



Evolving the Business of Energy

Jill C. Anderson

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May 2016

Evolution not Revolution



Leveraging Customer Contributions



Bronx Boys & Girls High School, 505kW Solar

Increasing Efficiency & Resiliency



NYC skyline during Hurricane Sandy blackout

Opening Distribution Markets



NYISO Control Room Source: NYISO

Guiding Regulatory Change



Learning More: ny.gov/REV4NY

Con Edison

Clean Virtual Power Plant; Building Efficiency Market Place; CONnectED Homes Platform

Central Hudson

CenHub – Your CenHub

Orange & Rockland

Residential Customer Marketplace

National Grid

Fruit Belt Neighborhood Solar; Market Engagement Model; Resiliency; Customer Convenience

Rochester Gas & Electric and NY Electric & Gas

Flexible Interconnect Capacity Solution; Energy Marketplace; Community Energy Coordination

New York's regulatory initiative, Reforming the Energy Vision (REV), aims to reorient both the electric industry and the ratemaking paradigm toward a consumer-centered approach that harnesses technology and markets. REV will establish markets so that customers and third parties can be active participants, to achieve dynamic load management on a system-wide scale, resulting in a more efficient and secure electric system including better utilization of bulk generation and transmission resources. As a result of this market animation, distributed energy resources (DER) will become integral tools in the planning, management and operation of the electric system. The system values of distributed resources will be monetized in a market, placing DER on a competitive par with centralized options. Customers, by exercising choices within an improved electricity pricing structure and vibrant market, will create new value opportunities and at the same time drive system efficiencies and help to create a more cost-effective and secure integrated grid.

The more efficient system will be designed and operated to make optimal use of cleaner and more efficient generation technologies. Weather-variable renewable resources will be made more economically efficient by increased use of load control, smart devices, and storage. The values of customer-sited generation – both reliability and environmental – will be recognized in markets. The system will encourage substantial increases in deployment of these technologies. Enabling these markets will require modernization of infrastructure and operations, particularly communication and data management capabilities. The result will be an increase in the efficiency, responsiveness, and resilience of the system, with reductions in costs and carbon emissions, and increases in customer value.

The reformed electric system will be driven by consumers and non-utility providers, and it will be enabled by utilities acting as Distributed System Platform (DSP) providers. Utilities are responsible for reliability, and the functions needed to enable distributed markets are integrally bound to the functions needed to ensure reliability. Technology innovators and third party aggregators (energy service companies, retail suppliers and demand-management companies) will develop products and services that enable full customer engagement. The utilities acting in concert will constitute a statewide platform that will provide uniform market access to customers and DER providers. Each utility will serve as the platform for interface among its customers, aggregators, and the distribution system. Utilities will respond to new trends by adding value, thereby retaining customer base and the ability to raise capital on reasonable terms. Simultaneously the utility will serve as a seamless interface between aggregated customers and the NYISO. The NYISO will be able to reflect the impact of active load management in grid planning and operations, and the wholesale supply markets will evolve to properly value dynamic load management. The objective of system optimization extends beyond the physical integration of distributed resources.

Reforming the Commission's ratemaking practices will be critical to the success of the REV vision. Under current ratemaking, utilities have little or no incentive to enable markets and third parties in creating value for customers. Rather, utilities' earnings are tied primarily to their ability to increase their own capital investments, and secondarily to their ability to cut operating costs, even at the expense of customer value. Utility earnings should depend more on creating value for customers and achieving policy objectives. Rather than simply building infrastructure, utilities could find earning opportunities in enhanced performance and in transactional revenues.

The Commission will not be alone in the design and development of the reformed electric system. This will occur over a period of years through the mutual efforts of industry, customers, non-governmental advocates, and regulatory partners. The implementation of REV will occur with reference to, and informed by, related initiatives throughout the industry.

References

Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, *Order Adopting Regulatory Policy Framework and Implementation Plan*, issued and effective February 26, 2015.

Whoa!

- ◆ **REV will “... help meet threats posed by aging infrastructure, more frequent extreme weather events, greenhouse-gas-driven climate change, and growing dangers to our physical and digital security.”**
- ◆ **“REV promises to make energy a win-win – for the first time in history.”**
- ◆ **Fire, steam power, the internal combustion engine, electricity itself? Were these mere single “wins” in energy?**

Value Proposition Sanity Check

- ◆ BAU (business as usual) utility revenue plus REV value added should exceed total customer payments under REV to utilities and new entrants.
- ◆ In other words, REV-world total benefits need to exceed REV-world total customer costs.
- ◆ NY assumes this will occur – *there is no showing that this is a reasonable assumption.*

What the People Want

- ◆ Electric utility customers want safe, reliable, reasonably priced electricity.
- ◆ There is little indication that customers want the complexity of a REV world.
- ◆ REV analogy to information-based networks like the internet is fundamentally flawed.
- ◆ Value proposition of those networks is diversity of choices and participants, whereas retail electricity is incredibly and inherently *homogenous*.

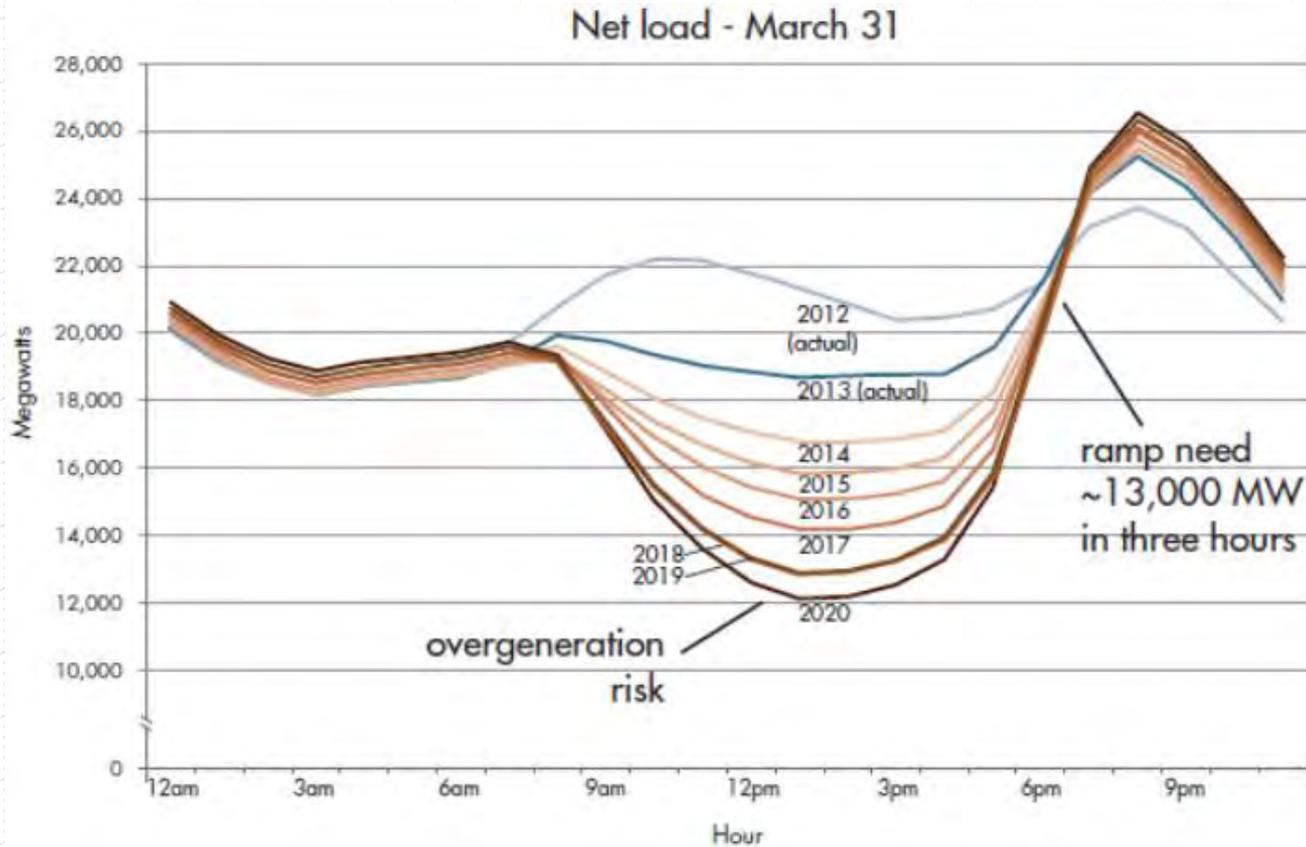
REV Claimed Drivers

- ◆ Some REV elements, like energy efficiency, demand response, and dynamic pricing, do **not require a “distribution system operator”** or equivalent.
- ◆ REV assumes need to accommodate a proliferation of two retail products:
 - Home solar.
 - Home batteries.
- ◆ Wrong on both counts.

Home Solar: Lessons from the West

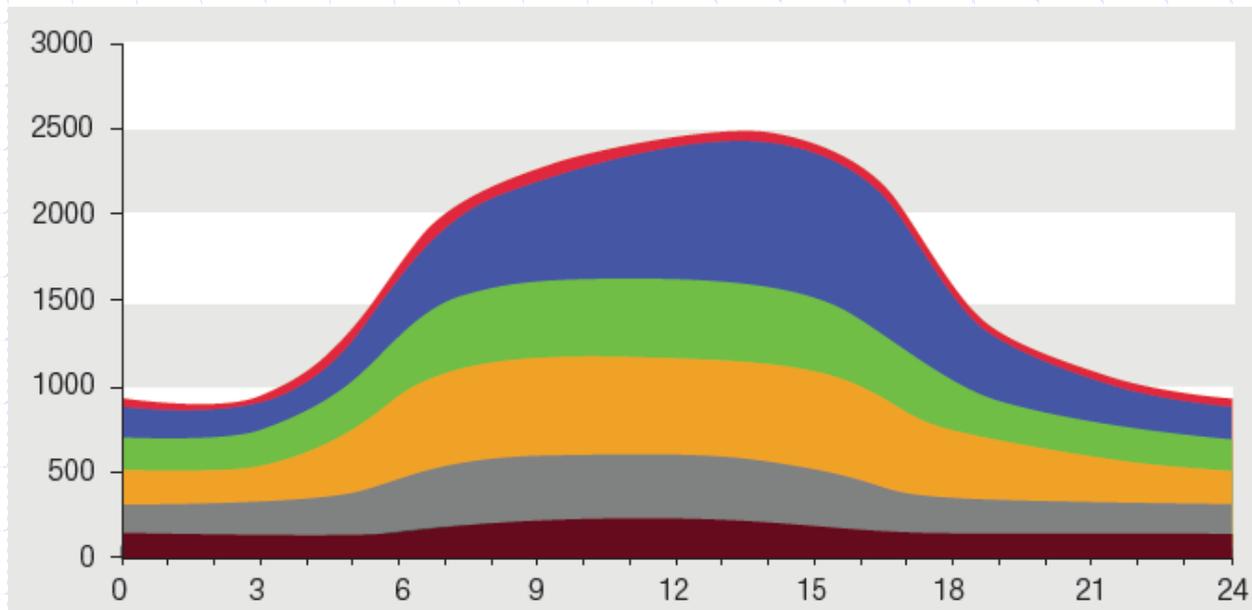
- ◆ Home solar dramatic growth in California due to its high rates, rate design and net metering.
- ◆ Net metering effectively provides distribution and storage services for free.
- ◆ **Growth in home solar is creating the “Duck Curve” with low “net load” in the afternoon to be met by traditional generation, and high “net load” in the evening.**

California's Duck Curve



California Responds with Storage

California to spend billions on storage, including behind-the-meter batteries that will shave afternoon peak demand (shown below) -- making the Duck Curve *worse*.



And Distribution System Expansion

- ◆ California to expand distribution system for new bi-directional flows due to home solar – but home solar was supposed to *reduce* distribution system costs.
- ◆ **In NY parlance of “LMP+D,” “D” is *negative*.**
- ◆ Estimated distribution expansion costs for Southern California Edison system to accommodate more home solar are two and a half times per kw what utility-scale solar itself would cost to provide same amount of solar.

Home Batteries: The Powerwall Follies

- ◆ Elon Musk announced the Powerwall home battery with great fanfare a year ago.
- ◆ The backup version was quietly abandoned earlier this year.
- ◆ The daily cycling version makes no sense with a payback period measured in decades in Australia, which has retail rates double those of the States.
- ◆ **BTW, it's not green.**

Other Hang-ups

- ◆ Making competition work requires competitors.
- ◆ But New York seems to be discouraging new entry into power markets:
 - Requiring retail marketers to guarantee lower prices than future default prices of the utility.
 - Seeking to close an economic nuclear plant (Indian Point) and keep an uneconomic nuclear plant open (FitzPatrick).

Demonstration Projects Not Promising

- ◆ **New York PSC said that utilities wouldn't be able to maintain conflict of interest by ownership of distributed energy resources, but that's what has happened so far.**
- ◆ Consolidated Edison getting \$14 million subsidy to install uneconomic home solar/storage units at \$7,900/kw.
- ◆ Niagara Mohawk getting \$4 million subsidy to install home solar units at \$7,600/kw.
- ◆ Private sector installs for \$3,500/kw.

Conclusions

- ◆ No demonstrated value added from REV, theoretical or empirical.
- ◆ **REV elements with potential value don't** require a REvolution.
- ◆ Home solar and home batteries lack economic justification (rely on subsidies from others).
- ◆ **NY's demonstration projects run by utilities at** uneconomic expense requiring large subsidies.
- ◆ REvolution. You can count me out.



Thank You!

Fortnightly **article on New York's REvolution** available here,
<http://www.energy-counsel.com/docs/You-Say-You-Want-a-REvolution-Fortnightly-February2016.pdf>.

Fortnightly **article on California's Duck Curve and policies** available here,
<http://www.energy-counsel.com/docs/just-ducky-fortnightly-april-2016.pdf>.

Fortnightly's Spark article on the Powerwall available here
(update forthcoming in *Fortnightly's May 2016 issue*),
<http://www.energy-counsel.com/docs/That-Old-Musk-Magic-Fortnightly-Spark-May2015.pdf>.



You Say You Want a REVolution

It's difficult to assess the REV promise because it's difficult to figure out what REV is really about

BY STEVE HUNTOON

Let's be honest. Does anyone know what New York's REV ("Reforming the Energy Vision") really is? Other than the most hyped regulatory initiative since California restructuring some 20 years ago?

Ken Munson of Sunverge Energy, writing in *Fortnightly's Spark*, says it will "... help meet threats posed by aging infrastructure, more frequent extreme weather events, greenhouse-gas-driven climate change, and growing dangers to our physical and digital security." What, not world peace?

And this: "NY REV promises to make energy a win-win -- for the first time in history." So fire, steam power, the internal combustion engine, electricity itself -- were these mere single "wins" in energy? Whoa!

It's difficult to assess the REV promise because it's difficult to figure out what REV is really about. The goals are lofty -- and commonly shared. The means are murky. Acronyms and visions abound, but there is no clear roadmap or even a clear destination. What is it that makes REV different from all other initiatives to "promote energy efficiency, grid security and resiliency, greater use of renewables (cleaner air), and wider deployment of distributed energy resources"?

We all understand that utilities make more money by selling more electricity and thus do not have incentive to sell less electricity. That's a given and is being given attention across the country under the term "decoupling."

But REV is promising so much more. Somehow the utility will be transformed into an entrepreneur with opportunities to make money in other

"NY REV promises to make energy a win-win -- for the first time in history." So fire, steam power, internal combustion engine, electricity itself -- were these mere single "wins" in energy?

ways to cover lost revenue in traditional service. Exactly how? And assuming it does so, where is the "extra" revenue going to come from that will compensate new entrants offering new, competitive services?

At the end of the day "business as usual" utility revenues plus REV value added must exceed total customer payments under REV to utilities and new entrants. Otherwise the whole thing doesn't make sense. And this same prerequisite of incremental value exceeding incremental cost should

apply to every REV element/program. But there is no recognition of this fundamental benefit > cost consideration in the REV construct.

REV's analogy to other networks is a stretch. The value proposition in networks is two-fold: (1) the diversity of choices; and (2) the increased value to network participants from more network participants. In the case of electricity, there is very little way to differentiate basic electric service: Electric wires can only deliver electric energy -- not endless information (Google), endless goods (Amazon), endless travel (Travelocity), endless videos (YouTube), endless music (Spotify), and endless tweets (Twitter).

Retail electricity is incredibly and inherently homogenous. It only comes to your home through three wires delivered at 120/240 volts, 60 Hertz AC. Sure there are different ways to generate electricity but it's all the same stuff delivered to your home.

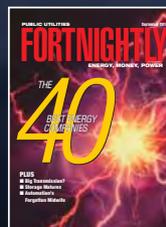
Steve Huntoon is the principal of Energy Counsel, LLP. Mr. Huntoon is a former President of the Energy Bar Association, and for over 30 years of practice in energy regulatory law he has advised and represented such companies and institutions as Dynegy, PECO Energy (now part of Exelon), Florida Power & Light (NextEra Energy), ISO New England, Entergy, PacifiCorp, Wiliston Basin (MDU Resources) and Conectiv (now part of PHI).



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Even if you generate some yourself, or store some yourself, it's still converted to 120/240 volts, 60 Hertz AC for delivery at your circuit breaker panel. And long before REV you had the options to generate and/or store electricity. It's rare to do so because -- absent subsidies like net metering -- the fundamental economics of distributed generation and of storage remain poor. REV can't change the fundamental economics.

When it comes to putting bells and whistles on this homogenous product, we saw that movie long ago. Remember Enron's New Power, PECO/Utility-Corp's EnergyOne, and Conectiv? These were aggressive attempts to sell packages of services around electricity, and they all failed. Causes of death varied, but one common element was

the difficulty of adding value to a homogenous product.

So if the REV vision doesn't hang together, what can we expect? Despite the NY Public Service Commission (NY PSC) assurance that the utilities won't be owning/controlling potentially competitive distributed energy resources (DER), that's exactly what they propose to do. And despite the NY PSC's assurance that REV will result in fewer costs socialized among all customers, when proposed projects don't make economic sense, the necessary subsidies can only come from one place -- all other customers.

The chosen REV demonstration projects are not promising. There will be utility-controlled customer education, website and aggregation

programs. Potential DER providers won't get access to the customer data needed for any real progress towards an REV vision.

As for physical projects, ConEd will receive a \$14.2 million subsidy to install 1,800 kw of uneconomic residential solar/storage units, which is \$7,900/kw. Niagara Mohawk will receive a \$3.8 million subsidy to install 500 kw of uneconomic residential solar units, which is \$7,600/kw. Meanwhile the private sector installs residential solar units at an average cost of \$3,500/kw (GTM Research), so the REV demonstration projects at least demonstrate one thing: Utilities shouldn't be running residential solar programs.

REvolution. You can count me out. **PUF**

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REV PANEL DISCUSSION

Is REV fundamentally different in its component elements from other initiatives being developed elsewhere? Is REV different in kind, or only in degree?

- REV proposes to apply the Independent System Operator (“ISO”) model that has been successful at the wholesale/transmission level to the distribution level.
- The idea of applying the ISO model to the distribution system is not unique to REV:
 - There are other visions for a Distribution System Operator (“DSO”) being developed in other states and countries.
- REV differs from other visions
 - Most prominently, REV is unique because of the decision of the NYPSC to limit utilities to a DSO role and prohibit them from owning distributed assets.

LMP + D. What is the value of D? What does it include? Is this fairly reflective of actual underlying costs and benefits?

- “D” is meant to incorporate the “full range of values provided by distribution-level resources.”
- The value of “D” is always changing, depending on the current configuration of the distribution system and the current demand. At present, there is no mechanism for adequately representing this kind of changing value.
- This is one reason why FERC opted for a DR compensation model that paid DR providers full LMP for energy. Such a system effectively sets “D” at the retail price of power, which can overcompensate DR providers:

How will REV products and services be accounted for in system planning, commitment, and dispatch?

- This is essentially the same problem as the value of “D:”
 - The value of DER assets is dependent on multiple factors that change with grid configuration and demand.
- However, distribution utilities are in the best position to account for these products and services, because of their experience with the local grid and its operation

- The distribution utility is in the best position to determine whether it is more economical to add DER resources or upgrade a feeder line, or whether grid stability will improve more if DR is dispatched as opposed to bringing in more power from the transmission grid.
- The REV construct limits the extent to which utilities can bring this expertise to bear

What will REV mean for the calculation of the Installed Reserve Margin?

- If REV is successful, it will result in a decrease in the required installed reserve margin, because there will be more resources available, and those resources will be more flexible than traditional generation.
- The problem will be getting sufficient REV resources installed, and ensuring that those resources are adequate substitutes for traditional resources.

What implications does REV have for cybersecurity? What implications do cybersecurity threats have for REV programs?

- Because all of the DR/DER providers will be networked together, the entire distribution grid will only be as secure as its least security member.
- Strict security requirements need to be imposed and should not be relaxed to engage new resources.

REV is built around the concept of a utility-operated DSO. Others have argued that an independent DSO – like an ISO/RTO at the distribution level – would be the better model. What are the advantages and disadvantages of each? Considerations include market power issues, effective wholesale market integration, and reliability factors.

- A utility-operated DSO is a challenging solution.
- A utility confined to a DSO role has minimal growth potential. Thus, a DSO will have a challenge finding investors, and will face significant transition challenges to becoming a services entity.
- An independent DSO is an alternative model
 - A regional DSO would need to develop the expertise required to operate multiple distribution systems.
 - Local DSOs would require converting existing utilities into non-profit entities.
- Another alternative is to keep the “DSO” within the current utility model; the utility operates its own system, but is also allowed to invest in DER and DR:
 - The use of RFPs can help address competitive concerns.

What are / should be the performance metrics for DERs?

- In the narrow sense, DERs need to perform according to contract, or pay penalties, like any other resource.
- In a broader sense, however, there needs to be a mechanism established to determine which solutions are best in which situations. So, prior to an upgrade, there needs to be a process to evaluate different DER and traditional options.
- For example, a system of RFPs could be set up to determine how to handle feeder or remote substation upgrades with both traditional and innovative solutions competing to solve the problem at the lowest price:
 - The results from these RFPs will allow regulators to build a database of solutions that can then be relied upon in the future when evaluating which proposed utility investments should be made, where and when.

What are the essential conditions to REV's success? What are the keys to communicating the potential benefits of REV to consumers? Is there an end-user demand for this?

- REV success ultimately will be measured by its bottom line—lower consumer costs.
- Obviously, achieving lower costs requires a clear set of goals, and mechanisms for lowering costs.

REV has gotten a lot of national attention. What else is going on out there that we should be watching?

- Two examples: KCP&L is making its customers its partners, while investing in the demand side itself with the support of its regulators.
- Tucson Electric has a community solar program that allows all customers to benefit from locally generated solar power.
- Many utilities in the US and the rest of the world still operate in a vertically-integrated world. There are innovative approaches taking place within the traditional utility model as well.

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ELECTRIC
PERSPECTIVES

Great Plains Energy's
Terry Bassham:

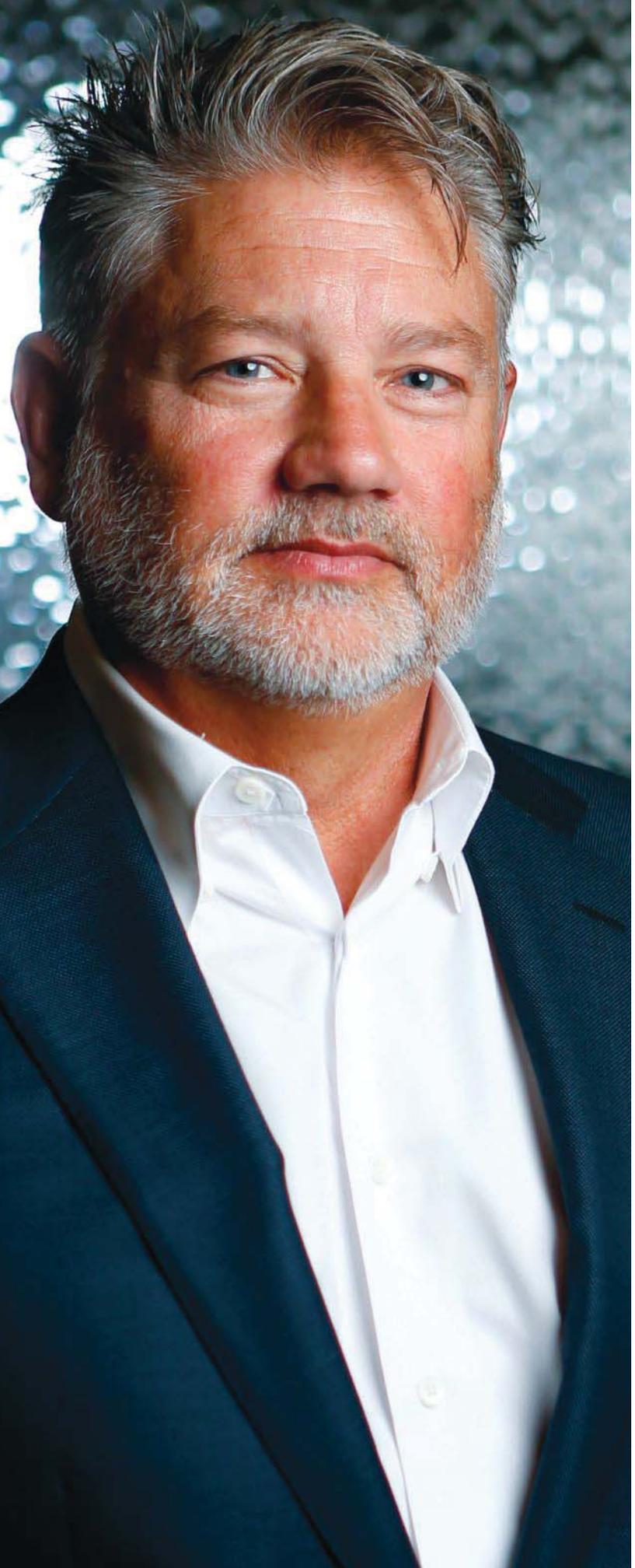
Transforming Customers into Partners

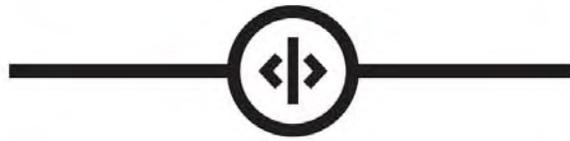
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The Promise of Tomorrow:
2016 Energy Industry Outlook

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Innovating for the Future





Transforming Customers into Partners

By Terry Bassham

*Chairman and CEO, Great Plains Energy
and Kansas City Power & Light*

By building stronger demand-side connections—with our customers and grid-edge resources—we can transform today's challenges into opportunities for grid optimization and improved utilization.

There's no question that the electric utility industry is in the midst of redefinition and change. Today is the beginning of a new era in grid modernization and a fundamental shift where customers and technology are pushing the limits of our historical business and regulatory models.

For more than 100 years, investor-owned electric utilities that plan, build, and run the distribution grid have operated under a straightforward regulated system. This model is predicated on reliability and cost-efficiency, and it has worked well. The pricing model is simple: Investment plus cost of operations divided by customer usage. Investors understand it. The result? One of the most reliable infrastructure systems in world history.

Now, the system is evolving and future success will be defined differently. Demand for electricity has softened; we are seeing increased adoption of distributed generation; and customers expect much more than just affordable and reliable electricity. To be successful in this new paradigm, our business and regulatory models must transition to meet these expectations. >>

Future success means embracing big data, automation, and interactivity—especially on the demand side, where customer-owned, grid-edge resources have made the distribution grid increasingly unpredictable. It also means continuing to adopt clean power and energy-efficiency practices—not only because policy is dictating it, but because our customers are, too.

These changes lead to inevitable questions about who will pay, who will benefit, and, most important, how we will continue to ensure reliable and affordable energy during this evolution. And, we need to do this while meeting and exceeding investor expectations.

At Kansas City Power & Light (KCP&L) we believe that—as a utility and as an industry—utilities are best positioned to mold the grid of the future in ways that capture the most value and that benefit all stakeholders. Unlike new entrants to the electric generation and distribution space, utilities do not optimize to one business model, solution, or technology. Rather, we optimize in favor of our obligation to serve all customers fairly and reliably. We firmly believe that the utility is best suited to drive these changes to ensure the most desirable societal outcomes in partnership with both our regulators and our customers.

Part of our strategy focuses on testing and proving customer programs via targeted projects and technologies that align with the philosophy of empowering customers and optimizing the grid. By embracing a vision of the future that chooses to think of integrating

grid-edge resources as an opportunity (instead of a threat), and customers as partners (instead of obstacles), we can optimize grid utilization and continue to deliver affordable, clean, and reliable power for the long haul. Our ultimate goal? To demonstrate that electric utilities are best positioned to maximize the total value of an optimized grid—from generation to consumption—and to create the platform for implementing the grid of the future.

Early History: Electrify and Build

In order to understand the future, it is critical that we remember the amazing journey we took to get here—and what has led us to this critical point in the grid's history.

In 1882, when Thomas Edison energized Pearl Street Station, he could not have predicted the dramatic game-changing impact that electricity would have on industry and our lives. From that day on, mankind has worked to convert most of its machines and technology to operate using electricity. This trend continues today, with surface transportation increasingly moving to electricity as the fuel of choice. From factories and trains to telephones and computers, our entire existence has become 100-percent reliant upon the secure, reliable, and affordable delivery of electricity. While that is a positive for our industry, it carries with it tremendous responsibility and scrutiny, and makes us a target for third parties who want to access the system itself and the invaluable data generated by operating it.

The electrification of nearly everything has led to a second major historical trend: consistently growing demand. To address this growth, our solution as an industry has been simple: build more central generation and distribution to serve this increasingly diverse load. We have built to supply increasing demand and to create reserves and redundancy to improve reliability. We build and build and build to serve a peak demand number (plus 12-percent reserves) that may only occur once in 20 years.

The unintended consequence of always building to accommodate peak is low system utilization. In fact, across the United States, total system utilization averages 43 percent. This provides for great reliability, but our assets are underutilized in comparison to most other industries.

Fundamental Industry Shifts

With flat, or even declining, overall demand, the shutdown of aging fossil-based resources, and increased environmental pressures, we are now faced with the same optimization, automation, and “lean” redesigns that most other industries already have been through. Let's take a brief look at some of the fundamental shifts shaping our industry.

Coal plants are retiring. Across the United States, more than 25,000 megawatts (MW) have been retired since 2009, with that much more expected before 2022. The Energy Information Administration predicts 90 gigawatts (GW) of retirements before 2040—most happening before 2020 and much of which is driven by the Clean Power Plan. At KCP&L, we have announced more than 700 MW of our own coal plant retirements by 2021.

Renewables and distributed generation are positioned to be a real part of the mix. Renewable energy

At KCP&L we believe that—as a utility and as an industry—utilities are best positioned to mold the grid of the future in ways that capture the most value and that benefit all stakeholders.

sources have been dominated by large-scale wind, but now smaller-scale renewable resources are increasingly cost competitive and are a bigger part of the nation's energy supply. As just one example, according to GTM Research and the Solar Energy Industries Association, solar surpassed 20 GW of "total operational solar photovoltaic capacity" in the United States by the middle of 2015. And according to a Deutsche Bank study, solar energy will reach grid parity in 36 states by 2016. In our service territories in Missouri and Kansas, we estimate that solar generation will reach grid parity before 2020 for many of our residential and commercial customers.

Strained, aging assets require investment. While load growth has been fairly level since 2008, the distribution grid is still faced with major constraints—whether from pockets of load growth on certain feeders, the addition of distributed generation, or simply due to age. Seventy percent of the U.S. grid's transmission lines and power transformers have been around more than 25 years, while the average power plant is more than 30 years old.

However, it is clear that we cannot replace this infrastructure holistically. Cost pressures, third parties with alternative solutions, environmental concerns and regulations, as well as shifting customer expectations, all point to an evolution in the way we approach maintaining and operating the electric distribution grid. Optimizing our current and future investments with a focus on these new realities will be crucial to our future success as an industry.

The great customer divide. Today a multitude of forces are driving separation between utilities and our customers. Policies incentivizing distributed generation,

All of these changes have joined forces to fundamentally alter the face of the distribution grid—from a one-way system to an emerging two-way system, with multiple points of entry into the grid.

coupled with declining costs of solar, have led customers to heavily adopt their own generation. Commercial and industrial customers across the nation are entering into their own power purchase agreements (PPAs) with renewable energy providers and pressuring state policymakers to further open access to third-party renewable providers. In fact, according to the American Wind Energy Association's annual report, more than 1,700 MW of wind PPAs were from private-sector, government, or educational institutions in 2014. And many program-centric third-party companies have built entire business models around serving as intermediaries between utilities and their customers, creating even larger challenges.

All of these changes have joined forces to fundamentally alter the face of the distribution grid—from a one-way system to an emerging two-way system, with multiple points of entry into the grid.

Modern History: Connect, Interact, and Balance

So what does this new era or next evolution of our industry look like? Amidst myriad options, there is one thing almost everyone agrees on: We must transform our grid from a one-way system to a new and dynamic two-way system. We must integrate grid-edge resources securely, reliably, and affordably. Many new players will want to offer products and services to our customers and connect them to our grid. Utilities

will be responsible for managing a much more complex and distributed grid than ever before.

As we transform the grid, the solution to many of our challenges resides on the customer side—which is essentially an untapped "Wild West" rich with capacity and resources that can be harnessed and leveraged to create broad, sweeping benefits. Rather than building up the supply side, we will begin building stronger demand-side connections—with our customers and grid-edge resources—to transform today's challenges into opportunities for grid optimization and improved utilization that Thomas Edison and his colleagues never could have imagined.

KCP&L's Clean Charge Network

A perfect example of what we're trying to achieve as an industry in customer-focused grid modernization and system utilization is our Clean Charge Network. KCP&L is investing more than \$20 million to build out a network of electric vehicle (EV) charging stations throughout the Kansas City region. As a part of this project, we are installing and operating more than 1,100 EV charging stations that will be capable of supporting more than 12,000 EVs. The stations are manufactured by ChargePoint and will be part of the ChargePoint network of more than 20,000 charging spots in North America. Installation of the charging stations began in January 2015 and will be completed this summer.

Connecting to our transportation system brings high-margin load growth that will help us make up for demand lost from other aspects of grid modernization like energy efficiency and distributed renewable energy.

The charging stations are being installed strategically throughout our service region, ensuring there will be a charging station near where EV owners live and work. We are partnering with local companies to serve as host sites for our Clean Charge Network. The host companies will not charge anything to locate the stations on their property. In return, we are providing the entire infrastructure at no cost to the host. Most of the charging stations currently installed in our service territory are behind our customers' meters. In contrast, our Clean Charge Network stations are being installed as part of our distribution grid infrastructure. We are filing for recovery of the capital and operating costs of the Clean Charge Network in base rates.

The Clean Charge Network illustrates how utilities should approach investing in the modern grid era. Not only does it embrace technology, customer expectations, and system optimization, but it begins to help redefine the policy conversation around the utility's emerging role. Developing and deploying the Clean Charge Network will demonstrate six areas of customer and public benefit:

- beneficial electrification coupled with more efficient grid utilization;
- improved environmental sustainability;
- local economic development;
- increased customer programs and interaction;
- lower costs through large-scale purchasing and planning; and

- proactive policymaking both at the regulatory and legislative levels.

There is growing pressure to better utilize the system we already have built without adding new capacity. Electric transportation is one of the best opportunities to do this. The Clean Charge Network is our effort to spur the electric transportation market in our region. Connecting to our transportation system—the last sector of the economy that is not electrified—brings high-margin load growth that will help us make up for demand lost from other aspects of grid modernization like energy efficiency and distributed renewable energy.

As more drivers adopt EVs, we will see more efficient use of the electric grid through increased electricity sales during off-peak times, spreading the cost of operating and maintaining the electric grid over increased usage.

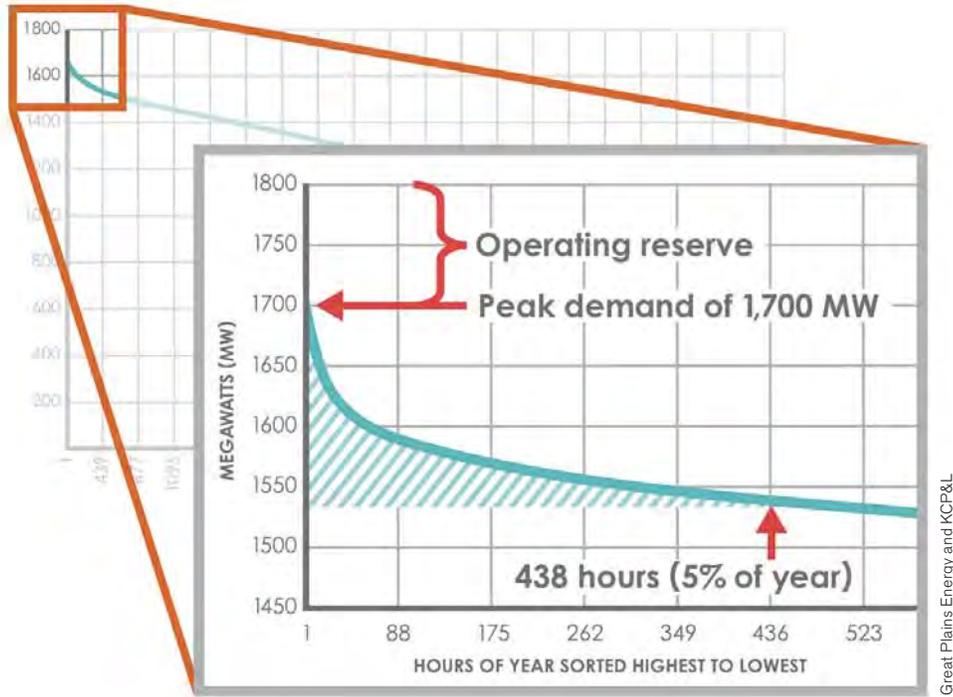
In addition, this project proactively demonstrates for policymakers the merits of utility primacy in planning, building, and operating the grid. It also serves as a showcase for the knowledge and value utilities can bring to integrating new customer-facing technologies into the grid. For example:

- This project generates multiple environmental and health benefits by reducing tailpipe emissions. EVs and plug-in electric hybrids reduce ozone-depleting emissions and help meet regional ozone standards. They also can be counted toward

carbon dioxide reduction as part of state compliance with the Clean Power Plan and eliminate many other pollutants categorized by the Environmental Protection Agency.

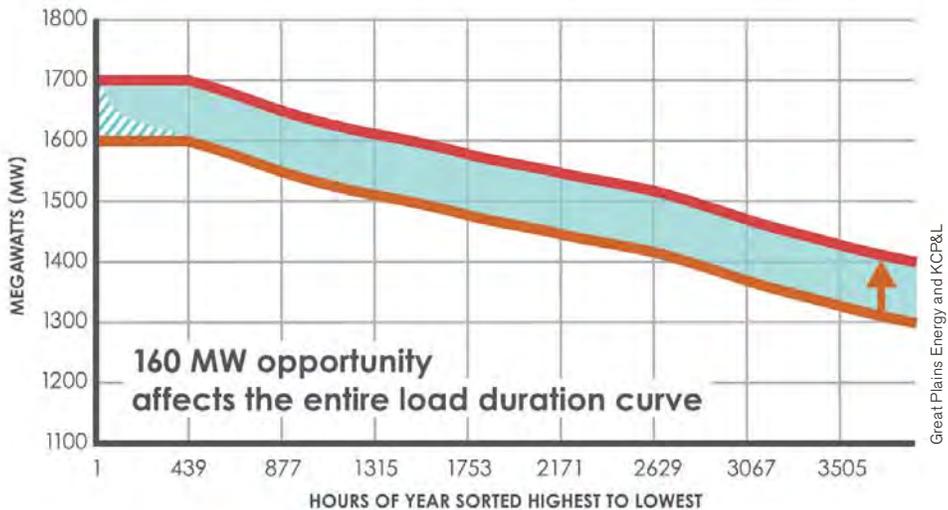
- The Clean Charge Network will spur regional economic development by attracting business and talent as well as by increasing household spending on local goods and services by reducing out-of-pocket costs for our customers on fuel and maintenance for their vehicles. We believe it will attract auto industry, EV industry, and battery and charging station companies to our service territory and has served as a proof point for the innovative projects many utilities are undertaking today.
- With more than 1,100 EV charging stations installed across our service territory, there is a unique opportunity to offer network-enabled programs for demand management, time-of-use rates, and vehicle-to-grid battery storage and discharge.
- We own and operate the Clean Charge Network, and just through the scale of this project, we already have reduced charging station installation costs by nearly 50 percent in our region. This will spur customer deployment of charging stations in our area and will result in a more robust system than one entity could create by itself.
- Beyond cost, design benefits gained from the installation and operation of charging stations as part the electric grid include the streamlining of infrastructure through central design, enabling easier expansion, and creating one unified customer experience and payment standard. While we own and operate the Clean Charge Network, we could not implement it without partnering with technology companies.

Figure 1: Load-Duration Curve



160 MW opportunity

Shaving the top five percent of the load-duration curve could improve distribution system utilization by nearly 19 percent.



19% increase in system utilization

Innovari's IEP provides automation, intelligence, and control to the farthest reaches of the distribution grid, resulting in real-time and two-way verifiable feedback for KCP&L.

By partnering with customers and gaining this control for 400–500 hours per year, not just for 20–40 hours of emergency scenarios, we have the potential to change everything about the way our system can operate.

ChargePoint handles the network operations, has designed a customer-centric interface, and has built into the network the capability for demand response and other load-management functions. We are supporting their business with our platform. Furthermore, we received support from car companies, environmental organizations, and a host of other stakeholders who were excited to see the utility lead an innovative project in our community.

The Clean Charge Network is a new grid technology that extends to the customer side of the meter. We are building support for the regulatory approval needed to rate-base this investment. The Missouri and Kansas Commissions have opened exploratory dockets, and we will make our case.

Projects like the Clean Charge Network are not without regulatory risk. Often such projects involve grey areas of unsettled regulatory policy—investments or operations that are not expressly prohibited but may exceed what many stakeholders view as the traditional or settled role for electric utilities. Many times such projects are met with misgivings or outright opposition by stakeholders such as consumer groups, environmental organizations, regulatory staffs, and non-regulated companies. This can result in negative media attention and protracted regulatory proceedings. As an industry, too often we avoid these risks and decide not to do the project without clear authority under current policies.

Electric utilities need to keep pushing the envelope. Through our Clean Charge Network and projects like it, we are defining what we think should be included in the definition of the modern, reliable, and resilient grid. We also are describing both the utility role in and value to that system. We have to build the future we want to see. Our industry needs to lead by doing. The Clean Charge Network is not a theoretical argument but rather an up-and-running concrete project that allows all stakeholders to evaluate and prove benefits while defining the role utilities should play in operating the grid of the future.

The Innovari Interactive Energy Platform

To truly optimize the distribution grid and integrate solutions that third-party companies have and customers want, we must embrace the edge of the grid beyond our meter as an integral part of the solution. Integrating generation and electric devices on the customer side of the meter, as well as taking a closer look at influencing customer behavior, are where the ultimate solution for a more efficient and reliable grid lies. But to achieve that goal, we must be able to see past the meter and to the grid's edge—to control it and dispatch it under the same tolerances necessary to meet our obligation to reliably meet customer demand.

We began by seeking a technology partner who could help us mine the untapped potential

of our distribution grid and grid-edge resources in partnership with our customers. Through Innovari's Interactive Energy Platform (IEP), we have begun to transform our biggest challenges into tremendous opportunities for improved grid performance.

Unlock capacity to defer infrastructure investment. One prevailing utility challenge has been low system utilization, resulting from the era of “build more.” The result has been a load-duration curve with a lot of room for improvement. (See Figure 1.) We needed to reshape that curve to improve system utilization to meet growing demands and relieve constrained feeders, without adding more infrastructure. This is a “lean” approach to managing the grid—in stark contrast to our “build more” heritage.

By effectively shaving the top 5 percent of that curve, a utility could improve system utilization by nearly 19 percent. This could result in huge savings in deferred, or even eliminated, infrastructure investment.

Through two-way verifiable actions, the IEP attacks that load curve, enabling the demand side to be a guaranteed 5-percent capacity factor. This makes the demand side a real part of the utility's sourcing, hedging, and system-management strategy. By partnering with customers and gaining this control for 400–500 hours per year, not just for 20–40 hours of emergency scenarios, we have the potential to change everything about the way our system can operate.

Unlike traditional demand response or demand-side management programs used for extreme peak demand situations and requiring post-event verification, our pilot project with Innovari provides real-time, two-way verifiable capacity back to the utility anytime we need it. It makes a

generation-quality resource from grid-edge resources. Unlike a generator that is centrally located, it enables utilities to operate with surgical precision, unlocking capacity at the individual substation or feeder level—so we can target our most problematic areas. And it is one that also is owned by the utility as a capital asset, rather than a programmatic expense that creates revenue erosion.

Transform customers into partners. Most important, the business model is designed to strengthen the relationship between KCP&L and our commercial and industrial customers—which was one of the primary drivers behind choosing the IEP.

The utility industry has gotten a bad reputation for treating customers as ratepayers rather than clients. While we believe forces have been at play that foster this concept for their own means instead of hard facts, perception can be reality, and we are working to change that perception and build a new reality. The IEP has allowed us to pioneer techniques with Innovari that enable us to manage customer loads without impacting their operations or comfort.

Customers have shown us that they want technology that automatically manages and enhances their use of electricity. They are not interested in spending time or resources to participate in programs or analyze meter data every day. They are interested in “set it and forget it” functionality that manages consumption based on their wishes throughout the year.

When we call an event using the IEP, all changes to customer loads happen automatically. Customers set their preferences upfront, and real-time feedback means that the IEP can maintain their building environment, not just its load. In addition, participating customers

always have the option to opt-out or change their settings. This “soft touch” means customers only benefit from participating—reinforcing us as a true, trusted partner in their business.

The benefits of the IEP extend far beyond customers enrolled in the program. In fact, automatic demand side management is only one of the grid-edge resources we are looking to leverage and optimize. As customers begin adopting more distributed generation and looking for creative ways to manage their bills, there will be additional ways for them to partner with KCP&L through the IEP and other intelligent technologies.

Integrate the grid’s edge to benefit all customers. The IEP provides automation, intelligence, and control to the farthest reaches of the distribution grid. As we continue to deploy this project, it is our hope that we will be able to connect and coordinate a variety of grid-edge resources to balance supply and demand as locally as a feeder—even balancing renewables with other distributed energy resources. With grid intelligence, we can limit unpredictability; and with coordination and control, we can manage two-way power flow and enhance reliability across the grid. In addition, we can leverage and optimize customer- and utility-owned renewables to deliver cleaner energy across our service territory.

Imagine a customer with significant rooftop solar. Imagine that those panels are producing more energy than that customer can use, but that other IEP-connected buildings could use that power to recharge batteries or pre-cool their buildings before peak. Not only would this scenario optimize the use of clean energy, but it would also help KCP&L manage peak and integrate renewables without the negative consequences of intermittency. This is the future we envision.

Enabling the Future Grid Today

At KCP&L, we believe in the fundamentals of our industry. Being a vertically integrated utility allows us to seek solutions that have broad benefits for many stakeholders rather than a single technology that can benefit a single customer class. For lack of a better term, the grid we have created is a “public good,” and we are the stewards of that public good. Rain or shine, tornado or ice storm, we serve our customers with this public good and believe that is not going to change anytime soon. We do not believe that traditional utility structures inhibit innovation or creativity. We believe that we are better suited than anyone else to meet the needs of our states, our communities, and our customers, but we also recognize that we have evolved to meet their changing needs.

While many new players will enter this space in the next several decades, and our resource mix will likely change significantly, utilities will remain at the center and serve as the stewards of the grid. That leads us to our final belief that strong partnerships with our customers will characterize this new future. With our communities and customers as our partners, and our employees as champions, we will be able to effectively engage the grid’s edge and make this new future a reality. **EP**



Terry Bassham is chairman and CEO of Great Plains Energy and Kansas City Power & Light.