JUNE 2016 • SPECIAL REPORT

PUBLIC UTILITIES FORTNIGHTLY

"In the Public Interest"

Industry Leaders' Perspectives
Survey on Electricity's Future
Discussion About Electricity's Future

State & Future of the Power Industry

IN COLLABORATION WITH

NAVIGANT

PUBLIC UTILITIES FORTNIGHTLY
"In the Public Interest"
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What is the state and future of the electric utility industry? That's a broad topic, much discussed and debated. This special report takes a unique approach to getting a handle on our present and where we're heading.

First, PUF Editor-in-Chief Steve Mitnick conducted off-the-record interviews with sixteen industry leaders, asking them what they think about our path forward over the next five years. Then, PUF surveyed our broad readership with fifteen questions about our path over the next ten years. Finally, Mitnick asked Navigant's leadership about the industry's longer term future, with a timeframe of fifteen years and beyond.

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Email: info@fortnightly.com

Industry Leaders' Perspectives

What they really think about electricity's future

By Steve Mitnick, Editor-in-Chief, Public Utilities Fortnightly

SIXTEEN LEADING THINKERS from utilities (investor-owned and not), the regulatory and consumer advocacy communities, finance, law, academia and associations. PUF's Steve Mitnick asked them three big questions and summarizes their take.

- What is the single most disruptive distributed energy trend for traditional utility business models? How will it change the status quo in the next five years?
- How can utilities most effectively manage the disparate impacts, opportunities and threats caused by utility-scale and distributed renewables?
- How should utilities embrace a digitalized future? How can regulation support these goals?

Steve Mitnick is Editor-in-Chief of *Public Utilities Fortnightly* and author of the book "Lines Down: How We Pay, Use, Value Grid Electricity Amid the Storm."

OFF THE RECORD

LEADERS ACROSS OUR INDUSTRY SPEAK OUT FRANKLY

The ground rules were unusual. We promised the interviews would be totally off-the-record. We promised not to identify any of the prestigious sixteen-member interview panel.

"Say whatever you want, whatever you really feel, in response to my three questions."

The result? Particularly genuine perspectives on electricity's future from sixteen of our industry's greatest leaders and thinkers.

Though the interview panel was uniformly composed of respected figures in our field, they hailed from a broad range of organizations. This made the resulting dialogue fairly representative of our industry's approaches to the future.

Five of the sixteen presently work as officers of utilities, based in four different states. Two others have worked as officers of utilities in the past. One of them is now a lawyer and one is a consultant. Another member of the interview panel hails from the public power sector.

Two of the sixteen presently work with utility regulatory bodies. A third was a commissioner in the past.

One of the sixteen was a consumer advocate. One was a banker. Both are consultants now.

One is an economist and one is an expert on regulation. The last of our panel is a prominent regulatory lawyer.

That makes sixteen.

Geographically, the west was somewhat underrepresented and Midwest overrepresented. But generally we covered the diversity of the states fairly well.

The accompanying article summarizes the ten-plus hours of interviews.

Most Disruptive Trends

What is the single most disruptive distributed energy trend for traditional utility business models? How does it change the status quo in the next five years?

A utility executive from the east said that, with the proliferation of rooftop solar, the impact it will have is the complete upgrade in the robustness of the distribution grid. It will significantly change both its IT, information technologies, and its OT, operational technologies. So that the retail distribution level becomes more like the wholesale transmission level. To this exec, the two levels are converging.

But the upgrade will phase in, in accordance with the pace of rooftop solar development. It will take place on a circuit-by-circuit basis. If five thousand solar roofs are installed, in his service territory, that's manageable with the current infrastructure. But if five thousand grows to fifty thousand, that's totally different.

Energy storage was named as the most disruptive trend by several of the industry leaders.

The approach this exec prefers is wait and see. The upgrade and investment won't be made until the proliferation of solar roofs occurs.

When or if the proliferation occurs. Because, to this exec, the residential solar installers might hit a wall. Net metering isn't fair, he said. The wealthy benefit at the expense of low-income and fixed-income households. Political and regulatory leaders are starting to see this.

An economist for regulators thinks that distributed solar will take off. The growth rate will be high. But that it won't be disruptive within five years, since the present base is low. It'll be moderate, concentrated in a few states.

A recently retired utility executive said, people are getting very excited here in the Midwest about the weather. They haven't seen the sun much in the last forty-five days. Compared to utilities in Arizona or Hawaii, rooftop solar will not be such a big issue unless the cost really changes. In his view, maybe not a lot of change in the next five years.

An executive from the public power sector thinks there's disproportionate attention on rooftop solar. For him, it's more a fad than anything else.

But it's disruptive in rate-setting, creating social, economic and class tensions. We're wrapped around the axle with net metering, he added. The tensions are aggravated by flat demand.

Energy storage was named as the most disruptive trend by several of the interview panel members. An economist from the investor-owned sector said storage is the single most disruptive technology. But not in the next five years.

He added, consumers could actually separate from the grid. If

they've got storage, they're at least a lot less dependent on the grid.

Timing is key when evaluating the disruption from storage. A utility exec said storage is the game changer, but that's when it hits. An attorney said there won't be any disruption from storage or distributed energy generally that will have much of an effect in the next five years.

Some on the interview panel identified disruptions among consumers. A former consumer advocate is concerned that, in her opinion, a lot of solar providers are not all that reputable. Some providers haven't told utilities about installations as they should, with the potential of affecting reliability.

A prominent economist and author believes the greatest disruption may be financial. In the context of the overall utility picture, there will be flat sales if you're lucky. Distributed energy, if very successful, can chip away at utilities, given utilities' fixed costs and heavily indebtedness.

So, in his view, it could be drip, drip, drip. Every drip is important to the financial integrity of utilities at this point. Even within the timeframe of five years.

Another disruption brought up multiple times by the interview panel was on the pricing of electric utility service. A utility strategist said a lot of states don't have cost recovery and rate design that puts a value on the grid. The policy is outdated, in his view, formulated when rooftop solar cost ten times as much as it does today.

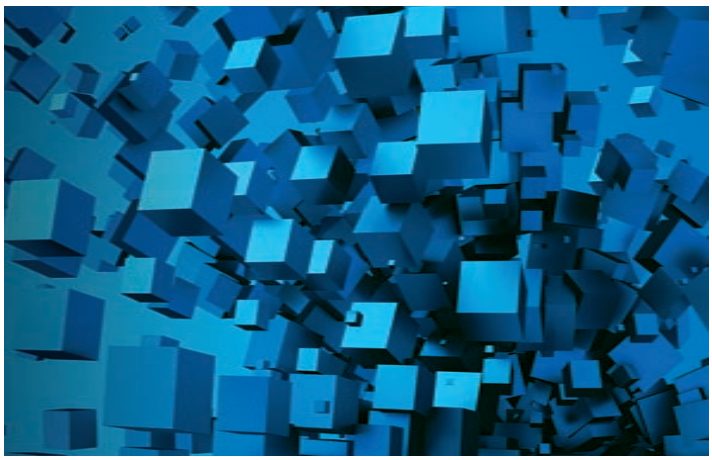
The strategist feels we need a policy where the grid is appropriately priced and valued, based on what the grid brings to the table. The non-participating customers need to be held harmless. And the treatment of distributed energy should be truly commensurate with benefits. He added, why does distributed energy get more credit than energy efficiency?

A former commission chair believes the subsidies are frankly irrational. I don't drink the Kool-Aid. He added, we seem to love solar. But solar isn't growing by leaps and bounds in his part of the country.

Another utility executive also believes the crucial disruptive trend is net metering and pricing for electric service generally. And the related avoidance for the already-invested electrical system.

This exec asked, who pays for the four lanes of the highway that we've already invested in? And what happens if we have to invest in the fifth and sixth lane?

To him, there's an opportunity lost for every megawatt of rooftop solar that is put in. It forces and pushes out investment in the grid. That comes from the inequality in the price signals and economic subsidies, he added.



A lawyer and former utility executive from the east gave as an example the six-cent contracts in New York. There's a regulatory compact. There's movement to opening up to markets, reducing barriers to entry, but the old bargain goes out the window.

Then the regulators say you don't have to pay for those old costs. Like network upgrades and backup power. He's concerned whether the assurances made by advocates for change will all work out.

Still another utility executive agreed that the greatest disruption is how we structure our pricing for electric service, how we fix it. He believes our responsibility is to figure out how to best implement distributed energy. And how to, simultaneously, maintain the grid's benefits and prevent detriments.

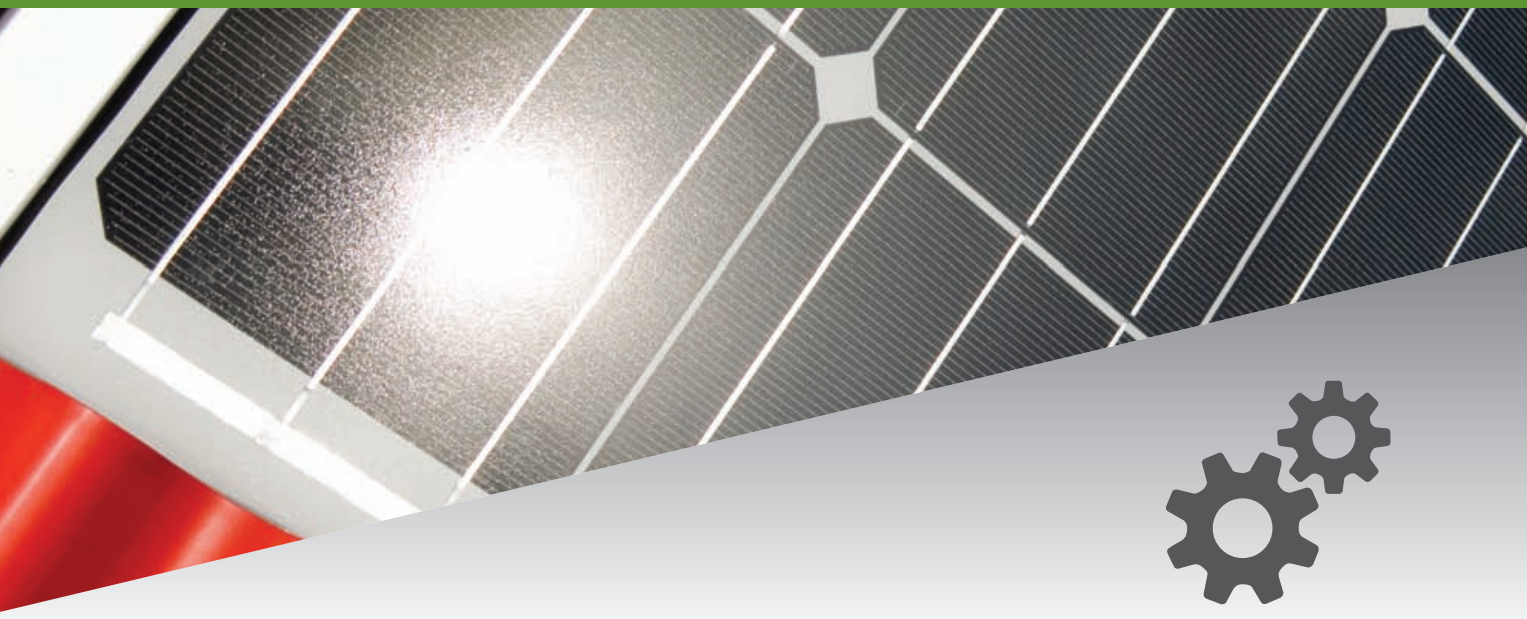
But if you would have predicted the last five years, this exec said, most would have had it wrong. What will the next five years be like?

The industry could go a number of different ways. But utilities could be blamed if things go poorly. The cost to consumers will be disruptive. And the additional expenses will start wearing on people.

Most of the interview panel also sees considerable uncertainty even within the five-year horizon. A strategist for regulators said that it's hard blocking something that people want like distributed energy. The future is diabolical, he said. The future's prerogative is to absolutely screw you.

And another utility executive reminded us that the iPhone is just ten years old. So five years out, half that duration of time, can seem like an eternity.

Another economist from the investor-owned sector thought the industry could go a number of different ways. But utilities could be blamed if things go poorly. The cost to consumers will be disruptive. And the additional expenses will start wearing on people.



Impacts, Threats, Opportunities

How can utilities most effectively manage the disparate impacts, opportunities and threats caused by utility-scale and distributed renewables?

The public power leader believes the industry needs to educate and inform. To him, there's a lot of misunderstanding among the public. And a mythology around renewables. We have no common facts about these technologies.

He's concerned about subsidies, feeling that they're unwarranted, and that they're skewing policy. A nascent product needs a hand up. But once it gets a job (it matures), then it's time to phase down.

The advocates are effective in perpetuating the subsidies, this exec said. We need a twelve-step program. We know we have a problem. Just two or three more years, and then we go on without the subsidies.

A utility executive said we need to get our pricing right. And embrace all of the above, distributed and utility-scale renewables, at every scale.

If you just let people put it in, as in Germany, the result is very problematic. Utilities are the integrators. We bring the engineering expertise, he added. Integration in renewables shouldn't be random, or left to third parties.

He likes parts of REV (New York's utility business model proceeding), and doesn't like others. He's concerned about the level of complication in distribution-level competition.

The former consumer advocate agrees utilities should lead. In a restructured state, the utility no longer has a one-on-one relationship with the customer. Utilities should go to the legislature and say we need to make a change. Because utilities can do renewables cheaper, and have the knowledge, the skills.

A regulatory specialist from the investor-owned sector thinks utilities should be really clear about the costs of renewables. We serve our customers, he said, but we should be very clear that rates can change. Nobody is immune. The economics of solar can't continue.

Utilities are between a rock and a hard place. Microgrids are not going away. But utilities should take the lead in every proposal. Lead rather than follow.

Two on our interview panel want utilities to take the lead. An economist from the investor-owned sector pointed out, we're the aggregator provider of choice. Utility-scale solar is superior to that at the customer-scale.

Utilities are between a rock and a hard place. Microgrids are also not going away. But utilities should take the lead in every proposal. Lead rather than follow, this economist believes.

And a utility executive said, we have the installation abilities,

when they work technically and economically, and when they don't. He feels we should educate consumers.

The strategist for regulators is all for leading rather than following. People use the word risk all the time. Risk is not equal to threat. There's a set of unknowable factors. Use the word risk like the financial community does.

Take a chance, he recommends. The pace of change is too quick. Recognize that we're always wrong seven years out.

So you invest diversely. Put some dollars in. Utilities should support things like a portfolio manager. Like a portfolio manager, like we crush rock, we want to bring in a new service for ratepayers.

Another utility executive believes we need to get back to basics of grid resource planning. In our part of the country, the Midwest, wind can beat gas and beat solar.

Small-scale solar is twelve to fourteen cents, with net metering. Utility-scale solar is six to nine cents. Small-scale wind is four to six cents. Large-scale wind is two to four cents.

That's the renewable stack to get to the same value. What's the scale benefit? For him, that's a critical question from a societal standpoint.

The recently retired utility executive said, I hate the word threat. I like opportunity or challenge as opposed to threat.

Instead of disruption, I see transformation. That should be the mindset.

The strategist is all for leading rather than following. People use the word risk all the time. Risk is not equal to threat. Use the word risk like the financial community.

Then he added a thought about grid integration of renewables. The telephone analogy only works to a certain point. The grid now becomes even more vulnerable. With two-way flow of information and electrons. So I want the grid working very well.

Though some on the interview panel wanted utilities to lead on all renewables, the panel was divided, with some who want the emphasis on utility-scale. The economist for commissioners said, the most economic is utility-scale solar. Even if rooftop solar became more economical, utility-scale would always be the most economic. Utilities should pursue utility-scale solar.

The lawyer also favors utility-scale solar, or sponsored solar that is not rate-based. There can be an enormous amount of third-party solar. Utilities should be enabling it in every way possible.

We have irrational economics for rooftop solar, he feels. Now we need to put in batteries to support it and further add to the disruption and cost.

The other lawyer on the interview panel takes a different approach. Utilities should be joining the party, at all levels of renewables, with a healthy attitude.

But, he added, you have to have competition that is fair. Some states may say utilities can't get in.

If SunEdison goes bankrupt (it has since filed for bankruptcy), said the lawyer, that will leave a bad taste in peoples' mouths.

According to the utility strategist, we assume consumers value clean energy. What segment of consumers is it really? How is the value growing?

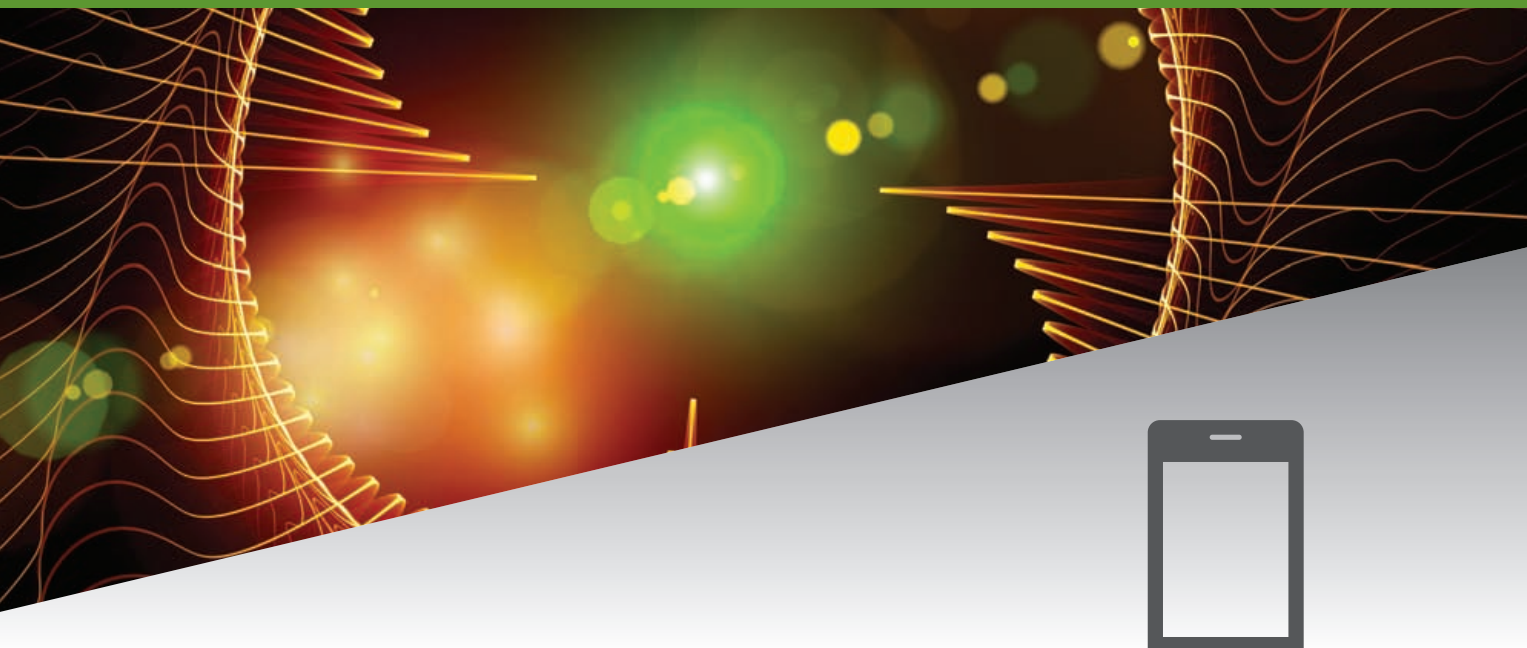
What about customers who want clean energy but don't want solar on their roof? The segment who want and can have solar roofs is small. We can do more if you have the option like community solar.

What about customers who want clean energy but don't want solar on their roof? You have the option of community solar.

The prominent economist and author on the panel warns, this is a major paradigm shift. Utilities say, it costs more to do this, it costs more to do that. Society says we need to do more on climate, but wants nothing to do with the details about cost.

Utilities don't really realize what's happening, said the economist. Maybe, we'll have to really do something.

The former commission chair summed it up when he said, we need to make some choices, like to build utility-scale solar. It's better for customers if utilities are allowed.



The Digital Future

How should utilities embrace a digitalized future? How can regulation support these goals?

The utility executive from the east expressed that utilities are adaptive. They can be nimble at the pace that regulators allow.

Regulators can clear the way, so utilities can move rapidly, and try new things. Regulators should allow utilities to take risks. Tariffs can be modified faster.

But, he's stated that we can't abandon cost of service regulation. Electricity is an essential service. Costs are shared in a fair and equitable way. Return is set at a reasonable level, very low compared to private companies like solar installers.

This enables utilities to invest capital at low cost. The proof statement is ESCOs (energy service companies). They have a hard time making money while utilities buy and pass through the power without any profit.

One of the utility execs was bullish but concerned. The Internet of Things will allow customers to take advantage of present rate structures. Customers will be able to buy something for $240 to save $340 by gaming our rates, he said.

Customers who want greener or different reliability will get it. Young people are coming in with tons of new ideas on evolving our business model.

A number of the interview panel members were skeptical that more than a small segment of consumers, the early adopters, will embrace the smart home anytime soon. The exec from the public power sector said that he expected it to proceed at a pretty slow pace. People are not that interested. Like energy efficiency, people like low-hassle stuff.

My kids, the exec added, have the technology. They're chained to it. But they've got only twenty-four hours in a day too.

So we're supposed to reorient the whole megillah to satisfy the desires of one percent of the customers? Most customers want cheap and reliable. So before we run off, let's base what we do on data and analysis.

The regulatory strategist from the investor-owned sector agreed. Some utilities have all these pilots, and focus groups. A lot of people didn't show up.

People said: "You don't have kids. I don't have the time."

Not everything is a market. Unless you have set-it and forget-it.

Regulators should go slow. Don't jump fifteen years into the future.

Then there's the recently retired exec. I'm not sure what's there. I'm a nerd, but to save six dollars a month, does that get your attention? No, it doesn't. People won't get excited about that.

This concern about consumer reaction, from a majority of consumers, was voiced as well by the economist from the investor-owned sector. Most consumers are going to say, I just want you to provide my power at the lowest cost. I don't want to think about it.

The economist added, yes, there are early adopters. So we have to have a model for both worlds, for early adopters and the majority that will be reluctant at first.

A similar view came from one of the Midwest utility executives.

He emphasized that we all need to work the technology curve. You know what Google found out with Nest? It's a lot more complicated. It was a green play, but that's because the money (the green) wasn't there.

He concluded with a key point. It's not a measure of consumer acceptance if results are based on consumers getting stuff for free or nearly so.

What should regulators be doing? The economist that works with commissioners said that, most importantly, regulators should make sure there are no undue barriers. But the time scale may be ten to fifteen years.

He also feels there's a question of what is the benefit to consumers? Real-time information and more control, there's over-hype with that. Electrons are still a commodity.

There's a divide, he points out, between the active consumer versus the passive consumer. Five to ten percent of consumers would be active. How much time will people want to spend on managing their electricity?

The lawyer believes regulators need do nothing. It's sort of silly to him. Doesn't add value. Good for bragging rights.

The smart home, from his perspective, is not getting any penetration. Consumers simply want reliable power.

More skepticism came from the author and the consumer advocate. And serious concerns about cybersecurity.

From the author, it won't make a hell of a lot of difference. I'm not going to be paying less for electricity.

What do consumers want? Until consumers don't have to do anything. What's in it for me? To save ten dollars per month?

I'm not keen on having it in my house, open to the Internet. And my utility will do a better job protecting my data than a bank or the CIA?

"Any definitive answer comes from a liar."

From the consumer advocate, I do worry about consumer privacy. A lot of consumers don't want the information every fifteen minutes. There're not nerdy people like us.

An eighty-five-year-old-year old woman said she didn't want a smart meter. "I don't know what it does. I don't want what it does."

She also mentioned cybersecurity. "There's a hacker on every block taking advantage of you."

Her proposal, regulators live in the bubble of regulation. They might have to hire a team of experts. Or an in-house technology person, to keep up.

Another intellectual leader for regulators said, it's going to depend on artificial intelligence. Like an energy butler, it might be some box in your house that makes choices for you.

But how close is that? Who can afford that?

For the regulator, to serve those that don't want to pay $400 for an energy butler and those that do.

Most regulators don't want to go ahead. Let's let California do that first.

For commissioners, he said, it's difficult because what we're seeing is a ten-year problem, and my term is three years. Then there's the deep geek basement, the gnomes. The tomorrow land crowd is wrong though. They're assured of their inevitability.

The energy butlers, the artificial intelligence (AI), are open to cyber attacks. Want the Ukraine switching off your lights? Many will say, I don't want to open myself up like that. That's a pain in the behind.

The former commissioner said, I'm not an early adoptor. Regulators should hedge your bets. Move somewhat in that direction. But …

We can't allow the grid to be manipulated inappropriately, but it's solvable.

There are a lot of examples in which we moved too fast. Home run hitters strike out a lot.

To him, regulators should take some prudent steps without diving in too deep.

Another of the lawyers is also worried about security. Utilities and regulators may not have to do anything about it, but play in the game. The cybersecurity risk is serious. We're creating new entry vectors for hackers. We can't allow the grid to be manipulated inappropriately, but it's solvable.

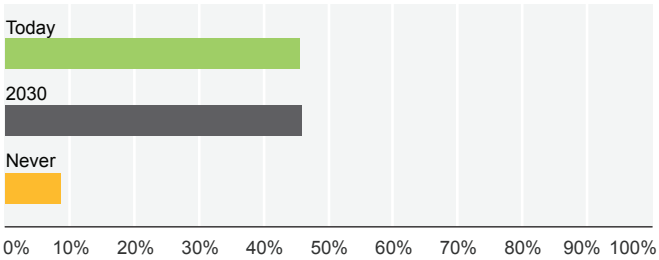
The last word goes to the utility strategist. Utilities should be the system integrator. In the rate regulation space, they can make it affordable for all. And make it simple for all.

Like Carson the butler in Downton Abbey, utilities should be like that, to make everything work. But with this in mind, there is no average customer. ➤

Survey on Electricity's Future

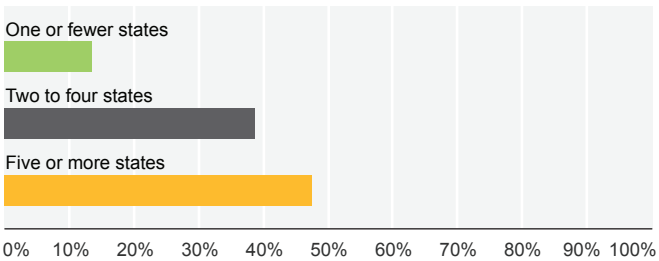
PUF conducted a fifteen-question online survey and received hundreds of responses to each question. In all, three hundred sixty-six of you participated. Your responses are shown with graphical breakdowns and take-aways.

When will growth of distributed energy resources (DER) force a major shift in utility business models?



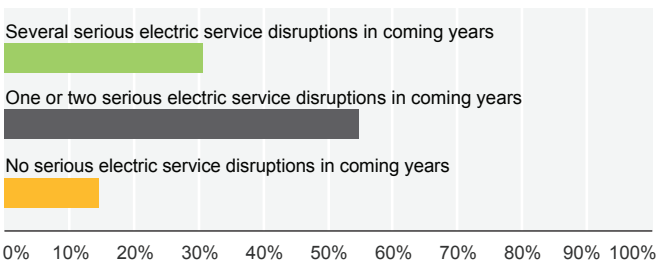
A virtual tie. Distributed resources will force a shift in utility business models either now or not for another fifteen years.

How many states will, by 2025, adopt some version of a distribution-level system operator as proposed in New York's REV?



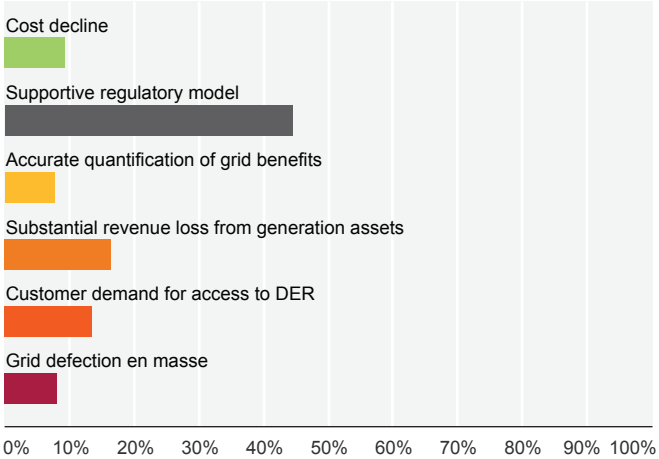
Nearly half believes five or more states will go to a distribution system operator in ten years. Almost as many believe two to four states will.

Will the increasing threat of cyber attacks, from more connectivity on both sides of the meter, result in:



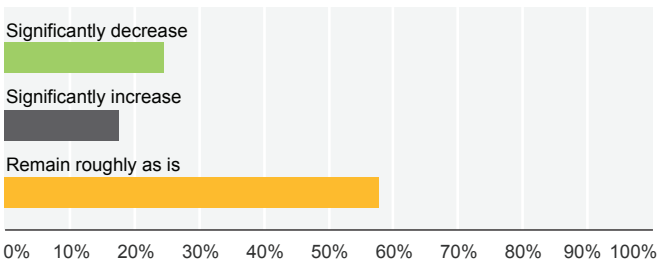
The cybersecurity challenge is real. Over half see one or two serious disruptions in utility service in coming years. Three in ten see several such disruptions.

What is the most important tipping point for utilities to aggressively pursue owning and operating DER?



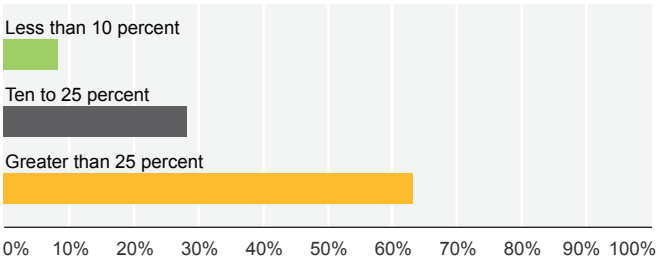
Nearly half see a supportive regulatory model as key to utilities aggressively pursuing distributed resources. Other factors such as revenue trends, customer demand and cost declines were cited much less.

By 2025, will the role of regulated utilities significantly decrease, significantly increase, or remain roughly as is, in providing services to consumers?



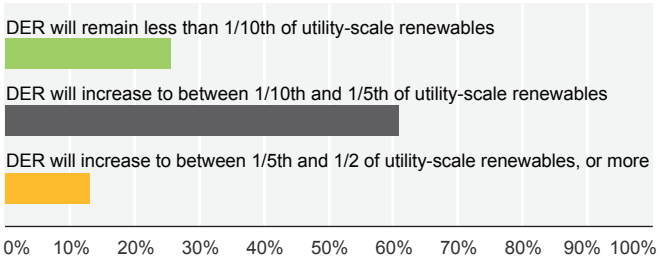
Nearly six in ten project that, in ten years, the role of utilities will remain roughly as it is now. Though a quarter project the role of utilities will significantly decrease.

By 2025, what proportion of US households will resist adopting intelligent home energy management, due to cost, concerns, lack of interest, etc.?



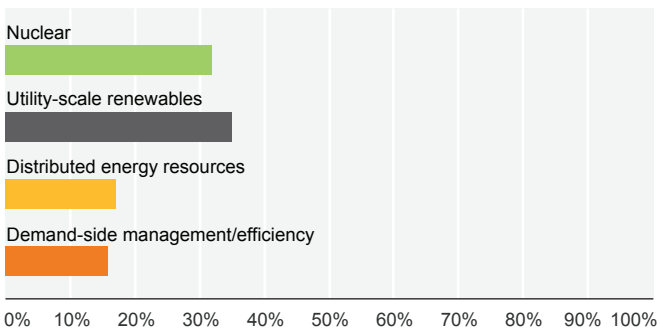
More than six in ten expect that, in ten years, a substantial proportion of households will resist intelligent home management. Few expect that the resistance will be rare among households in 2025.

By 2025, to what extent will DER catch up with the megawatt generation of utility-scale renewables?



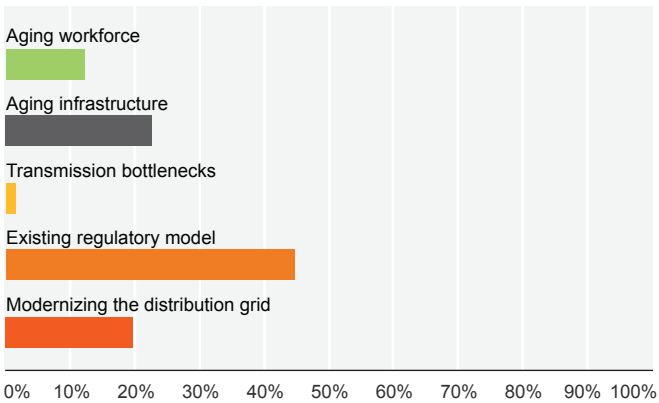
Over six in ten see distributed resources, in the next ten years, growing to somewhat less than a fifth of utility-scale renewables. Though a quarter see distributed remaining at less than a tenth of utility-scale.

What is the most viable resource alternative today to backfill a potential widespread decline in coal and natural-gas baseload generation?



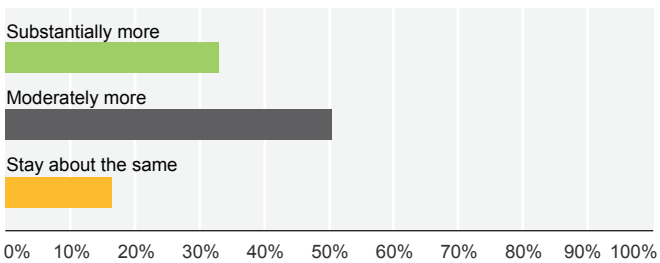
Nuclear and utility-scale renewables are seen as the most likely substitutes for retiring fossil generation. Fewer are counting on distributed energy and demand-side.

What legacy challenges will be the greatest challenge for utilities in 2025?



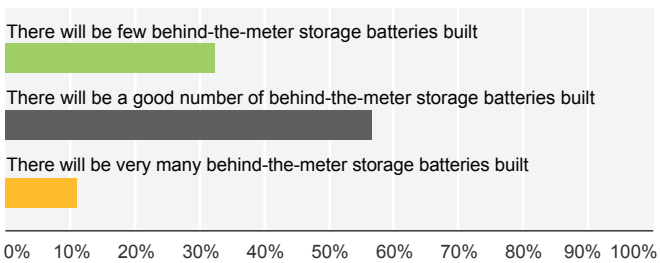
The greatest challenges for utilities in 2025 are expected to be the regulatory model, and also aging infrastructure and modernizing distribution.

How will residential and commercial customers' demand for choice and control change over time?



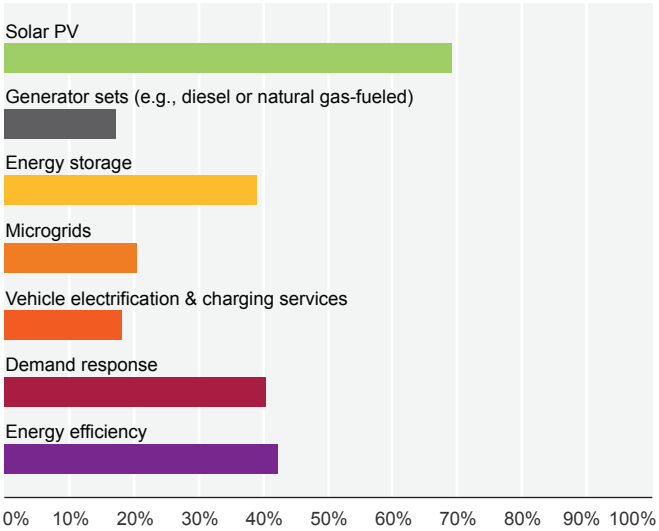
Half believe customer choice will moderately increase over time. But a third feel choice will substantially increase.

By 2025, how extensive will be the installation of behind-the-meter storage batteries?



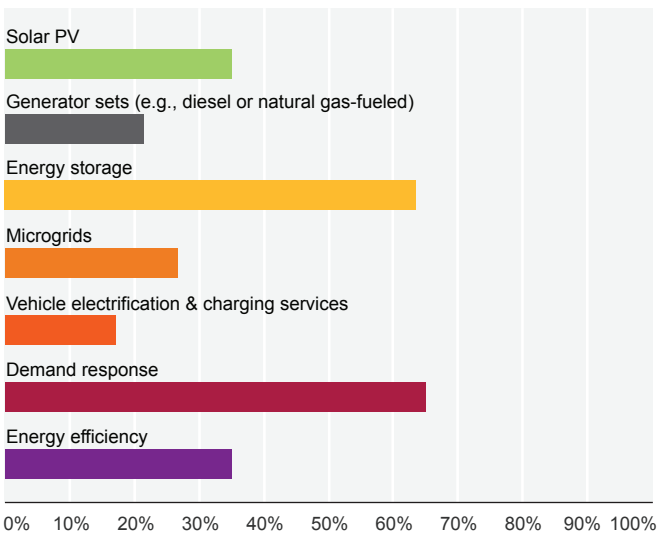
In ten years, nearly six in ten project a good number of behind-the-meter storage. A third feel there will be few instead.

Which will be the most prevalent distributed energy resource in terms of capacity by 2025 (pick three)?



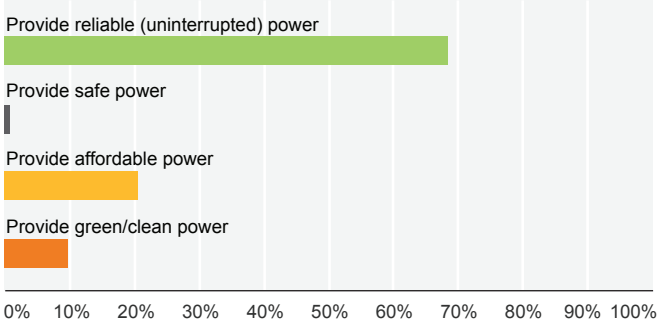
Solar was named by over two-thirds as the most prevalent distributed resource ten years out. But four in ten named as well energy efficiency, demand response and storage.

Which distributed energy resource will be the most useful to utility operations by 2025 (pick three)?



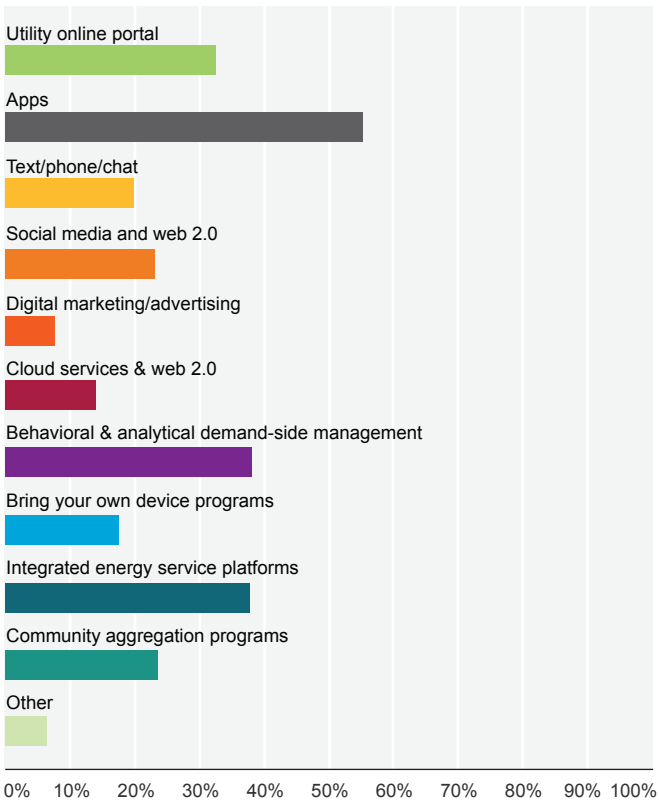
Storage and demand response were named by nearly two-thirds as distributed resources most useful to utility ops ten years out. Over a third named solar and energy efficiency.

What do customers believe is the most important role of the future utility?



Nearly seven in ten believe the most important role of the future utility is reliability. Just one in ten cited providing green energy.

What emerging customer engagement channels will be most widely used to deliver value to customers from utilities by 2025 (pick three)?



Apps were the most frequently mentioned customer engagement channel for the 2025 utility. But many also mentioned integrated energy platforms, analytics and online portals.

Discussion About Electricity's Future

Steve Mitnick talks with Jan Vrins, Robert Wilhite, Karin Corfee, David O'Brien, Jay Paidipati, Mackinnon Lawrence and Colette Lamontagne of Navigant

With over 450 management consultants focused on the utilities industry in North America, Navigant's Energy team works side-by-side with their clients on some of the most pressing and complex challenges and opportunities. In working with utilities, government organizations, manufacturers, law firms and investors, they are at the forefront of what is happening in the energy industry. They help clients navigate the many changes and challenges they are facing and deliver value through industry insights, a collaborative approach and an experienced team.

Jan Vrins, Karin Corfee and Rob Wilhite are managing directors at Navigant. Colette Lamontagne, David O'Brien, Jay Paidipati and Mackinnon Lawrence are directors at Navigant. PUF's Steve Mitnick asked them eight questions about electricity's future.

PUF's Steve Mitnick: You have but an elevator ride alone with the chief executive of a major utility. What would you want to tell him or her?

Jan Vrins: Do not underestimate the pace of transformation facing our industry today. Customer choice and emerging energy technologies will exponentially change the way we produce and use power going forward. While we are in an era of change for the electric utility, the franchise remains a vital link in the energy value chain. There is significant opportunity to reshape your business for long-term shareholder value. It feels like this is the beginning, but we just entered the second half of the chess board, where exponentially growing factors begin to have a significant economic impact (see Ray Kurzweil, *The Law of Accelerating Returns*, 2001).

If you had to create a new energy company that will be a leader in 2025, how would you do that?

It's not only about understanding how customer choice and demands are changing. You have to build strong relationships with your customers, and more importantly, they need to trust you. It's also important to fully appreciate the opportunities and challenges presented by emerging technology and embrace innovation. Most of the opportunities that will define this industry in the future lie outside of our collective purview. And the barrier for market entry is significantly lower now. By pro-actively offering products and services that benefit your customers and that can compete with yet-to-be-seen solutions, you will gain their trust, and stay in business. If you choose to remain reactive or defensive, remember that new entrants are lining up to capture market share in this industry by exploiting every inefficiency in your value chain. There's too much revenue at stake. Don't wait, regulation,

Jan Vrins is a managing director and Navigant's Global Energy practice leader. He advises utility executives on developing strategies for ensuring long-term operational and financial success in a rapidly changing landscape. Jan developed the Utility of the Future Framework to help clients understand how the trends in the market and evolving business models can improve their commercial and operational performance. His utilities industry experience includes investor- and government-owned utilities in North America, Europe and Latin America. Jan has authored various publications and presented at leading industry conferences. With extensive consulting experience (24+ years) in the energy sector and a history of growing businesses in diverse, global markets, Jan is a global leader in today's energy consulting industry.

business models and operations will follow and will be sorted out over time.

And finally, take your best and brightest people, including people that have experience in other industries, and ask them: if you had to create a new energy company that will be a leader in 2025, how would you do that? The threats are real, we have seen it in every other industry. Change your thinking, your mindset, your DNA, don't be that dinosaur.

Topics like renewables, DER and digital transformation have become board and C-level priorities.

PUF's Steve Mitnick: As the leader of a moderately large complex organization, have you experienced challenges that utility executives are facing? And how did you address those challenges? What excites you about where you are headed?

Karin Corfee: Like our utility clients, our Energy practice went through a large transformation to better address changing client's needs. We evolved from groups specializing around energy markets, new energy technologies, demand-side management, grid modernization, transmission and generation, to one team with an integrated go-to-market approach. In effect, we were just as much a victim of silos as our clients in the utility business. Now our cross-practice and company offerings are reflecting the convergence of technologies and issues currently shaping this industry, and delivering value by increasing revenue or reducing costs of operations for our clients. Topics like renewables, DER and digital transformation have become board and C-level priorities. Our integrated capabilities are now helping client's define a holistic strategy and plan forward to capitalize on these opportunities in an increasingly complex landscape.

I'm excited to be part of Navigant because we are working side-by-side with our clients, advancing an industry facing profound change. The challenges are lofty, but not insurmountable. The opportunities to create a more sustainable energy industry and harness the power of innovation are within reach and will deliver more affordable, safer and cleaner energy. We're seeing sustainability objectives more aligned than ever among policy makers, government, energy companies and their customers; this is creating unseen momentum to truly impact the future of this industry and our world.

PUF's Steve Mitnick: The challenges facing utility executives are evolving at a rapid pace. How is what you advise these days different than what you advised five years ago?

Rob Wilhite: Our solution offerings and advisory capabilities are more complex and comprehensive than what we needed to offer five years ago. Offering purely technical, engineering or business strategy solutions is not, in isolation, sufficient to address the new dynamics our clients are facing. Clients need advisors who can not only perform the deep data analytics, technical analyses or engineering studies, but provide the broader customer and

Karin Corfee is a managing director in Navigant's Global Energy practice specializing in strategic planning, energy efficiency, renewable energy, distributed generation and climate planning initiatives for utilities. With more than 30 years of industry experience, Karin has conducted numerous studies examining the impacts of DER on the grid. She helped develop the California Energy Efficiency Strategic Plan and the California Independent System Operator five-year strategic plan.

Robert Wilhite is a managing director in Navigant's Global Energy practice. He directs business strategy and regulatory advisory services for utilities in North America, Europe and the Middle East. Rob has helped energy clients achieve increased efficiency in utility operations and grid automation, and has led revenue growth and expansion strategies. He is co-author of the book Utility of the Future: Directions for Enhancing Sustainability, Reliability and Profitability. In 2011, as part of President Obama's Council on Jobs and Competitiveness, he participated in a private smart grid and energy session. Rob was recognized as one of the Top 25 Consultants in the U.S. by Consulting Magazine in 2009 and identified in 2012 as one of the Networked Grid 100 Movers and Shakers of the Smart Grid by Greentech Media.

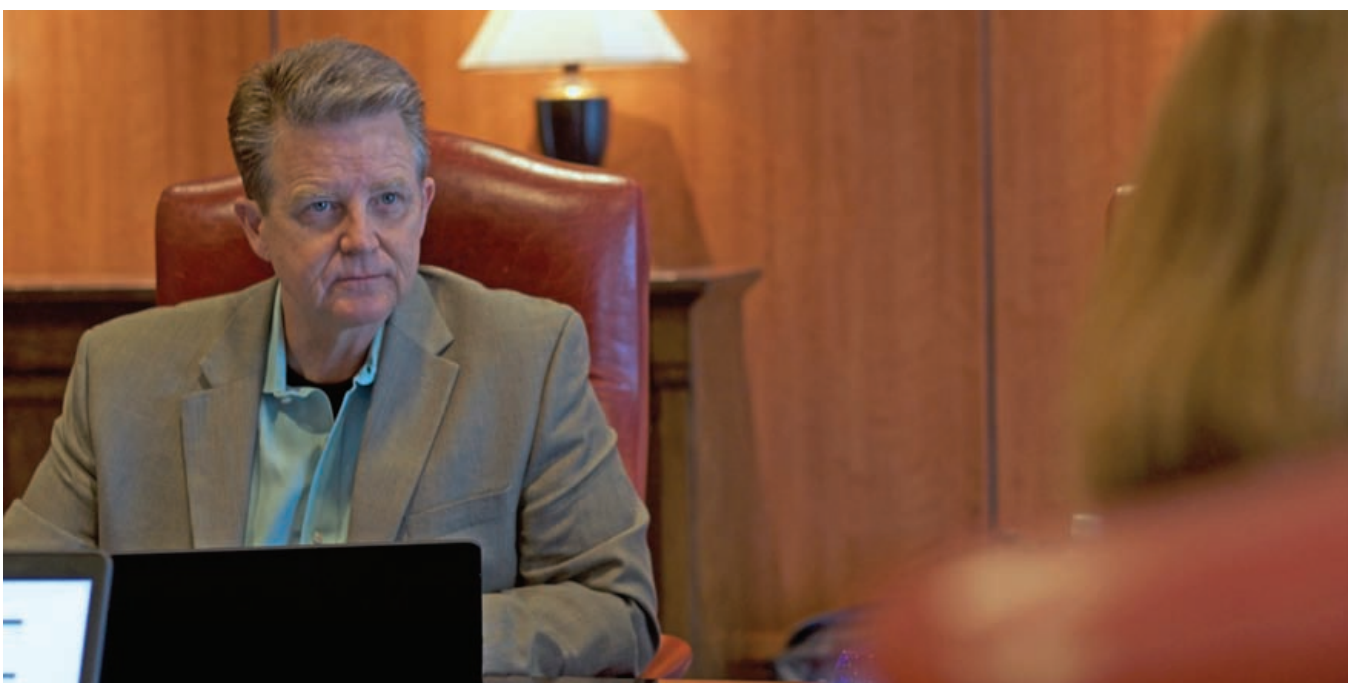
business strategy context and support their regulatory and external stakeholder proceedings. In other words, an integrated set of capabilities and knowledge adds greater value to utility executives and more effectively resolves their most difficult challenges.

As professional advisors, we also need to instill greater levels of innovation, cross-industry knowledge and the ability to stay current with accelerating change in the energy industry. Through our research team, we monitor shifting market trends, costs and technological advancements, enabling us to quickly move from data analytics to developing business strategy and actionable recommendations. Fully integrating services across multiple energy sectors provides differentiated and more meaningful solutions to the numerous challenges our clients face in this rapidly evolving market. Given the dynamic nature of the current market, we're also developing more robust solutions for existing utility clients to help manage risk and uncertainty in an industry growing more competitive each year.

As a whole, the future electric grid will be cleaner, more distributed and intelligent than what we know today.

PUF's Steve Mitnick: Utility regulators are taking varied approaches toward industry change, and in some cases, states are moving slowly toward reform. Talk about how utilities should engage in these environments and what degree of risk you see that transformation of the business could render some new initiatives and investments imprudent.

David O'Brien: There is no question that we are moving from a centralized hub-and-spoke electric grid to one that is far more diverse, distributed and highly networked (we call it the Energy Cloud). As a whole the future electric grid will be cleaner, more distributed and more intelligent than what we know today. This



David O'Brien is a director specializing in strategy and operations within Navigant's Global Energy practice. He advises clients on how to prepare for and optimize the transformative change taking place in the energy industry. David helps clients examine the changing physical and financial domains of the distribution grid and consider the business models and regulatory frameworks that will sustain their business. David is an industry thought leader whose numerous published articles focus on opportunities to leverage grid modernization capabilities and advance policy goals, meet the increasing expectations of customers, and foster the emerging 21st century energy marketplace.

will entail a concentrated movement toward customer-centric solutions and DER. The transition from big power to small energy will occur at different rates by region as the policy approach, viability of new technologies, market dynamics and structure, and cost of electricity vary. For some states, a wait-and-see mode of operation may be the case for some time.

Stranded investment could become a real issue, and we have seen this dynamic occur dating back to the street car companies at the turn of the 20th century.

The key here for utilities and regulators is to maintain an open and ongoing dialogue about the changing nature of the industry, the evolving preferences of customers, and how an altered use of the grid impacts the regulated franchise from a financial and physical perspective. Utility commissions and policymakers may not have an appetite for significant change, and for good reason—they may have retail rates that are competitive and a level of service that satisfies customers. In these circumstances, it is in the utility's interest to continually engage in a dialogue with its regulators and stakeholders, formally and informally, to keep them informed of how the energy business is evolving. When the time comes for more substantive policy examination, the relationship is in place and a foundation of common understanding can exist. In my experience, the greatest value from major policy examinations into the so-called utility of the future was the alignment around common challenges and interests. A proactive effort by utilities in less active states will yield long-term value.

As increasing numbers of customers begin to supply their own energy—marking the entry of third-party competition—the core business model of the incumbent utility is being reshaped. As a result, the level of demand and therefore the need for enabling capacity can shift, potentially rendering installed infrastructure no longer viable. The term is "used and useful" in ratemaking parlance. So there is a risk that stranded investment can become a real issue, and we have seen this dynamic occur in regulated industries dating back to the street car companies at the turn of the 20th century. Arguably, this is the greatest challenge for regulators to face: an adjustment in terms of

Colette Lamontagne is a director in Navigant's Global Energy practice. She focuses on emerging technology and DER strategy, demonstration and implementation. She has 25 years of industry-focused consulting experience, which includes numerous studies for utilities, technology providers and government agencies. Colette's work also covers market research, opportunity assessments, strategic planning, demonstration oversight and procurement support. During her six years with the Energy Storage Association Board of Directors she has held several leadership positions including Board Chair.

the role of the legacy system in an Energy Cloud world. I think the active dialogue I referenced here is tantamount so that utilities and regulators are working in tandem as much as possible to pivot through the changing landscape. We cannot forget that there is significant ratepayer and shareholder capital invested in legacy systems and it remains a central means to advance policy goals such as New York's Reforming the Energy Vision. A reshaped business model and regulatory compact can realign the distribution utility franchise for the future.

While there is growing demand for customer-centric solutions like rooftop solar and DER, a majority of customers still value safe, reliable and affordable power.

PUF's Steve Mitnick: Given the remarkable diversity of electric service customers, for example early tech adopters versus senior citizens, how can utilities and their regulators accommodate everyone's needs?

Colette Lamontange: It is important to remember that while there is growing demand for customer-centric solutions like rooftop solar and significant interest in DER (especially with large customers), a majority of customers still value safe, reliable and affordable power. The challenge for utilities will be to meet an exponentially growing set of customer choices and changing demands, while continuing to serve their core customer base. Utilities, in other words, have to invest in new products and services (including DER), new business models and new organizations, while keeping the lights on.

This is an area of shared interest among utilities and regulators because the long run financial integrity of the regulated franchise is dependent upon retaining its customer base. In the absence of options, commercial and industrial customers will find their own supply solutions, and together with advanced energy management, effectively abandon the regulated grid. As technology and solution providers increasingly vie for market share, the customer always benefits from more options coming available every day.

The foundation for customer trust and loyalty is to create the dynamic, plug-and-play platform environment that enables customers to achieve their goals (cost savings, reliability, resiliency, sustainability) while also remaining a customer of the utility. To accomplish this, utilities and their regulators will need to work together toward an advanced grid infrastructure that can physically support a dynamic grid environment and adaptable rate structures, as well as toward rate design that supports diverse and personalized products and services. Inaction and lack of coordination among utilities and regulators runs the risk of utilities ceding ground to third-party market entrants leveraging customer-centric solutions. While today the impact of customer defection is most seen in the large customer segments, the continued decline in the cost of DER and increasing mass-market solutions will mean that residential customer defection from the grid will be a materializing threat as well.

Utilities should strive to become leaders in DER at every scale.

PUF's Steve Mitnick: Some say utilities should become leaders in DER at every scale and some say utilities should stay out to foster greater competition.

Jay Paidipati: Utilities should strive to become leaders in DER at every scale. By sitting on the sidelines today, utilities risk missing out on building a foundation for long-term success. Across the industry, the platforms for long-term growth are being assembled today. Meanwhile, the overwhelming trend points to rapid and sustained growth across the entire DER spectrum—from solar PV to distributed storage to demand response and energy efficiency. As the scale and velocity of DER adoption accelerate, utilities will become more exposed to technology innovation than ever before. That's the pull.

Jay Paidipati is a director specializing in emerging technologies and business strategy in Navigant's Global Energy practice. His work is focused on helping Navigant's clients manage and make decisions regarding emerging energy technologies, including DER. He has worked with utilities, federal, state and local governments, as well as manufacturers and investors. In response to client needs, Jay has developed and delivered technology evaluation and screening services, cost studies, market penetration analysis, employment impact studies, cost and benefit studies, technology due diligence and program evaluation.

And the push, consider that in the future basic electricity and connectivity to the grid is likely to be a loss leader business. In this future scenario, the wires business will be the foundation of the value chain but not where the greater value-added services or margins lie. How will you make money and create shareholder value in this environment? Or, if you want to think less futuristic, what if the value of the grid diminishes over the next ten years (let's say 5% ROI), what would you do? If you think that way, you put yourself in a position to win. You have to step back and think out-of-the box. Mind over matter.

In most of the country, DER has been driven by mandate and typically only has a few touch points to the utility—physical interconnection, one-way monitoring, and a must take power purchase agreement. Meanwhile, DER affects utilities' customer relationships, rate structure design, communication requirements, distribution planning and operations and long-term planning. In this environment, the traditional utility playbook no longer holds. In order to position for long-term growth, utilities will need to develop an integrated strategy to assess, plan and implement DER that is coordinated across their departments at every level and allows them to capture value for their organization. If they do not, structures and programs may be forced on them that could undermine the long-term value of their business. Utilities must play both offense and defense in this in this integrated DER environment.

An updated defensive strategy will entail engaging with customers to understand their choices and changing demands vis-a-vis price and reliability; engaging with regulators to find equitable ways to charge net metering customers for transmission and distribution services that fairly address the cost to serve, improving customer service and grid reliability at the lowest prices possible and developing utility-owned renewable assets to appeal to environmentally conscious customers.

Playing offense is even more important. Utilities must create new revenue streams through the development of new business models, products and services, transform their organizations and culture in order to fully integrate sales, customer service and operations and upgrade the grid and operations to facilitate the integration of DER.

With many utilities hemmed in by a regulatory model better tuned to centralized generation, utilities must maneuver to allow sufficient flexibility to balance both centralized and distributed assets. More importantly, utilities and regulators will need to allow flexibility for utility businesses to continuously swap out obsolete technologies and programs within their DER portfolios as technology life spans in tomorrow's grid are likely to be measured in years, not decades.

The traditional utility playbook no longer holds. Utilities must play both offense and defense in this integrated DER environment.

PUF's Steve Mitnick: It's 2025, just nine years from now. The most successful utilities have what common strategies and qualities?

Mackinnon Lawrence: Over the next decade, utilities will see the center of the utility value chain shift downstream. The most successful utilities in 2025 will, first, have sought opportunities to engage consumers in win-win relationships. They will have embraced digital platforms and engagement tools beyond the meter to deepen interaction with their customer base—their most valuable resource. Most importantly, those successful utilities will have built channels for two-way communication while offering optionality in how customers manage and consume their power. Utilities targeting these opportunities will be integrated into in the fabric of smart cities, offering a portfolio of solutions to building owners, facility managers and government stakeholders that leverage the revenue opportunities proliferating across the built urban landscape.

Second, they will have standardized agile planning processes internally and compressed investment cycles to more proactively navigate uncertainty and risk in an increasingly multivariable landscape. This includes working proactively with regulators, where necessary, to evolve current rate-based cost recovery models to allow for more freedom and opportunity to pursue less

Mackinnon Lawrence is a senior research director leading Navigant Research's Energy Technologies and Utility Transformations programs. With more than a decade of experience as an analyst and attorney serving the international energy sector, he has played a lead role in guiding the Energy practice's worldwide research agenda. His work has focused on the Energy Cloud and emerging technologies that are transforming the power grid. He is a frequent speaker at industry events and is often quoted in major media outlets including The New York Times, Forbes and Scientific American.

conventional utility revenue opportunities.

Finally, as the number of technologies along the edge of the grid proliferate, those utilities that are willing to actively manage portfolios of DER, and are flexible in pursuing plug and play optionality, will be more successful at embracing innovation. Additionally, those successful utilities will have capitalized on opportunities to aggregate DER resources—from community solar initiatives to building energy management system (BEMS)-enabled virtual power plants to demand response-enabled solar plus storage. To create this diverse environment utilities will view themselves as high-powered enabling platforms that are physically capable of a managing two-way power flow and offering pricing mechanisms to foster the myriad of transactions that will occur.

The most successful utilities in 2025 will, first, have sought opportunities to engage consumers in win-win relationships.

PUF's Steve Mitnick: What are the existential opportunities and threats confronting utilities if any? What do utilities need to do this year, 2016, to position for these threats? What are clients' major blind spots in strategic planning?

Jan Vrins: As described in Klaus Schwab's recent book, The Fourth Industrial Revolution, "the velocity, scope, and systems-level impact of current breakthroughs has no historical precedent…disrupting almost every industry in every country." Enjoying nearly 150 years of unfettered growth, the electric utility is not immune. The transformations facing the utility industry today go beyond the physical—renewables, proliferation of DER and phasing out of coal capacity—and expand into the digital realm with destabilizing impact on traditional revenue streams. Even for the most forward-thinking utilities, keeping pace with the rate of innovation and capitalizing on the full scope of opportunities will be an ongoing challenge.

Specifically, the prospect of highly networked assets and customers in the future Energy Cloud will reduce demand for traditional utility services. The bulk of these innovations are centered on the distribution grid and behind the meter, resulting in exponential growth in generated data, sensors and cyber-physical networks. The end result is a whole-scale shift downstream in the utility value chain with new revenue opportunities expanding in kind. Taken to its logical conclusion, the integration of AI, autonomous drones and a self-organizing Internet of Things into the power grid has the potential to render conventional utility jobs and services obsolete.

As the primary owners of physical infrastructure (e.g., transmission and distribution) and managing direct relationships with customers, utilities are strongly positioned to capitalize on these transformations to build long-term value. Utilities need to realize that their current business models no longer work in a world of DER, and it is up to them to develop new business models. To be successful in the future, today's utilities need to formulate their strategy, educate their regulators and plan for the new world of DER. This means revamping processes and organizational structures, integrating new technologies, and most important of all, changing their cultural DNA to be customer-centric and to feed the entrepreneurial spirit. Utilities need to anticipate the needs of their customers and develop competitive products and services to meet them, or develop partnerships with companies that can. Allowing the changing needs of their customers to be unmet creates a vacuum that will be filled by others at the utility's peril. Utilities that craft a robust digital strategy today will be best positioned to build out a robust platform of innovative solutions to keep pace with the rapid transformations that face the industry tomorrow. ➤

Navigant Consulting, Inc.
30 S. Wacker Drive
Suite 3100
Chicago, IL 60606 United States
Navigant.com/energy

The above responses from Navigant represent the views and opinions of the identified experts.