that electricity load would continue to grow indefinitely as the economy expanded, creating new opportunities to rate base infrastructure and collect additional revenue from customers.

But as consumers have become more energy efficient and increasingly are able to serve more of their own load through distributed resources, that assumption may not hold for many utilities.

Companies facing stagnant load growth can see revenue stagnate or even decline, while the need increases to invest in infrastruc-

For each customer segment, which load growth trend do you see in your service area?

| | Declining load | Stagnant load | Increasing load |
|-------------|----------------|---------------|-----------------|
| Industrial | 21% | 52% | 27% |
| Commercial | 13% | 49% | 38% |
| Residential | 24% | 40% | 36% |
| Overall | 19% | 50% | 31% |

ture to replace aging assets and prepare the grid for distributed resources. In the face of those challenges, utilities are pushing regulators to adjust their rate designs to better cover fixed costs as well as open new revenue opportunities for investments, such as leveraging distributed energy resources to substitute for traditional grid infrastructure.

Our survey shows that while most utilities are seeing stagnant or declining load growth in 2017, a significant number are still seeing increasing load across some of their customer classes.

ELECTRICITY SALES

Key Findings

- Utility respondents from the Southwest and South Central (54%) and Great Plains & Rockies (50%) were most confident in load growth, with over half indicating overall load is increasing. This reflects higher economic and population growth relative to other U.S. regions.
- Respondents from the West Coast were the most pessimistic about load growth, with 31% observing an overall decrease. This reflects the high growth of distributed energy resources in that region, as well as the proliferation of community choice aggregation in California.
- In all other regions — the Northeast, Mid-Atlantic, Southeast, and Canada — a majority of respondents indicated their overall electricity load is stagnant.
- Utilities were more confident in the growth of commercial and residential load than industrial load across all regions.





RATE DESIGN REFORMS

Though not the overwhelming factor for most utilities, the growth of distributed resources puts pressure on them to reform their rate structures.

While the majority of utility rate revenues come from variable, volumetric rates, most of their costs for grid upkeep and power delivery are fixed. When faced with stagnant growth in electricity sales, recovering fixed costs becomes more difficult. Any DER proliferation only lowers customer demand for electricity, further exacerbating the issue.

WHILE THE MAJORITY OF UTILITY RATE REVENUES COME FROM VARIABLE, VOLUMETRIC RATES, MOST OF THEIR COSTS FOR GRID UPKEEP AND POWER DELIVERY ARE **FIXED**.

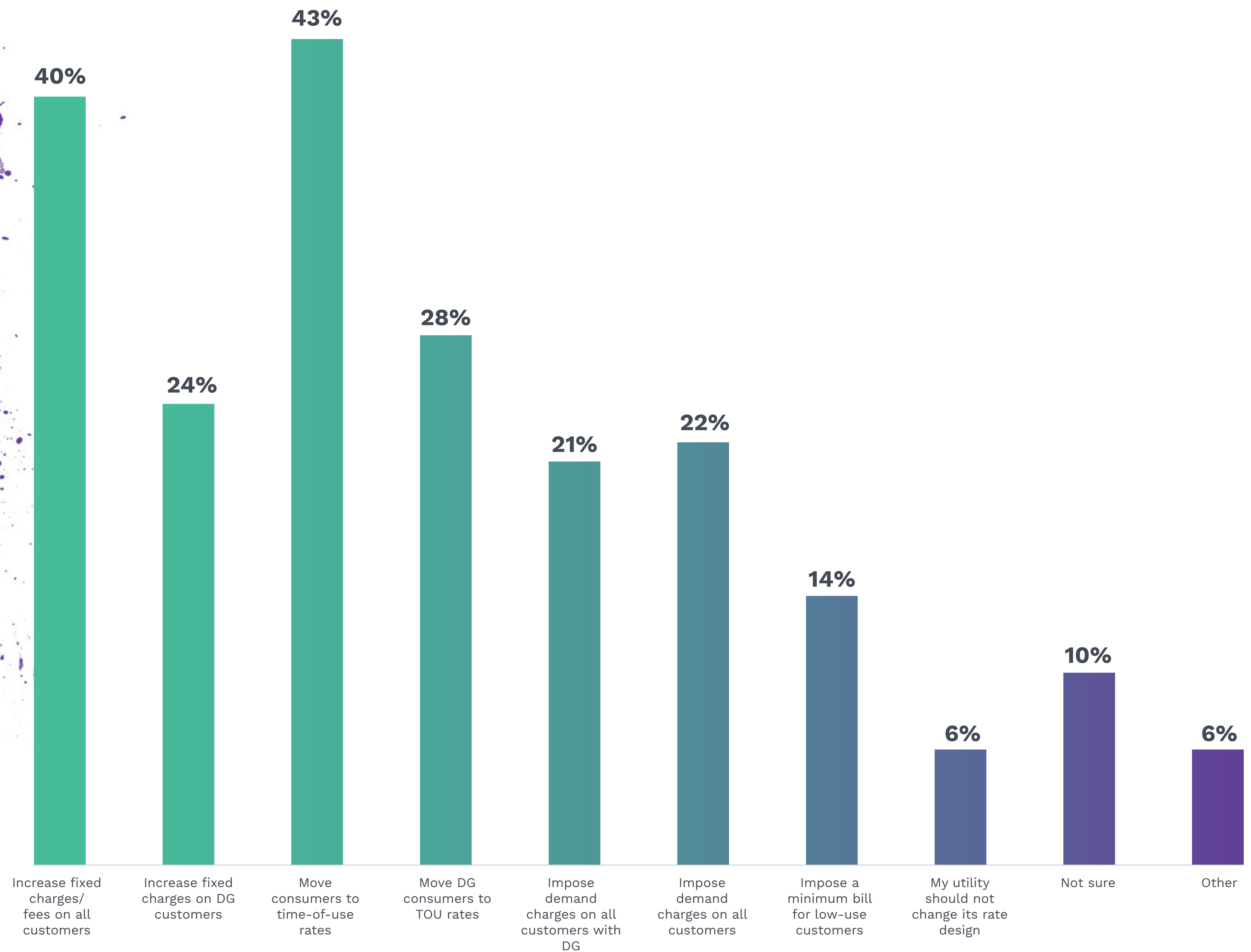
To compensate, utilities in many states have pushed a series of rate structure reforms to allow for better fixed cost recovery, particularly by raising fixed charges or adding new fees for customers. Those charges, however, have proven controversial with consumer advocates who say they limit customer control over power bills. Most often, fixed charge proposals have been scaled back by regulators.

Utilities continue to push fixed charge increases as a solution but have also turned to more targeted methods to reduce peak power demand and recover fixed costs. Residential demand charges — typically common for commercial and industrial customers — charge ratepayers a high per-kWh fee for their highest power demand period over a billing cycle and are similarly controversial with consumer advocates and DER providers.

Time-of-use (TOU) rates, conversely, charge different electricity rates for consumers depending on demand, and are less controver-

In your service area, what is the most appropriate rate design reform to allow utilities to recoup fixed costs, particularly in the face of stagnant/declining load growth and the proliferation of DERs?

(choose all that apply)





sial with stakeholders. A number of utilities have completed TOU rate pilots, and the rate structure could become more commonplace after California makes it the default for customers in 2019.

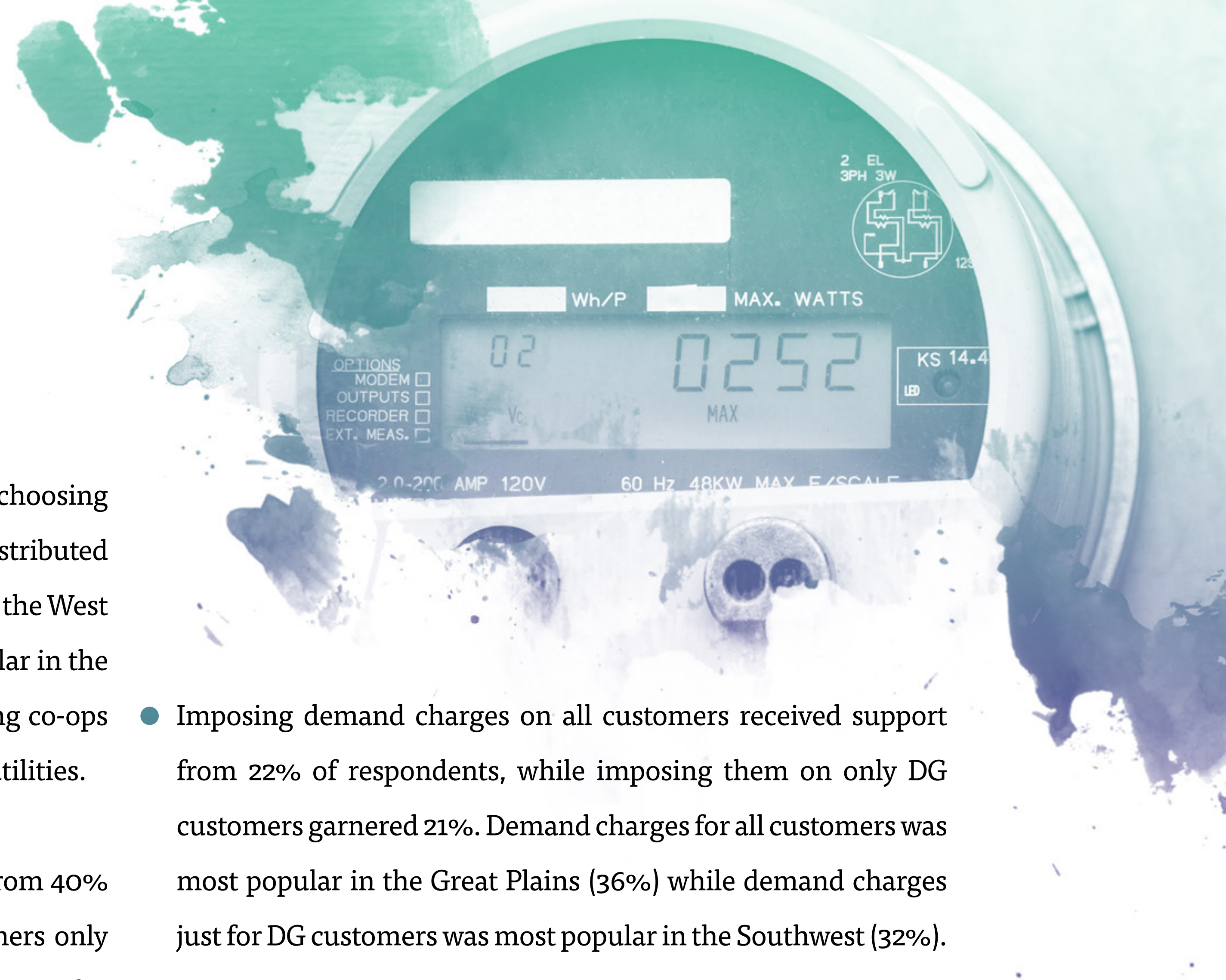
Increasing confidence with TOU rates and their ability to lower customer demand during peak periods is indicated in survey responses, with nearly half choosing the option. Fixed charge increases remain relatively popular, however, attracting nearly a third of respondents. Other rate reforms, including demand charges and minimum bills, lagged further behind.

With each rate reform, utility executives indicated their preference to institute the change on all customers, rather than singling out customers with distributed generation. Many respondents also chose more than one option, indicating that they view a variety of changes may be necessary to adapt their rate structures to changing market realities.

RATE DESIGN REFORMS

Key Findings

- Time-of-use (TOU) rates were most popular, 43% choosing them for all customers and 28% choosing them for distributed generation customers. TOU-for-all was most popular in the West Coast (53%) and New England (52%); it was least popular in the Southwest (27%). TOU-for-all was more popular among co-ops (50%) than municipal (43%) or investor-owned (41%) utilities.
- Fixed charge increases for all customers got support from 40% of respondents, while increasing them for DG customers only received 24%. Fixed charge hikes for all were especially popular in the Great Plains (54%) and Midwest (48%) and least popular in the Mid-Atlantic (30%) and Canada (18%). Co-op respondents were more likely to choose fixed charge hikes for all (61%) than municipal (38%) or investor-owned (35%) utilities.
- Imposing demand charges on all customers received support from 22% of respondents, while imposing them on only DG customers garnered 21%. Demand charges for all customers was most popular in the Great Plains (36%) while demand charges just for DG customers was most popular in the Southwest (32%).
- Co-ops were more likely to want to impose demand charges on all customers (41%) than municipal (19%) or investor-owned (19%) utility respondents. About 20% respondents from each utility type, however, want to impose them just on DG customers.



UTILITY OWNERSHIP OF DERS

Turning distributed energy resources from a challenge to an opportunity has been a goal of the utility sector since DERs first started to grow. But to invest in the resources, utilities must devise new business models, whether it is partnering with vendors or owning the resources outright.

In recent years, debates about utility ownership of DERs have become more widespread as utilities attempt to control the speed and location of DER growth and capture additional revenues from their deployment.

Few utilities have actually dabbled in DER ownership. Arizona has allowed two pilot projects for utility-owned rooftop solar, while Georgia Power won approval from regulators to sell rooftop solar through an unregulated subsidiary in 2015. The New York REV proceeding, meanwhile, aims to prohibit direct utility ownership of DERs, unless the private market proves unable to deliver them.

Should utilities be permitted to own and operate distributed energy resources?



Yes, regulated utilities should be able to own and rate-base DER investments in all or most circumstances



Yes, but only through unregulated subsidiaries



Yes, but only in specific instances where the competitive market fails to equitably deploy DERs to all customers and/or fails to serve optimal grid needs



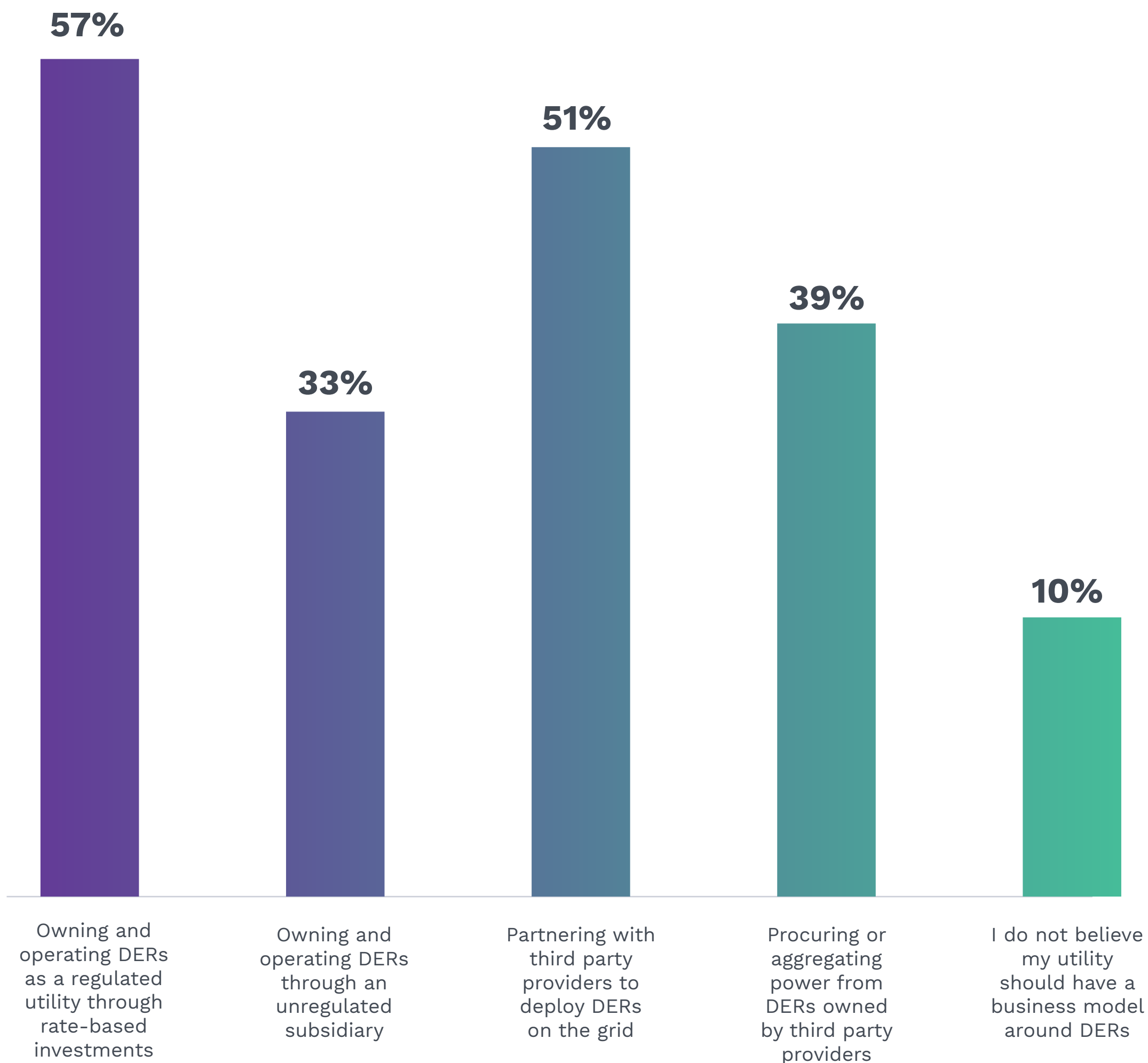
No

UTILITY OWNERSHIP OF DERS

Key Findings

- 95% of respondents believe utilities should be able to own distributed resources, with 71% saying it should be in all or most circumstances.
- Support for broad utility ownership was highest in the Midwest, where 82% said it should be allowed in all or most circumstances. The option also garnered 70% or more support from the West Coast, Mid-Atlantic, Great Plains & Rockies and Southwest.
- Broad utility ownership was least popular in the South & Southeast (57%), New England (61%) and Canada (64%). In the South, rooftop solar has yet to catch on in most states, while most New England states do not allow regulated utilities to own generation assets.
- Allowing utilities to own DERs only when a market need can be demonstrated was most popular in New England, where it got 24% of respondents.
- Ownership through unregulated subsidiaries was most popular among investor-owned utilities (14%) than among municipal utilities (11%) or co-ops (9%). Investor-owned utilities more commonly have unregulated generation businesses than their publicly-owned counterparts.
- Investor-owned utility executives showed less consistent support for broad utility ownership (65%) than respondents from municipal utilities (73%) and co-ops (89%).

How do you believe your utility should build a business model around distributed energy resources?



DER BUSINESS MODELS FOR UTILITIES

If utilities are largely in agreement that they should be able to own DERs, there's less consensus on how they should build business models for them.

For the second year running, many utility respondents chose more than one option when asked about how best to build a utility business model for distributed energy resources. Though more than half indicated they want to be able to rate-base DER investments as a regulated utility, for instance, more than half also indicated they want to partner with third-party providers.

As many utilities are still in the pilot project phase of DER deployment, the diversity of answers indicates that utilities are still testing different models to ascertain which works best. It shows that utilities want flexibility from their regulators to try different models as they integrate DERs into their core operations.



DER BUSINESS MODELS FOR UTILITIES

Key Findings

- 57% of respondents indicated they would like to rate-base DER investments. Sentiment was strongest in the Midwest (66%), Canada (64%) and Great Plains & Rockies (63%), regions where vertically-integrated utilities are accustomed to rate-basing generation. In no region did fewer than half of respondents choose the option.
- 51% of respondents indicated they want to partner with third-party vendors for DER deployment. The option was most popular among West Coast (59%) and Great Plains (59%) respondents, both regions with states where DER vendors are active.

- While fewer than 40% of respondents chose the option to buy power from DERs aggregated by a third party, the option got support from half or more respondents in two regions — West Coast (50%) and New England (52%). Both the California ISO and ISO-NE currently allow aggregated DERs to bid into wholesale markets.
- Though deploying DERs through unregulated subsidiaries was chosen by fewer than a third of respondents, nearly half in New England (49%) picked the option, reflecting the fact that most states in the region do not allow regulated utilities to own generation.
- Investor-owned utilities (41%) were more likely to choose the unregulated subsidiary option than co-ops (25%) or municipal utilities (23%), reflecting that they more commonly have unregulated units in their companies.
- No more than 15% of respondents in any region said their utilities should not have a DER business model, with the Southwest and Midwest regions both hitting that number. Neither region has yet seen DER growth catch on as significantly as it has in other areas of the country.

Who will be the primary aggregators of distributed energy resources in five years?

37%

Third-party
DER providers

28%

Regulated
distribution
utilities

18%

Not sure

15%

Regional grid
operators (ISO, RTO,
regional reliability
corps.)

3%

Some other
governmental
or regulatory
entity

AGGREGATION OF DERS

For most of their history, distributed energy resources have been used as tools for rate arbitrage by consumers — opportunities for individual consumers to lower their bills. They’ve been marketed as such by vendors, too.

But as DERs are adopted more broadly, utilities and vendors are beginning to investigate how they can be used to serve bulk power needs by grouping them together as one resource. DER aggregation already occurs in some wholesale power markets like California, but the practice is still nascent across most of the nation.

While third-party vendors sometimes aggregate the DERs they provide so they can function as a single resource for a utility or grid operator, how the practice will mature remains an open question. Utility respondents have yet to coalesce around a single aggregation model. Third-party aggregation remains the most popular choice, but sizeable portions of the respondent pool believe another entity should be responsible — or simply are not sure.

AGGREGATION OF DERs

Key Findings

- 37% of respondents believe third-party providers should be the primary aggregators. Support was strongest in Canada (45%) and the West Coast (45%), where vendors already aggregate DERs for wholesale market needs.
- 28% of respondents believe regulated distribution utilities should be the primary aggregators of DERs. Sentiment was strongest in Mid-Atlantic (41%) and New England (36%), regions where regulators are pushing utilities to become “distribution system operators” that encourage the creation of DER-enabling platforms.
- The regional grid operator option garnered only 15% of support, but 25% of South and Southeast respondents chose it — even though they do not have an organized market or independent grid operator.
- 18% indicated they were unsure who the primary aggregator should be. Uncertainty was strongest in the Great Plains (25%), Midwest (22%) and Southeast (21%), three regions without robust DER growth to date.





Electricity Markets

For much of the 20th century, electricity was not traded in open markets. Vertically-integrated electric utilities controlled the dispatch of power plants and typically traded power between themselves through bilateral contracts and power pool agreements.

As independent generators spread and states began to deregulate their power markets, FERC promoted the establishment and growth of Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs), organizations that operate the transmission system independently and foster competition among generators in wholesale electricity markets. PJM incor-

porated as the nation's first RTO in 1997 — and the organized market model quickly spread through the Northeast, Midwest, Texas and California into the early 2000s.

Today, two-thirds of electricity demand in the United States is served by these wholesale markets. The vertically-integrated model persists in the Southeast, Southwest and Northwest regions of the country. All told, 23 states and the District of Columbia have deregulated at least parts of their electricity markets.

Since the resolution of the California energy crisis in 2003, organized markets have been relatively stable, facilitating the provision of reliable power and supporting a variety of generation resources. But since the Great Recession and the outset of the shale gas boom, many of the same forces disrupting the utility

SINCE THE GREAT RECESSION AND THE OUTSET OF THE SHALE GAS BOOM, MANY OF THE SAME FORCES DISRUPTING THE UTILITY BUSINESS MODEL ARE **PRESENTING CHALLENGES TO ORGANIZED MARKETS.**



business model are presenting challenges to organized markets. Low natural gas prices, cheap, subsidized renewables and stagnant load growth in many regions have combined to depress energy market prices, driving many baseload generators into unprofitability and putting pressure on the balance sheets of independent power producers.

In response, a number of states have devised “around market” mechanisms to keep baseload plants — particularly zero-carbon nuclear generators — viable. The supports are controversial, with opponents arguing they are discriminatory and threaten price formation in organized markets.

Last year, the Supreme Court weighed in, blocking a Maryland program to guarantee income to a gas generator; meanwhile, FERC blocked a proposal for generation subsidies in Ohio.

Those upheavals and the continued retirement of nuclear generation in wholesale markets have left some analysts concerned that the organized market model may be threatened in some parts of the nation. But utilities, by and large, appear at home with their market models. The only change in outlook for wholesale markets comes from utility executives in certain regions saying they want and expect more deregulation of the power system — not less.

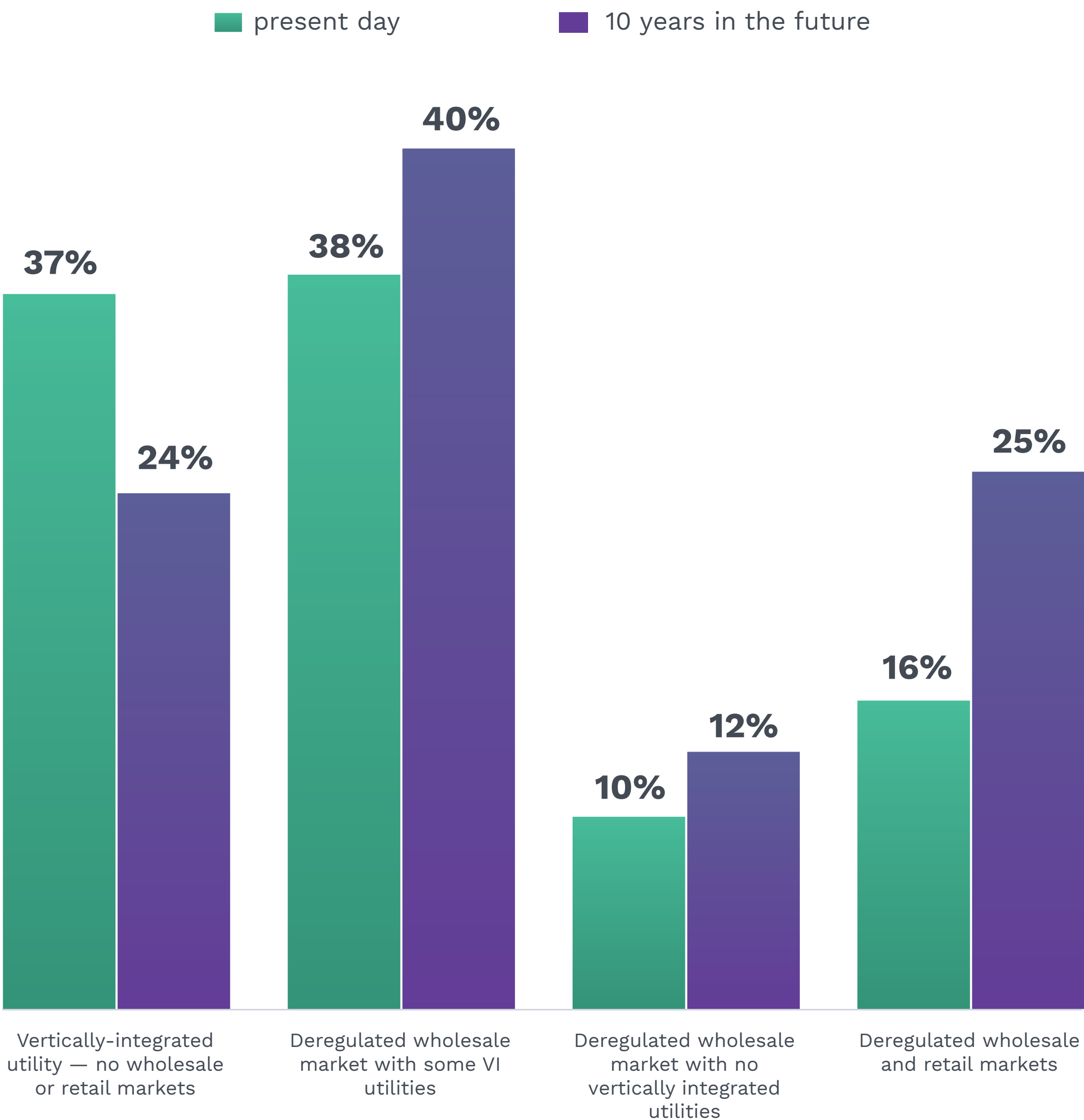
OUTLOOK FOR ELECTRICITY MARKETS

A variety of electricity market models exist in the United States, from fully regulated and vertically integrated markets to completely deregulated wholesale and retail power markets.

Since deregulation began in the late 1990s, a number of states have settled on hybrid models, including mixing deregulated power markets with vertically-integrated utilities and varying levels of retail market choice. Michigan, for example, is a member of the MISO wholesale market, but its utilities still own generation and retail electric choice is limited to 10% of its customer load.

For simplicity, respondents were presented with four organized market models: Vertically integrated utilities (no wholesale power markets); deregulated wholesale markets with vertically-integrated utilities; deregulated wholesale markets without vertically-integrated utilities or retail access; and deregulated wholesale and retail electricity markets.

Which of the following best describes the electricity markets in your service area?



It's safe to say utility executives do not expect major changes in organized market structures over the next decade. Where respondents do expect change, they see vertically-integrated utility models becoming increasingly deregulated and wholesale power markets being implemented for in more utility service areas.

Responses indicate utilities do not see the organized market model as being under imminent threat. While cognizant of problems in wholesale markets, the vast majority of utility executives surveyed expect either the preservation of existing models or further deregulation.

WHERE RESPONDENTS DO EXPECT CHANGE, THEY SEE **VERTICALLY-INTEGRATED UTILITY MODELS BECOMING INCREASINGLY DEREGULATED** AND WHOLESALE POWER MARKETS BEING IMPLEMENTED FOR IN MORE UTILITY SERVICE AREAS.

OUTLOOK FOR ELECTRICITY MARKETS

Key Findings

- While 37% of utility respondents indicated they are vertically-integrated today, only 24% expect to be vertically-integrated in 10 years.
- Respondents anticipate a decline in vertically-integrated models across utility types. Vertically-integrated investor-owned utility responses shrank from 32% to 20%, municipal utility responses came down from 40% to 30%, and co-ops went from 47% to 27%.
- Respondents expect each type of deregulated market construct to grow over the next ten years, with 40% saying they will have deregulated markets with vertically-integrated utilities, and 25% saying they will have both deregulated wholesale and retail markets.
- In no region did a majority of respondents indicate they believe they will be under a vertically-integrated utility model in 10 years. The most optimistic about the future of that model were South and Southeast respondents, with 48% indicating it will still prevail in a decade.

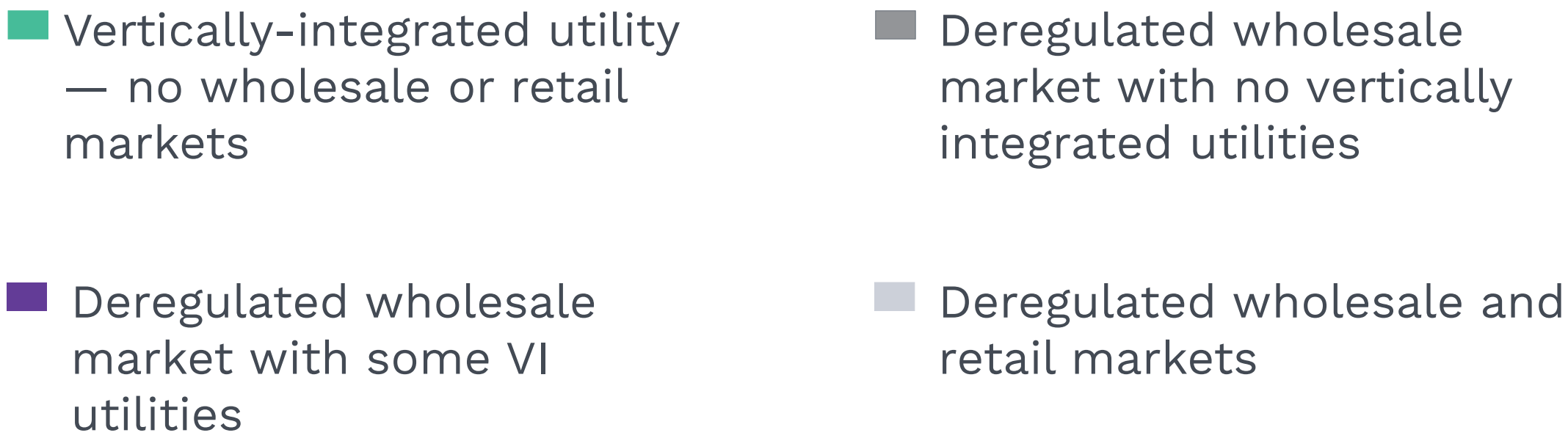
INDUSTRY SENTIMENT ON ELECTRICITY MARKET MODELS

Despite upheavals in the nation’s wholesale markets, utilities did not express a strong desire for changes to their organized market structures. The desired electricity market models for utility respondents tracked closely with their expectations for what those markets would look like in ten years.

The results reflect an industry whose aversion to market uncertainty appears to outweigh any concerns with the organized market model. While many utilities remain concerned about symptoms of organized market disruptions, such as generation retirements or stranded assets, respondents listed regulatory and market uncertainty as their greatest challenges today.

The responses show regulated utilities themselves are less concerned about the future of organized markets than many other stakeholders, such as independent generators and policy analysts. This is likely due in part to the fact that many utilities

In your opinion, what is the most appropriate electricity market construction in the 21st century?



do not own generation that compete in the markets and/or are still in vertically-integrated markets today.

INDUSTRY SENTIMENT ON ELECTRICITY MARKET MODELS

Key Findings

- The hybrid model of wholesale markets with vertically-integrated utilities was the most popular response across all utility types and nearly every region.
- For each response option, the percentage of respondents who indicated a preference for a certain market model differed by no more than four percentage points from the proportion that indicated that same market model was expected in 10 years.
- Response trends tracked existing regional market constructions: Deregulated wholesale and retail markets were most

popular in New England (50%), for example, where the model prevails today.

- Vertically-integrated utility models were most popular in the South and Southeast (32%). It was the only region where the vertically-integrated model was most popular of the given options.
- The hybrid model of wholesale markets with vertically-integrated utilities was most popular in the Great Plains & Rockies (55%), the Southwest and South Central (44%) and West Coast (42%).

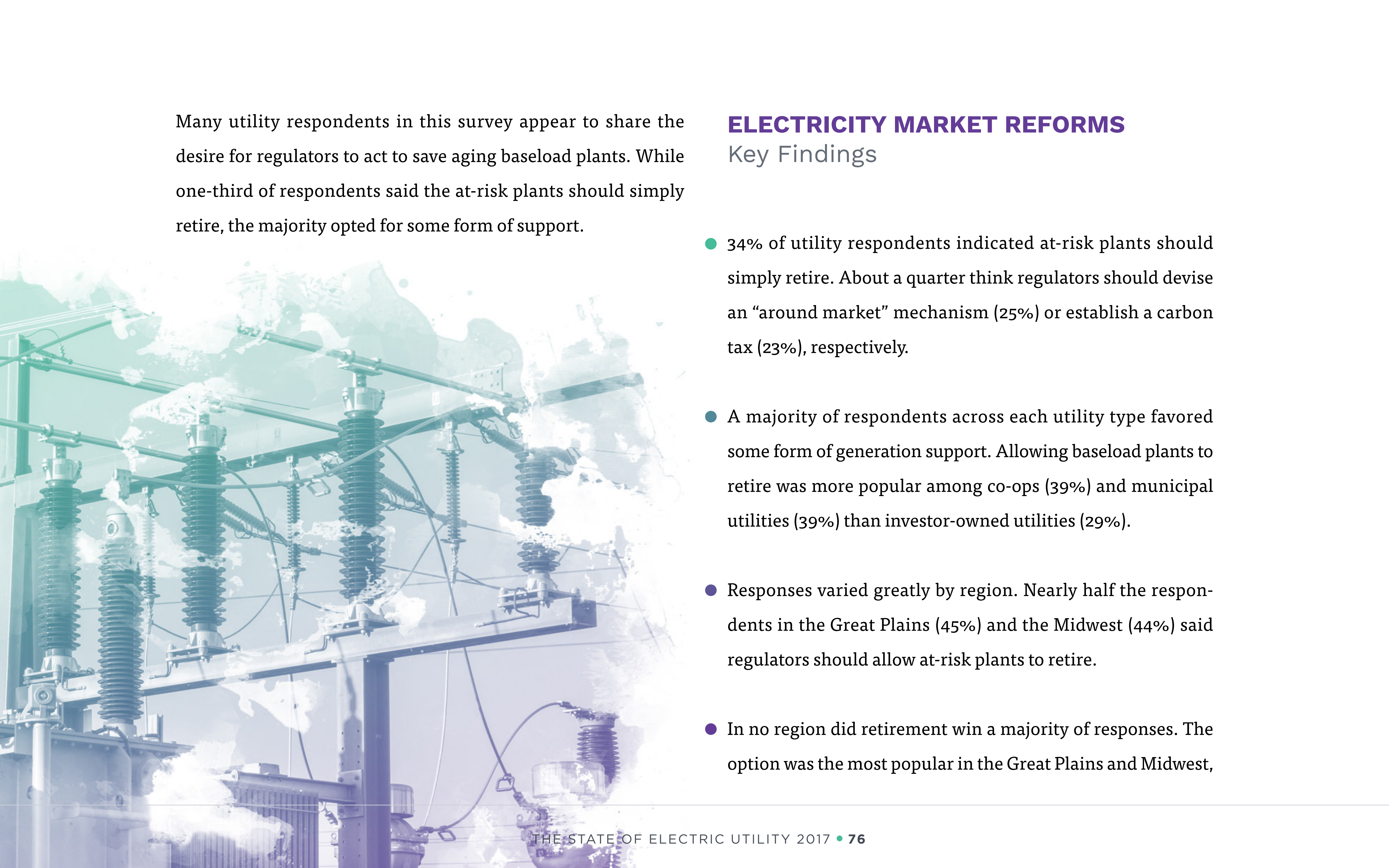


ELECTRICITY MARKET REFORMS

In many of the nation's wholesale electricity markets, stagnant electricity demand growth, low natural gas prices and cheap renewable energy have lowered power prices, squeezing baseload generation and forcing some plants offline.

The baseload plants at risk include a number of aging nuclear facilities, which provide zero-carbon generation around the clock. Policymakers worry that if these plants go offline, the U.S. will not be able to meet its climate goals under the Paris Accord.

The threat to baseload plants has led some states to devise “around market” mechanisms to subsidize the generation, such as zero-emission credit schemes approved in New York and Illinois for nuclear facilities. But the supports are controversial in the power sector, with independent generators arguing the payments infringe on FERC's authority to regulate interstate power markets and unfairly disadvantage other plants.



Many utility respondents in this survey appear to share the desire for regulators to act to save aging baseload plants. While one-third of respondents said the at-risk plants should simply retire, the majority opted for some form of support.

ELECTRICITY MARKET REFORMS

Key Findings

- 34% of utility respondents indicated at-risk plants should simply retire. About a quarter think regulators should devise an “around market” mechanism (25%) or establish a carbon tax (23%), respectively.
- A majority of respondents across each utility type favored some form of generation support. Allowing baseload plants to retire was more popular among co-ops (39%) and municipal utilities (39%) than investor-owned utilities (29%).
- Responses varied greatly by region. Nearly half the respondents in the Great Plains (45%) and the Midwest (44%) said regulators should allow at-risk plants to retire.
- In no region did retirement win a majority of responses. The option was the most popular in the Great Plains and Midwest,

as well as Canada (48%), the Southwest (48%) and West Coast (41%).

- “Around-market” mechanisms were most popular in the South & Southeast (33%) and Mid-Atlantic (30%). Only in Canada (11%) did the option garner fewer than 20% of responses.
- Economy-wide carbon taxes were most popular in New England (35%) and the Mid-Atlantic (34%). Only in the Midwest (14%) and Canada (18%) did the option garner fewer than 20% of responses.
- Re-regulation of utility business models was most popular in the Southeast (23%), the only region where the response broke 20%.

In your opinion, how should federal and state policymakers respond to the retirement of baseload generation (especially nuclear plants) in the nation’s organized markets?

34%

Nothing; allow uneconomic generation to be retired

25%

Devise an around-market mechanism to keep selected plants online (ie, New York’s Zero Emission Standard)

23%

Impose an economy-wide carbon tax to support nuclear and let other baseload plants retire

10%

Re-regulate state utility markets to the vertically-integrated model

9%

Increase capacity payments to generators until they are financially viable



Utility Regulation

The utility industry may prize stability, but if there's one thing respondents want to change in 2017 it's their regulatory models.

Regulatory issues contribute to every challenge faced by the sector. Elements of regulatory reform, such as DER policy and rate design, ranked high on the list of challenges facing utilities, while utilities expressed broad dissatisfaction with their regulatory models in the 2017 survey.

Given the ongoing transformation of the sector, the results are not surprising. Industries experiencing technological disruption — like the growth of DERs and renewables — often see innovation

outpace regulation, leaving policymakers to catch up. That very much appears to be the case in the utility industry today.

The traditional utility revenue model assumes that electricity load will continue to grow indefinitely as the economy expands, creating new opportunities to rate base infrastructure and collect additional revenue from customers. But as consumers become more energy efficient and serve more of their own load through distributed resources, that assumption is not holding true for many utilities.

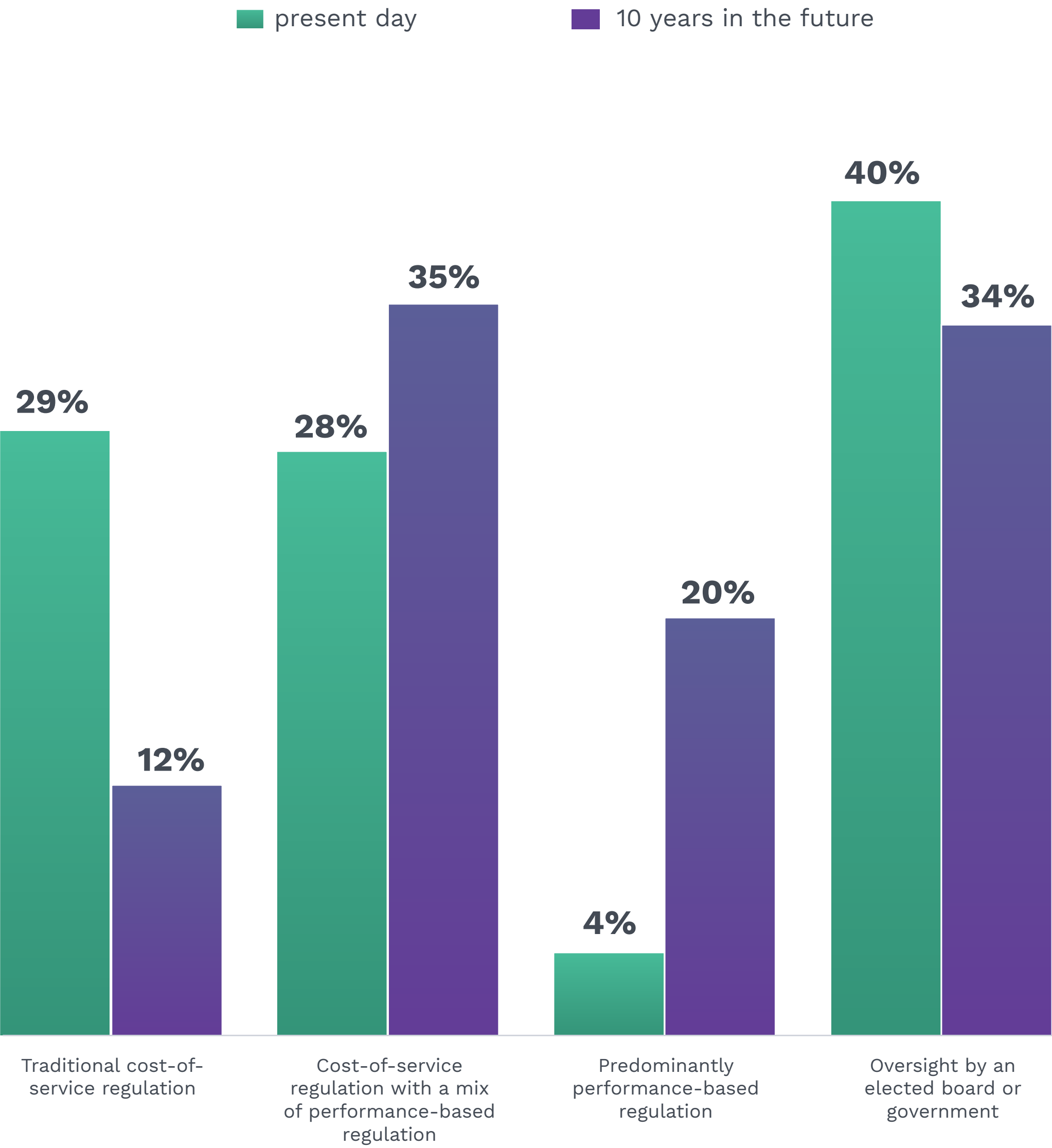
Companies facing stagnant load growth can see revenues slow or even decline, just as the need increases to invest in more infrastructure to replace aging assets and prepare the grid for distributed resources. In the face of those challenges, utilities are pushing regulators to adjust their rate designs to better cover fixed costs and unlock new revenue opportunities for investment, such as using DERs as substitutes for traditional grid infrastructure.

Though most business model reforms are still early in their development, utility executives appear to acknowledge in this survey that regulators are responding to the challenges. More than three-quarters of respondents indicated their state either already has a regulatory docket open to reform the utility business model, or at least that they would like to see one. Many of those dockets — notably, the New York REV and California’s various distributed energy proceedings — aim to institute and enhance performance-based regulatory incentives in addition to the traditional utility cost-of-service revenue model, a move respondents broadly support.

In all, the responses reveal an industry anxious to work with regulators and other stakeholders to reform the way it does business.

IN ALL, THE
RESPONSES
REVEAL AN
INDUSTRY
**ANXIOUS TO WORK
WITH REGULATORS**
AND OTHER
STAKEHOLDERS TO
REFORM THE WAY
IT DOES BUSINESS.

Which of the following best describes your regulatory environment?



OUTLOOK FOR UTILITY REGULATION

If a number of utilities remain dissatisfied with their state regulatory models, the good news is many respondents expect them to change significantly in the coming years.

Most investor-owned utilities today are overseen by traditional cost-of-service regulation, where utilities can earn a regulated rate of return on infrastructure they put on the grid. Increasingly, however, state commissions are integrating performance-based regulation — metrics that reward utilities financially for policy aims outside the traditional cost-of-service model, such as energy efficiency or customer engagement.

In our 2015 survey, 56% of utility respondents indicated they broadly supported performance-based regulation over traditional cost-of-service (44%), and a number of respondents this year expect the sector to move in that direction. Utility executives in the 2017 survey broadly see a move away from traditional cost-of-service regulation across the country, with an increase in performance-based regulation and mixed models.



OUTLOOK FOR UTILITY REGULATION

Key Findings

- Investor-owned utilities broadly expect to move away from cost-of-service regulation, with only 11% choosing it as their expected regulatory model in 10 years. 50% of investor-owned utility respondents expect a mixed model while 27% expect predominantly performance-based rates.
- Across every region, investor-owned utilities expect to integrate more performance-based metrics into ratemaking. In no region did traditional cost-of-service ratemaking lead responses for the expected regulatory model in 10 years.
- Most municipal utilities and co-ops expect to still be regulated by their elected boards, though some co-ops expect to be brought under the jurisdiction of state utility commissions.
- Among investor-owned utilities, the mixed model was the most popular response for expected regulatory model across every region in the U.S. and Canada. Sentiment was especially strong in the Plains & Rockies (62%), Southwest and South Central (60%) and Midwest (60%).
- Among investor-owned utilities, the performance-based regulation response was most popular on the West Coast (35%) and New England (35%), both regions where regulators are actively pushing performance-based regulatory reforms.

INVESTOR-OWNED UTILITIES **BROADLY EXPECT TO MOVE AWAY FROM COST-OF-SERVICE REGULATION**, WITH ONLY 12% CHOOSING IT AS THEIR EXPECTED REGULATORY MODEL IN 10 YEARS.

INDUSTRY SENTIMENT ON UTILITY REGULATORY MODELS

While it may be too soon to declare the traditional cost-of-service model dead, utilities appear ready to write its obituary.

Fewer than one-in-six utility respondents across every region indicated they believe pure cost-of-service regulation is the most appropriate regulatory model in the 21st century, indicating a preference for performance-based ratemaking and mixed models.

This reflects the findings from a more general question asked in the 2015 survey, when 54% of respondents preferred performance-based regulation to 46% who opted for cost-of-service.

The decline in support for cost-of-service regulation may reflect greater acceptance of alternative utility revenue models since the 2015 survey. In that time, regulators in New York and California have both instituted new performance-based metrics for utilities, aiming to incentivize them to deploy DERs and demand

In your opinion, what is the most appropriate utility regulatory model in the 21st century?

42%

Cost-of-service regulation with a mix of performance-based regulation

28%

Predominantly performance-based regulation

17%

Oversight by an elected board or government

8%

Traditional cost-of-service regulation

5%

Other

management technologies. Those proceedings have helped build familiarity and comfort with the concept of performance-based regulation.

But while utilities want to reform cost-of-service, they don't want to throw the old regulatory model out completely — a mixed model was most popular among respondents, accruing 42% of the total vote.

Whether they support mixed models or full-on performance-based regulation, the indication from this year's survey is that utilities both expect and want the integration of more performance-based metrics into their regulatory models across the nation.

50%

OF INVESTOR-OWNED UTILITIES **SUPPORTED MIXED REGULATORY MODELS.**

INDUSTRY SENTIMENT ON UTILITY REGULATORY MODELS

Key Findings

- 50% of investor-owned utilities supported mixed regulatory models, and 33% supported performance-based regulation. Both options were far more popular among IOUs than cost-of-service regulation (8%).
- Municipal utilities and co-ops are split on whether their model of oversight by elected boards is the most appropriate. While board oversight remained most popular for co-op respondents, more municipal utility respondents opted for mixed regulatory models.
- Among investor-owned utilities, mixed regulatory models led responses in every U.S. region and Canada. Only in the Southwest and West Coast did the option not garner a clear majority of investor-owned utility responses, due to the

popularity of performance-based regulation in those regions. In every region, more investor-owned respondents chose performance-based regulation over the traditional cost-of-service.

- Traditional cost-of-service regulation did not receive support from more than 15% of investor-owned utility respondents in any region.

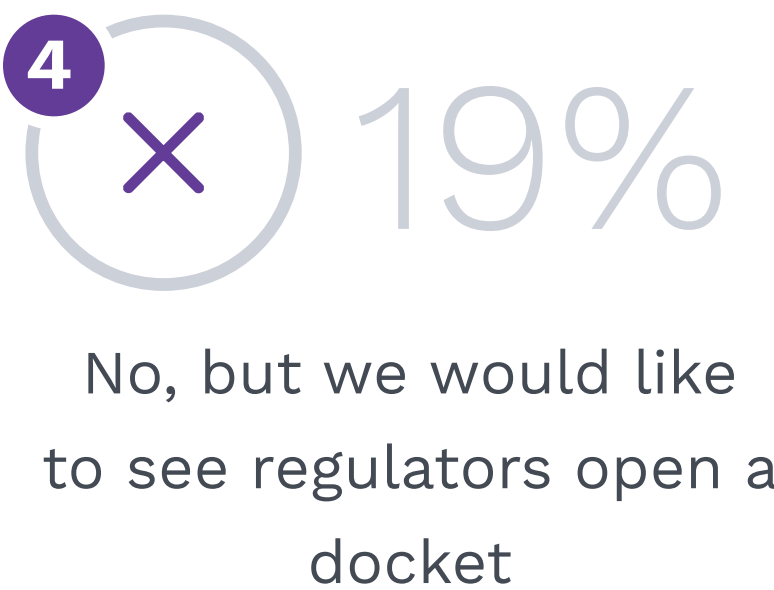
UTILITY BUSINESS MODEL REFORMS

In the face of regulatory model stresses, a number of states have opened regulatory proceedings to reform utility business models to help them adapt to the new realities of the power system.

New York’s Reforming the Energy Vision, which aims to facilitate a shift to transactive energy markets, is undoubtedly the most well-known, but a number of other states have ongoing utility reform efforts or are considering them. California, for instance, opened its first regulatory docket on DERs in 1998, and many of its proceedings cover similar ground.

Utility responses in this survey show that the desire for utility business model reform is spreading. A majority of respondents indicated they either already have a reform docket in their jurisdiction or expect one in the next 2 years.

Are regulators in your state conducting a proceeding to reform utility business models?





UTILITY BUSINESS MODEL REFORMS

Key Findings

- A majority of respondents either have a utility reform docket in their state (32%) or anticipate one in the next two years (26%). A further 18% would like regulators to open such a proceeding.
- Responses varied greatly by region. Nearly two-thirds of New England respondents (62%) indicated they already have a reform docket open, and nearly half (43%) of West Coast respondents said the same thing.
- Fewer than a quarter (22%) indicate they do not have a utility reform docket and do not want one.
- In only two regions did more respondents indicate they do not want a utility reform docket ahead of other options — the South & Southeast (43%) and Great Plains (45%).



REGULATORY MODEL CHALLENGES

The power sector is a century-old industry dealing with the arrival of a host of new technologies, customer preferences and regulations. In that sense, it's unsurprising that the top issues respondents associate with their state regulatory models would be a mix of legacy issues and emerging problems.

Nearly half of respondents identified recovering fixed costs through rate design as one of their top three regulatory issues, reflecting a desire to reform rate designs using time-of-use rates and higher fixed charges, among other reforms. Fixed cost

recovery is a longstanding utility issue, but it has taken on new importance for many utilities as they deal with stagnant load growth and DER proliferation.

The next two most popular options — justifying emerging investments and managing DER growth — are emerging issues that have become more important in recent decades. A significant number of respondents also chose recovering lost revenues as a top concern, a legacy issue that's exacerbated by the proliferation of DERs and demand management programs.

Please identify the top three difficulties associated with your state regulatory model.



REGULATORY MODEL CHALLENGES

Key Findings

- Recovering fixed costs was the most popular concern, chosen by 49% of respondents. Justifying emerging investments (43%) followed, along with managing DERs (41%) and recovering lost revenue (35%). No other option received more than 25% support.
- Fixed cost recovery was the most popular concern across all utility types — investor-owned utilities (51%), municipal utilities (47%) and cooperatives (42%).
- Half of investor-owned utilities (50%) chose justifying emerging investments to regulators as a top concern, higher than municipal utilities (38%) or co-ops (28%), which are typically regulated by elected boards rather than utility commissions.
- Recovering revenue lost to stagnant load growth and energy efficiency appears to be more pressing to co-ops (40%) and municipal utilities (38%) than investor-owned utilities (32%).
- Fixed cost recovery was particularly important for respondents from the Southwest (74%) and Midwest (56%). It was of least concern to the Mid-Atlantic (32%) and New England (34%) respondents.
- Managing DER growth and net metering impacts was of particular concern to respondents from New England (54%) and the Plains & Mountains (51%). It was least important in the Midwest (30%).

FIXED COST RECOVERY WAS PARTICULARLY IMPORTANT FOR RESPONDENTS FROM THE SOUTHWEST **(74%)** AND MIDWEST **(56%)**.

Looking Ahead

Despite the election of Donald Trump to the U.S. presidency, the overall trajectory of the utility industry in 2017 looks remarkably similar to the course noted in previous years: Utilities still overwhelmingly expect to add more renewables and gas, retire baseload generators and reform their business models to suit the new energy economy.

If anything, our 2017 survey shows a sector transitioning toward a cleaner energy future more steadily than ever before, as utilities expressed more confidence in renewable energy integration and increased interest in deploying DERs this year than they did in past surveys.

Those results are unsurprising considering that utilities plan their capital investments in 10-year timeframes or longer. Throughout the

Obama administration, power companies tailored their generation and grid modernization strategies to meet federal and state goals pushing decarbonization. But their outlooks on the future haven't changed much because of a new presidential administration.

Even as Donald Trump's presidency unfolds, utilities appear unlikely to abandon the push toward clean energy. No matter what happens over the next four to eight years, the next president could easily change course, reinstating climate policies to levels at or above the Obama administration's targets. If that happens and utilities have slowed their transition to a low-carbon grid in the meantime, the costs of restarting the transformation and catching back up could be quite steep.

All of that is to say that the future course of the utility sector is contingent on much more than federal energy policy. Economics play a large role, with renewable energy and natural gas expected to remain the most competitive resources for capacity additions throughout the Trump era.

THROUGH THE TRUMP ADMINISTRATION AND BEYOND, PROACTIVE STATES AND THEIR UTILITIES — NOT FEDERAL POLICYMAKERS — WILL BE THE ONES **DRIVING THE TRANSFORMATION AND DECARBONIZATION OF THE POWER SECTOR.**

State policies, meanwhile, have the greatest influence on the sector's trajectory. In the absence of strong federal climate policy, forward-looking states like New York, California, Massachusetts, Hawaii and others are widely expected to take the lead in crafting new policies and regulations to enable the energy transformation. Utilities and their subsidiaries that operate in these states will need to stay on their current course in order to meet these goals.

Beyond decarbonization, states will continue to be the primary venue for other utility sector reforms as well. No matter what happens in Washington, critical issues of utility ratemaking,

grid planning, customer engagement and distributed energy policy will continue to be decided by state utility regulators. As the cost of renewables and DERs continues to fall, the reform of utility rate structures, revenue models and business practices is expected to become more critical.

The upshot? Through the Trump administration and beyond, proactive states and their utilities will play primary roles in shaping power sector transformation and deep decarbonization. If the United States upholds its commitment under the Paris Climate Accord — roughly 80% economy-wide decarbonization by 2050 — utilities will not only need to speed up their own de-

carbonization efforts; they will need to upgrade their systems to assist other sectors of the economy through electrification.

While White House policy is widely expected to do little to advance these goals in the years to come, proactive states could establish new models for future federal efforts to decarbonize and modernize the power sector in the post-Trump era. In 2017 and beyond, the continued evolution of the power sector — and the goal of decarbonization — may well rest with these states and their utilities.