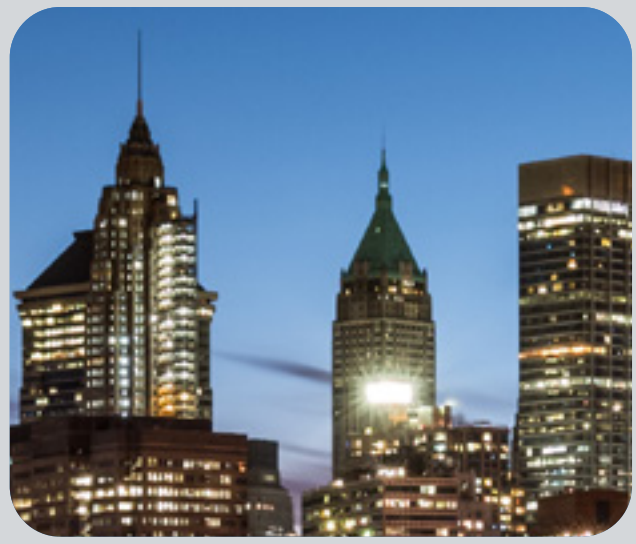
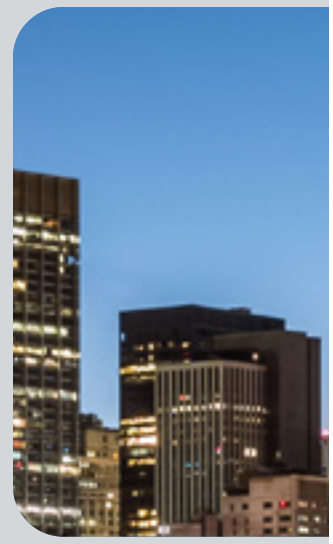
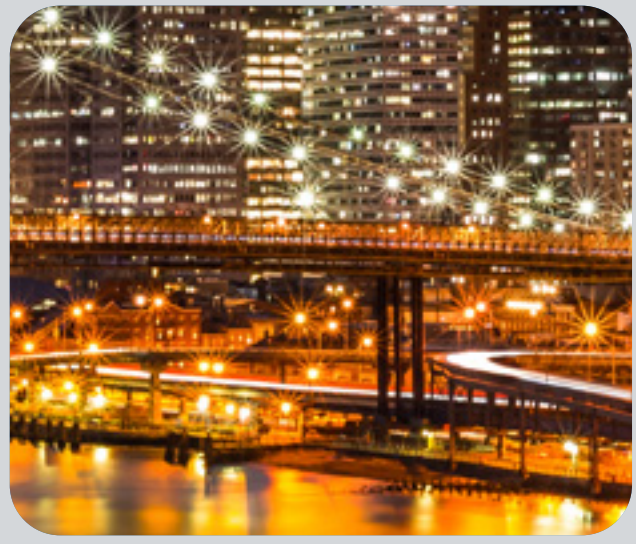
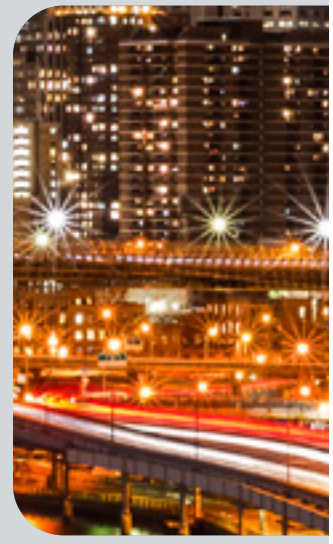
REGULATORY FORESIGHT AND THE NEXT GENERATION UTILITY

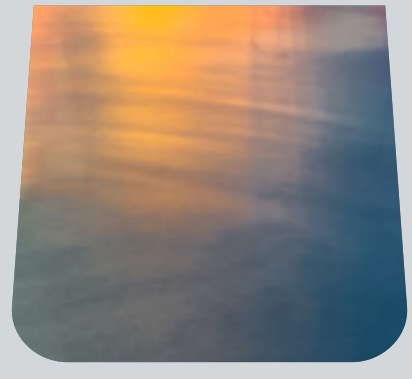
ENHANCING VALUE AMIDST POLICY & TECHNOLOGICAL UNCERTAINTY











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EXECUTIVE SUMMARY

The utility market and regulatory landscape is shifting, bringing new challenges and opportunities.

It is still being decided how utilities will be compensated in a future that is increasingly composed of distributed energy resources and more active participation of customers and third-parties. However, regulators are increasingly pushing forward market and regulatory reforms in support of these outcomes, which aim to more equitably balance shareholder and customer value.

For example, regulators in New York and California are currently undertaking some of the most ambitious plans to redefine how utilities facilitate the provision of safe, reliable, affordable, and clean power as they face an increasingly distributed energy world where customer choice is expanded.

These ambitious market and regulatory reforms create significant uncertainty for traditional utilities, potentially straining their ability to respond to the challenges posed by distributed energy resources and other potentially disruptive technologies.

As the cost-competitiveness of distributed solar, storage and other customer-centric technologies advances, policymakers across the globe are more likely to follow the lead of California and New York. Utilities are understandably concerned whether these reforms will succeed in maintaining safe, reliable, affordable, and cleaner power while also making it more distributed and customer-centric without detrimentally impacting the future of their business.

However, utilities do not need to wait for policymakers to chart a future vision to act. Utilities are typically in the best position to understand how new technologies can most effectively be integrated into their system to provide the greatest value to the customer and to the shareholder.

Next generation utilities should develop regulatory foresight to anticipate both the desirable and unwanted impacts of new technologies and policies, and create the internal flexibility to respond appropriately.

Developing regulatory foresight to manage uncertainty will look different for each utility. However, the basic building blocks include two major principles:

- Expanding far-sighted thinking
- Engaging in entrepreneurial policy-making

The co-evolution of technology and policy is exciting, even if there are potential pitfalls with an approach that is too polarized toward either a policy or technology. The disruptive technology and policy innovations facing the utility sector need not be a threat to utilities. Rather, by proactively recognizing and responding to changes to the status quo, utilities can increase value for shareholders and customers alike.

THE EVOLUTION OF TECHNOLOGY AND POLICY

For more than a century, utilities have been tasked with delivering safe, affordable and reliable power to the customers they serve. As part of that regulatory compact, utilities in most parts of the world have earned a steady rate of return on the grid assets in which they invested to meet that mandate.

As long as the lights stayed on, the construct was largely accepted by society. In the 21st Century, however, a confluence of forces is putting pressure on that traditional regulatory compact.

In the 1970s, the Public Utility Regulatory Policies Act started the trend of deregulation. In the 1990s, consumer choice was expanded with retail choice coming to many states. More recently, technology-induced competition has arisen due to the growth in distributed energy resources, and distributed solar in particular.

For example, the cost of solar photovoltaics have seen an approximate 50 percent decrease in the past half-decade, which, along with net metering policies and tax credits, have made solar PV an increasingly popular choice for homes and businesses.

San Diego Gas & Electric, for example, has more than 80,000 net metered customers in its territory, most of which have rooftop solar. There are more than one million solar installations in the U. S., most of which are distributed; that number is expected to double in the next two years, according to GTM Research and the Solar Energy Industries Association.

Utility customers are increasingly adopting distributed energy resources, such as solar, to lower their bills. But these customers are still reliant on the larger grid for reliability as society has become increasingly interconnected and digital. Businesses and homeowners are less tolerant of outages than ever before, and the combination of solar and energy storage has not yet been demonstrated to economically provide this same level of reliability.

Distributed solar is just one area of innovation at the grid edge. There have been significant advancements in demand-side technologies, from controlling individual lighting and HVAC systems to monitoring portfolios of buildings with software and analytics. Increased intelligence and controls in the built environment offer opportunities for utilities to engage with customers in new ways.

These forces, largely playing out at the edge of the grid, are pushing utilities and regulators to incorporate decentralization into their thinking, in contrast to the centralized system planning that has been the core of utility and regulatory philosophies for more than a century. Although challenging, stakeholders can and should think about all of these trends holistically in order to form a new compact.

POLICY INNOVATION
PROMOTING SPECIFIC TECHNOLOGIES

Policies to support next generation utility investment and low-carbon generation sources are being implemented globally. One of the most striking examples is Germany's energy transition, known as Energiewende, which began in 2011.

Germany offers many lessons, both good and bad, on leveraging policy innovation to meet clean energy goals. The country was an early adopter of policies promoting specific types of clean energy technology. It has met those goals – but not without significant unintended impacts.

Energiewende outlined goals for the adoption of both large- and small-scale renewable energy that were supported with generous feed-in tariffs for solar PV. Grid operators were also mandated to give preferential treatment for clean energy over fossil-fuel generation. The mechanism worked, and clean energy – particularly distributed solar – now makes up a substantial portion of generation in Germany. In one afternoon in 2015, for example, renewable energy provided 78 percent of the country's generation.

However, the focus on enabling clean, distributed solar has created a structural crisis for many large generators. Wholesale markets have been driven down to the point where the value of coal and natural gas plants has been significantly eroded in the market.

In 2014, the CEO of RWE, one of Germany's largest utilities, acknowledged that the company had entered the renewables market too late. Utilities such as E.ON and RWE have since spun out their renewable energy and customer-facing businesses from their conventional power businesses – but not without a lot of financial hardship.

Addressing the Problem Beyond Germany

Although Germany's early support for renewable electricity made it one of the first countries to grapple with these problems, other countries will increasingly face them, as well. Global clean energy investment hit a new high in 2015 at $329 billion, up from $88 billion in 2005, even as fossil fuel prices remained low.

As clean energy technologies become increasingly cost competitive in many regions of the globe, the need to create a new regulatory construct is clear. Utilities are being asked to provide safe, affordable and reliable electricity – but it is also targeted to be increasingly cleaner and, often, more distributed.

There are various regulatory constructs that can support that future. One approach, underway in New York, is planning for a market at the distribution level facilitated by utilities to encourage clean generation while ensuring an efficiently run distributed market that is synchronized with the wholesale market. Another approach is allowing distributed energy resources to be bid into the existing wholesale markets, as California is doing and Texas is considering.

Given the accelerating pace of technology change, there are advantages and disadvantages to each approach. By establishing policy to open up new markets as clean energy technologies mature, it is possible to misjudge which technologies will proliferate and which type of market structure will work best to create a level playing field. But waiting too long also increases the risk of falling behind technology trends and having vested interests try to shut down distributed energy.

The co-evolution of technology and policy is exciting, even if there are potential pitfalls with either a policy or technology-led approach. Utilities should not only be planning for the most likely scenarios, such as continued cost decreases for distributed solar and energy storage, but also high-impact, low-probability scenarios.

For most utilities there is still an opportunity for incremental, calculated and proactive regulatory engagement.

THE DISTRIBUTED WORLD: NEW YORK

In 2014, New York Governor Andrew Cuomo asked New York regulators to transform utility regulation to meet the needs of a more distributed, consumer-focused energy system. At the time, the state was moving up the rankings of leading solar states, from ninth place in 2013 to seventh place in 2014. In 2015, it was ranked fifth.

The transformation, however, goes far beyond valuing and enabling distributed solar. The New York Public Service commission answered Cuomo's call with the *Reforming the Energy Vision* proceeding, known as REV.

REV seeks to further enable a clean energy system while ensuring resiliency and affordability. A key tenant of REV, which is an evolutionary process rather than a single regulatory proceeding, is that it will turn distribution utilities into platform providers that will essentially be the purchaser and aggregator for distributed energy resources. As the utility role evolves, New York policymakers intend to move away from rate-based assets to market-based earnings referred to as platform service revenues. Utilities are rightfully hesitant to take on additional non-regulated investment (and earnings) risk. However, the Commission will allow utilities to still earn a fair return on the services, which are best provided under natural monopolies.

"By fundamentally restructuring the way utilities and energy companies sell electricity, New York can maximize the utilization of resources, and reduce the need for new infrastructure through expanded demand management, energy efficiency, renewable energy, distributed generation, and energy storage programs," Audrey Zibelman, chair of the New York Public Service Commission, said at the time REV was announced.

New York hopes that creating markets at the distribution level will help the state achieve the Governor's goal of cutting carbon emissions by 80 percent by 2050 and generating 50 percent of electricity from renewable resources by 2040.

The state is moving quickly, especially by utility industry standards. But the pressure is on. The initial demonstration projects to test new business models have been slow out of the gate; and utilities were given an extra six months to complete their distribution system implementation plans, which will be filed in June 2016.

Case Study: Consolidated Edison's BQDM

New York distribution utilities are not waiting for guidance from the PSC on how to craft new business models, or for which technologies to pilot in years to come as REV unfolds. The utilities are embracing the challenge to work with regulators and third-party vendors in new ways.

Shortly after REV was announced, Consolidated Edison filed a plan to defer the cost of building a $1 billion substation with investments at the grid edge. The Brooklyn/Queens Demand Management Program (BQDM) is a cutting-edge non-wires alternative project that will test some of the elements of REV. But it did not come about solely because of the REV process. Instead, BQDM is driven by a real need to rapidly meet the requirements of a changing city in new ways. Con Edison sees growing demand for electricity in certain pockets of the outer boroughs. Often the peaks are as late as 11:00PM in neighborhoods that are largely residential and small commercial.

Consolidated Edison will invest $200 million in novel customer-side load management programs, with an additional $300 million going toward more traditional utility investments to shed 53 megawatts of loads from specific neighborhoods in Queens and Brooklyn by 2018.

Most of the customer-side solutions involve energy efficiency and demand response. There is also voltage optimization and battery storage for load shifting. To get the right commercial customers involved, Con Edison has already hired a software vendor to get better results for targeted demand management.

The BQDM project may be the first example of New York utilities taking a cutting-edge approach to meeting future load growth – but it is not alone. As part of REV, all of the distribution utilities will have to file at least one non-wires alternative project that leverages distributed resources as an alternative to traditional grid investments.

Although BQDM is still being deployed, Con Edison has already filed for another non-wires alternative project in the Brooklyn neighborhood of Bensonhurst that will leverage similar resources as BQDM.

Non-wires alternatives can be a good way for utilities under various regulatory schemes to implement new technology and build new relationships with customers across different classes. At the same time, it can breed a symbiotic relationship between regulators and utilities as technology advances. While some state regulators are requiring utilities to increasingly look at non-wires alternatives, utilities can also be proactive in proposing these projects as a new way of doing business. Ultimately, this proactive approach can help utilities prepare as major technology shifts occur.

REV Demos

In New York, non-wires alternatives are only the beginning of the transformation. As part of REV, each utility was required to file demonstration projects in 2015. Unlike non-wires alternatives, the projects cannot be rate-based, nor can they be one-off technology experiments.

The exercise is meant to get utilities thinking about new ways of interacting with third-party vendors, customers and regulators in a more collaborative process. It is also intended to kick-start the evolution of ratemaking and test potential earnings mechanisms that the utilities and regulators may use in the future to assess the viability of a transition away from rate-based assets. Some are skeptical of the effectiveness of market-based earnings; others believe they are critical to establishing distribution-level markets with healthy third-party participation.

One potential earning mechanism could be a lead generator for companies that sell energy efficiency related products and services. Many of the utilities have launched some version of an energy marketplace that will offer tailored solutions for commercial or residential customers. Some are only slightly more robust versions of targeted efficiency programs that are already in place at other utilities. These marketplaces are being designed to allow utilities to test performance-based energy efficiency offerings, which are expected to replace rate-based energy efficiency programs in the future.

The first round of REV demos took longer to launch than anticipated. While trying to move quickly, regulators are also urging patience as stakeholders navigate this new world of collaboration. New York regulators are betting that the more the state's utilities design these pilots, the more success they may see in moving toward a new business construct that values distributed energy, and encourages entrepreneurial behavior. As New York regulators and utilities flesh out what will be included in the platforms, a far-reaching education campaign will be needed so that the legislature and general public understands what the costs and benefits are to this novel market construct.

THE DISTRIBUTED WORLD: CALIFORNIA

California has long been the U.S. leader in distributed solar and advanced grid planning. It is first in the nation in distributed solar, with approximately 5,000 MW of cumulative capacity installed through end of year 2015 - of which approximately 1,400 MW was installed in 2015 alone. Additionally, California has a target of 50 percent renewables by 2030.

In 2009, the California legislature first called for utilities to build smart grid deployment plans that outline the vision, deployment baseline and strategy to bring the grid into the 21st Century. But that was just a warm-up act.

Since then, the state's utilities and regulators have laid out roadmaps for performance-based energy efficiency, distribution resource plans (DRP) and modern demand response rules that allow distributed resources to take part in wholesale energy markets. The goal is not just to better integrate with existing markets, but to allow distributed energy resources to be a central part of future grid planning.

The DRPs are some of the most forward-looking plans in the U.S. utility market when it comes to valuing and integrating renewables at the grid edge. However, California already has levels of solar penetration that make every part of the process more controversial than it might have been if it was started sooner. Customers and third-parties are increasingly clamoring for clear rules on sharing data, participation in wholesale markets and more holistic rate design.

For starters, the utilities are building complex models on a handful of feeders. Pacific Gas & Electric has modeled all of its distribution feeders and analyzes them annually, while Southern California Edison started with 30 feeders that will be representative of the rest of its system. The goal of modeling feeders is to gain more detailed information about hosting capacity on feeders to better serve the interconnection process for distributed energy resources in the near term and work with third-parties to better site distributed resources in the long term.

California's three large investor-owned utilities have the advantage of having a strong advanced metering infrastructure in place. But far more investment

in distributed energy resources management systems, GIS and other analytics will need to occur in order to integrate distributed resources with distribution planning.

Ultimately, the DRPs are meant to value distributed energy at the distribution level for utility-planning and compensate them for being placed where they add value to the grid, much like New York is trying to do. But California is likely to stop short of the type of distribution market that New York's REV envisions.

In the near term, one of the biggest drivers for the continued growth of solar is the extension of California's net metering policy, which was upheld in early 2016. The extension delivered regulatory certainty to all stakeholders, but it is still only a multi-year stopgap before time-of-use rates kick in.

The details of the time-of-use rates which also fell under the proceeding have not been formulated, but the need to move solar and non-solar customers alike to rates that better reflect the cost/benefit of energy at certain times is necessary, and not just in California. Other utilities, such as Commonwealth Edison in Illinois, have also filed for dynamic pricing rates for all residential customers. Comprehensive time-of-use rates are one component to better capture the value delivered by distributed energy resources, but other components such as the benefits beyond avoided cost and the non-commodity portion of rates also need consideration.

The DRPs are still in early stages, but California's Demand Response Auction Mechanism (DRAM) already allows demand-side assets to be bid into the wholesale market. The price mechanisms hammered out in the early days of DRAM auctions could influence time-of-use or distribution-level market pricing in the future, as well as rules around net metering for assets participating in the wholesale markets.

As with other changes in California, customers are somewhat ahead of regulators. They are adopting distributed energy technologies with increasing speed (thanks to state promotion policies) and now regulators are trying to update utility rules.

Case Study: SCE Preferred Resource Pilot /Integrated Grid

Like non-wires alternatives proposed in New York, Southern California Edison's (SCE) Preferred Resources Pilot is meant to show how clean energy options can be leveraged in place of traditional generation in areas that are transmission-constrained because of the closing of the San Onofre Nuclear Generating Station (SONGS) in 2013.

SCE called for hundreds of megawatts of "preferred resources" – including behind-the-meter storage, automated demand response and distributed solar – as part of its 2,200 megawatt local capacity requirement needed to make up for the SONGS closure. The utility modeled each source against central power plants.

Preferred resources become even more valuable in certain locations. That's where the pilot comes in. By 2020, the utility expects to see transmission and distribution system constraints. SCE will test whether distributed energy resources can be called upon in an integrated fashion to meet local supply needs and avoid the need for traditional grid investment. Unlike DRAM, the pilot is not about bidding grid edge resources into a wholesale market; rather, the utility is sending the price signals in order to leverage resources for supply and balancing at the distribution level.

As part of the pilot, SCE also has its integrated grid project that models how energy storage, efficiency and demand response could be called upon to balance the load in areas where solar penetration is particularly high. The project is trying to identify the locational marginal price of assets at different times of day under different conditions on individual circuits. It is a difficult process and these are still the early days, but it will be necessary to move the statewide locational benefit methodology forward.

This project is not only about valuing distributed resources on a local level, but also ensuring they can be called upon to support substations in case of a significant loss of the costal transmission corridor, which was previously linked by SONGS. By taking a bottom-up approach, SCE hopes the modeling will influence distribution grid planning in the future.

MANAGING UNCERTAINTY: FAR-SIGHTED THINKING

For many utilities, regulatory changes occurring in states like California, Hawaii and New York may appear far off from their own backyard. But 46 states in the U.S. took some type of policy action on distributed energy in 2015, and some of those actions revolve around increasingly complex issues and not just solar PV. Texas, New York, Minnesota and California are just some of the states that have already launched regulatory proceedings that look at distributed energy beyond just solar.

Utilities should consider establishing a "no regrets" planning protocol, no matter the coming technology changes or regulatory shifts. It begins with a robust strategy that considers probable, possible and preferred future outcomes.

Each of those scenarios will look vastly different for each utility, given current and near-term adoption of distributed energy resources in the utility's specific region. Other forces, such as commodity prices, are also highly volatile and should be modeled based on various outcomes, especially those that are low-probability but high-impact for the utility.

The exercise is not about trying to guess the future, but rather applying individual lenses for each future scenario, especially in the next five years. Simply focusing on the near-term volatility and having strategies to adapt can be a challenge for utilities that have traditionally planned for assets on a decades-long scale.

Planning for a future with increasing uncertainty also means taking a more holistic view of how each outcome will affect all parts of the utility's business, from customer relationships to revenues to existing and planned assets.

MANAGING UNCERTAINTY: ENTREPRENEURIAL POLICYMAKING

No matter the current regulatory regime or rate of distributed energy resource adoption, utilities can benefit from being proactive and not hesitating until massive change is at their doorstep. In many cases, utilities may not ultimately be best served by preserving the status quo.

Instead, utilities might consider fostering an entrepreneurial spirit within their regulatory construct. Once the utility has defined a preferred future for its customers and other stakeholders, it could attempt to get just far enough ahead of technology innovation to support its preferred future. Ideally, that future would allow the utility to innovate at the speed of technology evolution.

A critical component is having a proactive and open dialogue with regulators. This is much better than a relationship in which regulators prescribe actions and outcomes to utilities. An entrepreneurial mindset is not just about taking more risk, but also rethinking how every piece of the business operates and how the regulatory process functions.

As utilities take incremental steps toward regulatory and technology change, they should also evaluate what sort of capabilities – from data analytics to visibility on the distribution grid and at the grid edge – would best serve a preferred future. Some of those investments, such as advanced metering infrastructure, can help the utility embrace future regulatory changes and build more innovative offerings at the grid edge.

BECOMING THE INNOVATOR

Utilities will always be tasked with providing safe, reliable and affordable electricity. The methods to achieve that mandate are changing. As cleaner, low-carbon and distributed generation is increasingly added to that regulatory compact, utilities have an opportunity to help rewrite the rules on power generation and delivery in the 21st Century.

The shift doesn't need to be contentious. If done correctly, everyone can benefit. New York and California offer glimpses of what is possible, with many more variations to come, especially because most states do not have their own independent system operators at the wholesale level. By taking an entrepreneurial approach to the regulatory process, utilities have an opportunity to craft a framework that supports their preferred future.

Entrepreneurial risk-taking for utilities does not have to jeopardize the reliability of the grid itself or the fiscal status of the utility. Incremental progress and innovation can go hand in hand. Regulatory foresight should be viewed as a strategy to embrace the future, thinking outside the box, and engage with regulators, customers and third-parties in new ways. Utilities will also need to weigh the risks of moving too far ahead of technology adoption with the risk of moving too slowly and being guided by market forces far beyond their control.

Fortunately, there is a middle road. By understanding the range of risks, utilities can map a future that will strengthen their business model and bottom line – even while technology and market changes occur faster than ever before.

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