Deloitte.

Reinventing resilience:
Defining the model for utility-led renewable microgrids

Deloitte Center *for* Energy Solutions

Table of contents

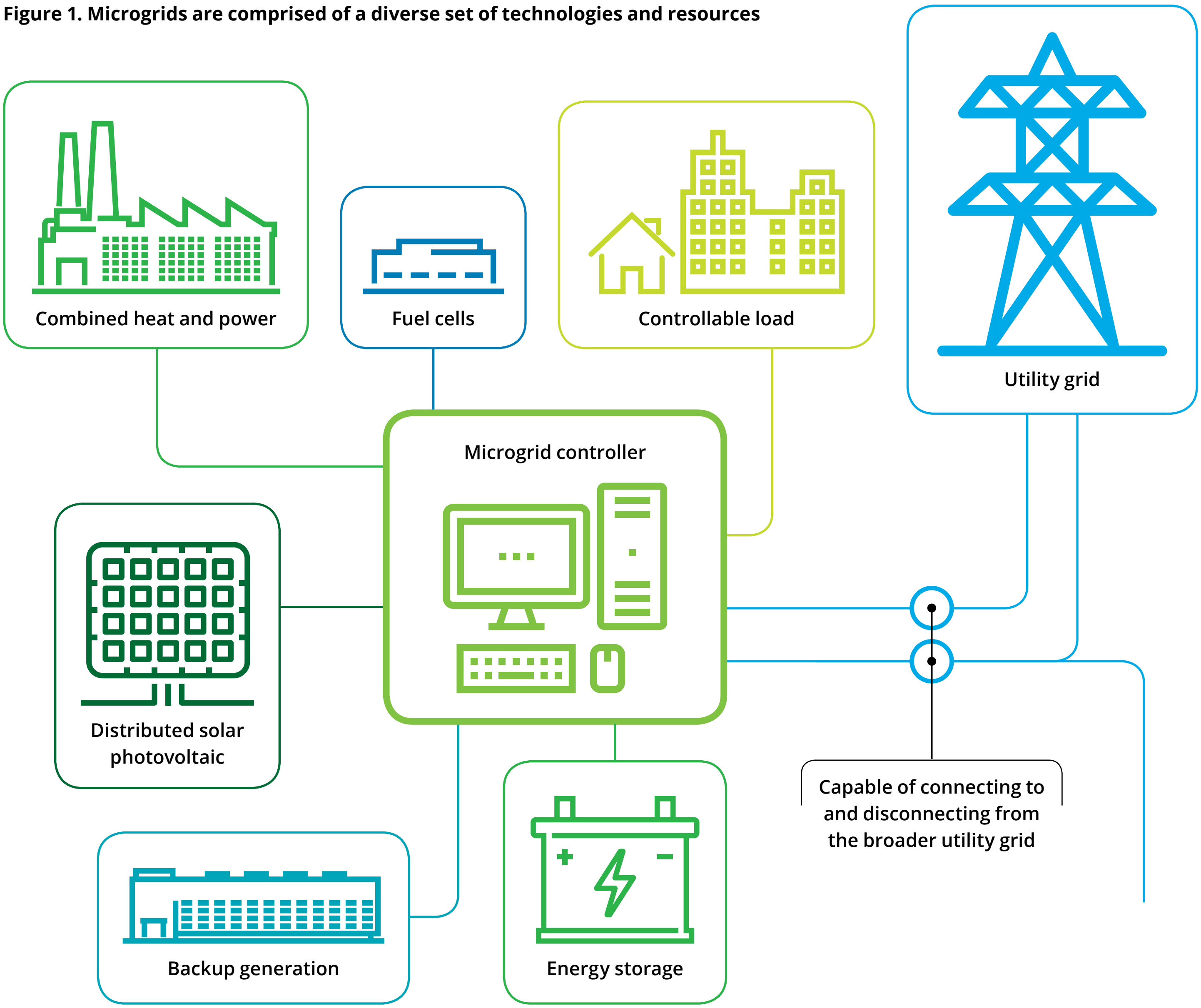
Executive summary

Recent extreme weather events have channeled the nation's attention to the importance of electric grid resilience. From catastrophic hurricanes, to snowstorms and record low temperatures, the frequency and severity of weather patterns that put the grid at risk continue to increase. Seven of the ten costliest storms that occurred between 1980 and 2014 took place during the past decade and caused over $1 billion in damages per event.[1] With each catastrophic occurrence, the call for utilities to take action by deploying innovative resilience solutions becomes stronger.

Largely in response to this heightened frequency of costly events, the largest regulated electric and gas investor-owned utilities (IOUs) in the United States collectively invested an average of $35 billion per year from 2008-2016 in upgrading the electric transmission and distribution (T&D) infrastructure.[2] A significant portion of these upgrades went toward physical adjustments that make the broader utility infrastructure less susceptible to storm damage, commonly referred to as "system hardening."[3] While hardening measures may continue to be an effective way to enhance the resilience of the grid, utilities are beginning to demonstrate how distributed, renewable generation in a microgrid setting can be a cost-effective alternative to traditional T&D investments.

Historically, microgrids have been loosely defined as a portion of an electric utility's distribution system that is capable of maintaining power during a broader grid outage. The first adopters were end-users that placed a high value on resilience, such as military bases, universities, and research facilities. Today, around two-thirds of installed microgrids in the United States are owned by single entities such as these. That statistic is projected to change, however, as utilities innovate to meet pressing and more broad customer demand for resilience.[4] As innovation takes its course, new ownership models are emerging, and the meaning of the term "microgrid" now incorporates a variety of technologies and resources, including solar photovoltaics (PV), storage and demand response technologies, combined heat and power units, and fuel cells. GTM Research now defines a microgrid as "an independently operable part of the distribution network including distributed energy sources, loads, and network assets that are controlled within clearly defined geographical boundaries and can operate in grid-connected or islanded mode."[5] Renewables, in particular, are positioned for rapid growth within microgrids. According to GTM Research, renewable capacity installed within microgrids is projected to double from 2016 to 2020.[6] Not surprisingly, utilities increasingly view microgrids as integration platforms for distributed, renewable resources.

Figure 1. Microgrids are comprised of a diverse set of technologies and resources



Investor-owned utilities are growing their share of the renewable microgrid market

The evolution in the microgrid market is being driven, in part, by the efforts of regulated IOUs to integrate renewable generation into their distribution networks in a manner that enhances reliability and resilience.

> According to the Institute of Electrical and Electronics Engineers (IEEE), the **resilience** of a distribution system is defined with respect to a system's ability to withstand rare and extreme events, while the **reliability** of a system is measured by the frequency and duration of power outages. This report focuses on solutions that enhance grid resilience.[9]

Mixed ownership models, where utilities partner with those who provide and consume distributed energy resources (DER), are growing in popularity among IOUs and are necessary for those that are restricted from owning generation in deregulated generation markets. Interest in partnering under a mixed ownership structure seems high among DER providers as well, as they often struggle to monetize the public benefits microgrids can provide. Furthermore, although private capital for these projects is plentiful, investors are rarely willing to finance the entire project.[7] Today, regulated IOUs increasingly see an opportunity to finance their end of the deal through their rate base, particularly for microgrids that serve public-purpose entities.[8]

Value streams within the distribution network are also driving the growth of utility-led microgrid systems. For instance, when strategically placed, microgrids can reduce peak demand at substations and relieve congestion, ultimately deferring grid upgrades. When equipped with storage technologies, they can also provide distribution-level ancillary services, including load shaping, load following, frequency regulation, reactive power, voltage control, and other services.[10] Benefits outside the distribution system include the ability to defer upgrades of transmission assets and to generate revenue in wholesale markets where ancillary services are compensated, such as in the PJM Interconnection, the California Independent System Operator (CAISO), and the New York Independent System Operator (NYISO). Finally, due to strong, existing customer relationships, utilities may be uniquely positioned to engage end-users—particularly those with distributed generation—when developing mixed ownership microgrids.

Despite these value streams and how well utilities are positioned to lead development, microgrids that are integrated into the distribution system are still relatively nascent in IOU service territories. To date, they have remained in a seemingly perpetual piloting and demonstration phase aided by funding from the US Department of Energy (USDOE) or other public grants. This "holding pattern" is due to a number of challenges—mostly regulatory in nature—that IOUs often face in attempting to deploy renewable microgrid solutions at scale. These hurdles include defining ownership structures that deliver optimal and cost-effective value to the grid, obtaining authorization for cost recovery of investments, and offering attractive value propositions for a variety of microgrid participants. Three recent case studies paint a picture of current efforts to overcome these barriers. These regionally diverse IOUs are proactively working with regulators and legislators to create a regulatory environment that fosters scalability. They each operate in states with electric generation deregulation policies—Oregon, Illinois, and New York—and their programs target different end-users by design: Portland General Electric (PGE) is piloting customer-sited solar-plus-storage installations for end-users; Commonwealth Edison (ComEd) has devised a strategy for building microgrids that benefit public purpose facilities; and National Grid is designing a model for a community microgrid in upstate New York.

Oregon explores the value of solar-plus-storage solutions

At a time when there was only one other grid-scale lithium-ion battery owned and operated by an IOU,[11] PGE partnered with suppliers to build the Salem Smart Power Center: a first-of-its-kind 5-megawatt (MW) lithium-ion battery-inverter system capable of storing 1.25 megawatt hours (MWh) of energy and of integrating with a commercial, customer-sited solar facility in Salem, Oregon.[12] The project, which was part of the Pacific Northwest Smart Grid Demonstration Project, a USDOE research effort, furthered the industry's knowledge of how to utilize solar-plus-storage solutions to benefit customers and meet system needs.[13]

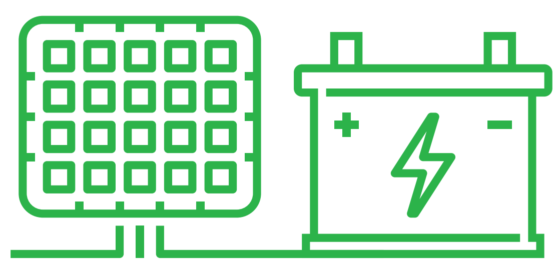
"PGE intends to design tariffs for solar-plus-storage systems that ensure all customers are treated fairly and continue to receive the benefits of PGE's low retail electric rates."—Brian Spak, manager of customer energy solutions at PGE

PGE is now working to deepen this understanding by designing and analyzing the performance of solar-plus-storage solutions in conjunction with the Energy Trust of Oregon, an independent nonprofit organization dedicated to helping utility customers in Oregon and southwest Washington save energy and generate clean, renewable power.[14] Through its partnership with Energy Trust, PGE is focused on identifying the potential value of solar-plus-storage by installing these systems at one to three customer locations. The utility seeks to understand the value customers can derive from controlling solar-plus-storage systems to help manage their bills, as well as the value that utility control of these systems can provide to the broader grid, such as generation and ancillary services and potentially deferral of transmission and distribution investments. This focus on value streams will help PGE understand how to optimize customer versus utility control of energy storage systems to maximize benefits for all PGE customers.[15] The utility sees the potential for a future electric grid that features customer-sited energy storage systems that are controlled by PGE the majority of the time but also allow customers to benefit from backup generation. The utility believes that an optimized control model for customer-sited solar-plus-storage systems could potentially serve customers' demand for resilience while allowing PGE to maintain competitive retail electric rates.[16]

System costs will likely be an important factor in scalability. While solar-plus-storage systems may have a higher cost than some other power technologies, they typically have a lower environmental footprint. The utility's planning and regulatory processes focus on balancing costs and risk, including environmental impacts. "PGE intends to design tariffs for solar-plus-storage systems that ensure all customers are treated fairly and continue to receive the benefits of PGE's low retail electric rates," according to Brian Spak, manager of customer energy solutions at PGE.

These pilots will likely play a small, but important role in helping meet Oregon's energy storage mandate that requires PGE to place a minimum of 5 MWh of energy storage in service by January 1, 2020.[17] PGE views the mandate as an opportunity to explore how a range of storage applications, including those tied to customer-owned solar systems, might provide a number of broader grid benefits, including improving customers' resilience.[18]

Figure 2. Solar-plus-storage



Commonwealth Edison proposes a path forward for public purpose microgrids

ComEd's strategy for enabling a flexible network of solar-integrated microgrids that enhance grid resilience is well underway. In 2015, the utility worked with industry stakeholders to create a vision for the new energy future of Illinois and support-related state legislation. Their policy proposal includes several provisions for clean energy, including the incorporation of renewable resources into five public purpose microgrids that would protect critical public infrastructure. "We are supporting legislation that reinforces the value and benefits that renewables bring to the grid and that supports our efforts to meet customers' growing demand for more choice and affordable clean energy solutions," explained Joe Svachula, vice president of engineering and smart grid at ComEd. The legislation aims to strengthen and expand the state's Renewable Portfolio Standard, grow energy efficiency programs, and create more equitable pricing for energy delivery.[19]

ComEd laid the groundwork for developing a first-of-its-kind solar-integrated cluster of public purpose microgrids back in 2014. Through a partnership with the Illinois Institute of Technology (IIT) and other vendors, the utility received a $1.2 million award from the USDOE to develop a master controller capable of facilitating the operation of microgrid clusters.[20] "We applied for the grant to develop the brains of the next-generation controllers that would be able to cluster microgrids together," said Mr. Svachula. ComEd's intention for developing this technology was to allow for a model where microgrids that protect critical infrastructure would grow over time. Rather than building one 100 MW microgrid at a large, public-purpose facility such as a medical district, ComEd envisions building ten 10 MW microgrids over a longer time period.[21]

To advance this vision, ComEd and IIT teamed up again with their partners and a growing smart energy ecosystem to advance the vision for a community microgrid in the Chicago neighborhood of Bronzeville—one of the five microgrids proposed in the state legislation. In early 2016, the partners received an additional $4 million award from the USDOE's Sunshot Program to develop a microgrid-integrated solar-storage technology (MISST). This three-year project aims to integrate and enhance the master microgrid controller with solar PV, a battery energy storage system and advanced inverter technology.[22] The Bronzeville microgrid will be designed to accommodate about 10 MW of capacity and be capable of islanding from and connecting with an existing 12 MW microgrid at IIT.[23] This system will likely be the first in the United States with this capability[24] and will demonstrate ComEd's vision for clusters of public purpose microgrids that can scale over time and potentially integrate customer-sited renewable generation.

"We are supporting legislation that reinforces the value and benefits that renewables bring to the grid and that supports our efforts to meet customers' growing demand for more choice and affordable clean energy solutions."
—Joe Svachula, vice president of engineering and smart grid at ComEd

In a state with a relatively low penetration of solar PV—Illinois ranked 38 in Q2 2016 among the states in total solar installations[25]—ComEd's plans for renewable microgrid development are ambitious. As part of the legislation before the Illinois General Assembly, the utility also proposed a change that would allow Illinois utilities to own and dispatch generation in the context of a microgrid. Any economic benefit of power sales would be used to offset the bills of its entire customer base.[26] This model would enable ComEd to deploy public purpose microgrids that deliver renewable energy while strengthening grid resilience to benefit customers.

National Grid's Potsdam demonstration is testing the feasibility of a community resilience utility offering

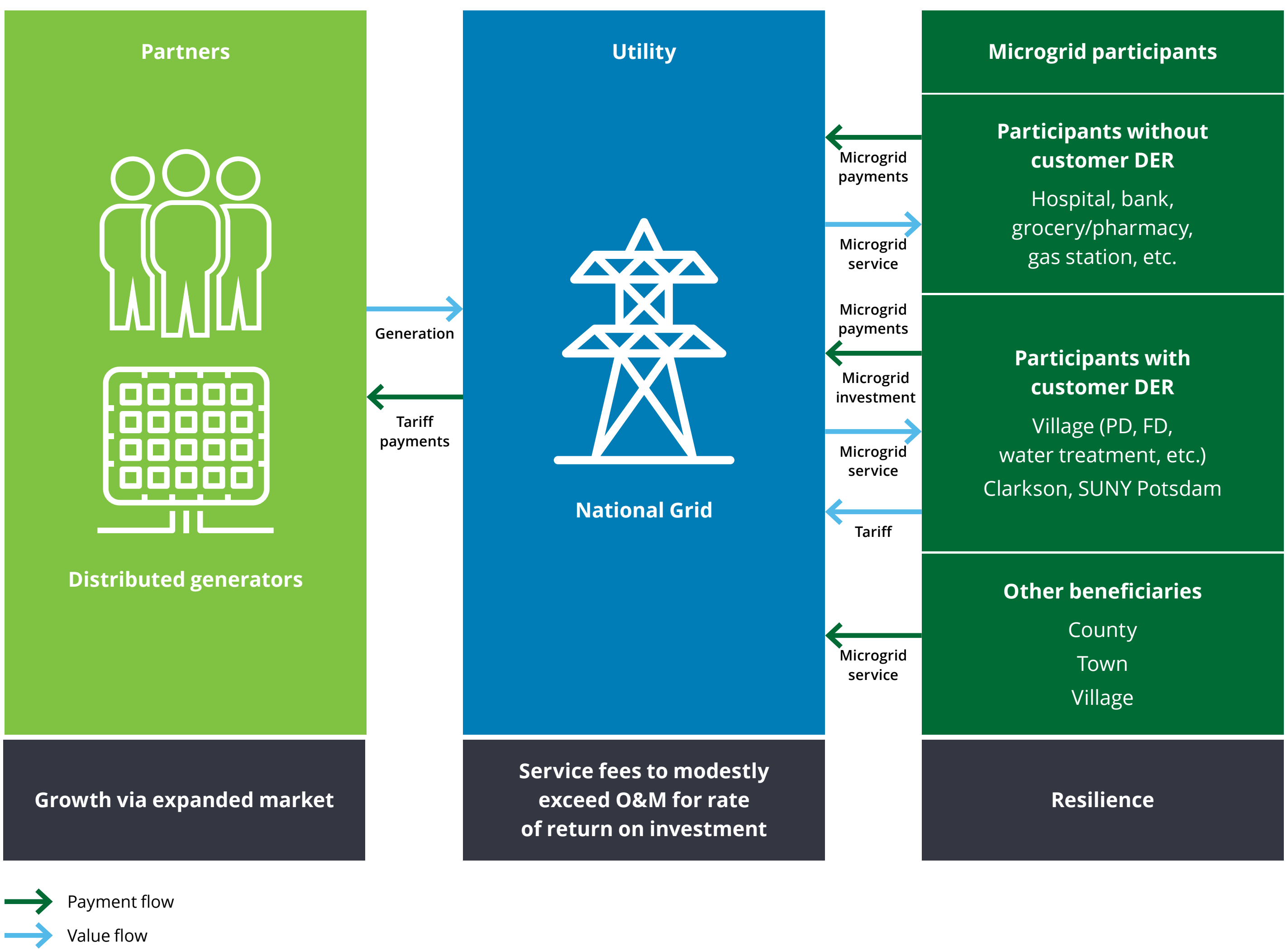
In Potsdam, NY, Niagara Mohawk Power Corporation, doing business as National Grid, aims to demonstrate a community resilience microgrid solution that integrates both community and customer-owned distributed generation. The company envisions a utility-led mixed ownership model, or distributed system platform (DSP), that supports clean, renewable resources and presents a value proposition for all microgrid participants, including the utility. This approach aligns with New York State Public Service Commission's directive under the Reforming the Energy Vision (REV) proceeding to enable market participation by non-utility DER providers. It also helps New York achieve one of the nine goals of REV by building a more resilient energy system.[27]

The Village of Potsdam is remotely located in upstate New York. The area is prone to electricity price spikes and winter outages.[28] It is home to various facilities that serve the sparse population of its surrounding region, including multiple municipal buildings, the Canton-Potsdam Hospital, and two universities: Clarkson University and State University of New York (SUNY) Potsdam. These public entities, along with other community resources such as a bank, a gas station, and a drug store, expressed their willingness to pay for a service to keep the lights on during an extended grid outage. Several of these customers already have distributed generation on their sites, but their existing resources are incapable of independently meeting their demand for resilience. The intermittent power provided by the 2-MW solar farm at Clarkson University cannot keep the university energized during an outage. The existing backup generation at Canton-Potsdam Hospital, which naturally becomes a hub for emergency services during power outages, is insufficient for serving a large influx of people from the surrounding region. In response to this customer demand, National Grid, in partnership with Clarkson University and others, is developing a community microgrid that engages DER solution providers and is substantially funded by its participants.[29]

As with PGE and ComEd, National Grid and its partners are in the process of developing the Enhanced Microgrid Control System (eMCS) through a $1.2 million grant awarded to General Electric in 2014 by the USDOE.[30] Clarkson University has also received funding from the New York State Energy Research and Development Authority (NYSERDA) to conduct a feasibility study for a community microgrid. National Grid's intention is to build upon these publically funded efforts to establish a replicable model where the wires and controls are owned and operated by National Grid and costs are recovered through a tiered rate structure, but the DER is owned by third parties, i.e., customers or microgrid participants. By identifying prospective revenue opportunities and value streams for each participant, National Grid is, in essence, testing a DSP approach to developing a resilience service offering.

Figure 3 maps out National Grid's vision for how various customer types and DER providers could benefit from participation. "Load-only" participants, or customers without DER, would stay energized during an outage in exchange for a "microgrid service" fee. This service would be an affordable alternative to installing or retrofitting thermal backup generation. "Generator-only" participants, or third-party DER providers, would be compensated through a new tariff both when the microgrid is islanded from the larger network and during "blue-sky" conditions when it is integrated with the grid. "Generator-load" participants, or customers with DER, can benefit from enhanced resilience while also monetizing their distributed assets. This model demonstrates how utilities can collectively enhance community resilience by integrating distributed renewables and other resources—and generate a return on their investments in the process.

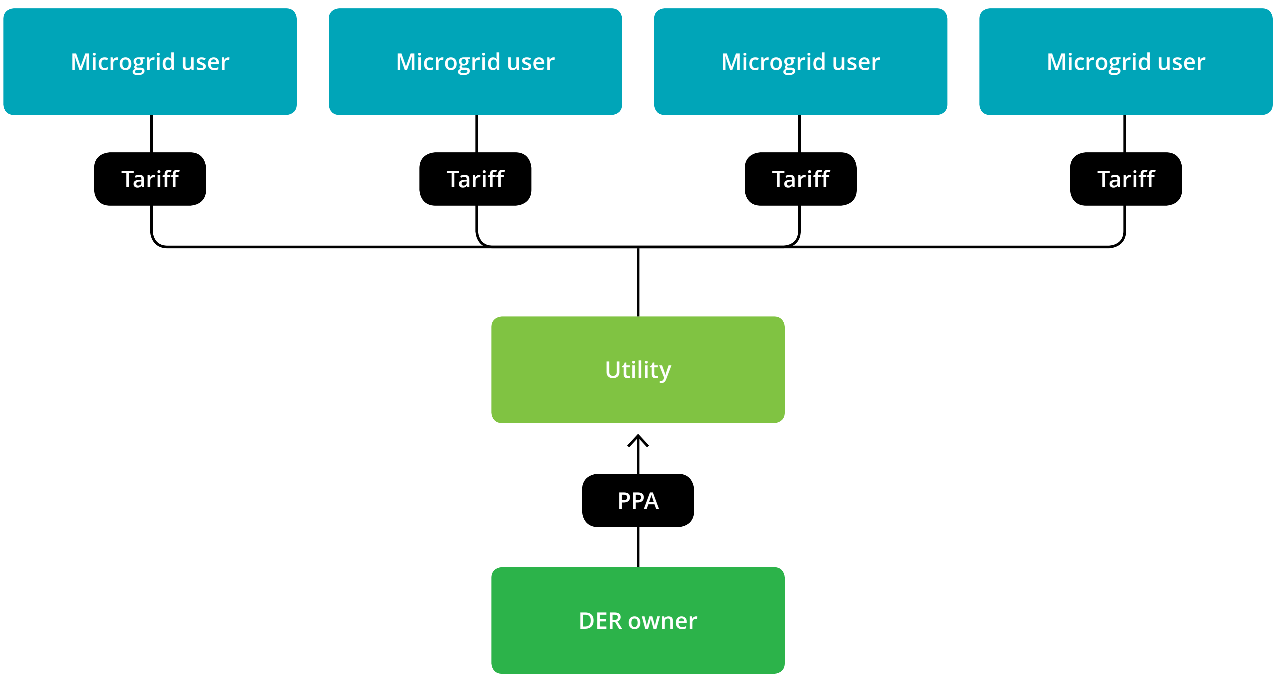
Figure 3. Community resilience microgrid value flow chart



Source: National Grid Proposed REV Demonstration Project Filing, submitted to New York Public Service Commission, July 1, 2015

Deploying this innovative approach is not without its obstacles. The NYSERDA-funded feasibility study revealed that existing customer-sited generation could service the majority of the 9 MW peak load, but that to island the microgrid for an extended grid outage—in this case, two weeks—an additional 4 MW of DER would need to be procured. This challenges National Grid to incentivize those with existing distributed generation to participate through attractive tariff pricing. The utility will also need to determine the best way to centrally procure the additional DER needed for islanding the microgrid. One option is to "backstop" or purchase energy from a third-party DER provider through a power purchase agreement (PPA). This central procurement model is depicted in figure 4 below. National Grid anticipates these additional community resources will likely involve a natural-gas plant and potentially a community-scale battery. [31] Nonetheless, a challenge remains in determining a PPA price that will provide an attractive return on investment (ROI) for DER providers.

Figure 4. Central procurement model



Source: National Grid Proposed REV Demonstration Project Filing, submitted to New York Public Service Commission, July 1, 2015

Current net-metering policies additionally pose a barrier to microgrid participation. The utility typically prices the tariffs for generator-only participants at or above the retail rate to make participation attractive. For generator-load participants, the compensation they receive from the tariff, coupled with the utility's community resilience service offering, should exceed the value of their net-metering arrangement. Other existing contractual relationships might prove to be an obstacle as well. For example, the 2-MW solar farm at Clarkson University is under a long-term PPA with a solar developer. As a result, National Grid anticipates that new or modified contracts will be necessary in order for this model to work.[32]

By collaborating with stakeholders and participants, and aligning project objectives with the goals of the REV proceeding, National Grid aims to design a utility-led community resilience offering that can be replicated across the United States. "One of the most important aspects of the REV demonstration projects is clarifying the value streams for each of the participants," said Carlos Nouel, vice president of new energy solutions at National Grid. "For the most part, we can make these systems work from a technology perspective, and National Grid is willing to take on risk from a financial perspective because we think these innovative programs will be a necessary component of future utility business models."

"One of the most important aspects of the REV demonstration projects is clarifying the value streams for each of the participants. For the most part, we can make these systems work from a technology perspective, and National Grid is willing to take on risk from a financial perspective because we think these innovative programs will be a necessary component of future utility business models." —Carlos Nouel, vice president of new energy solutions at National Grid

Conclusion

Determining the business model for offering resilience solutions at scale can be a challenge for IOUs. The unpredictability of extreme weather events has, in the past, made cost recovery difficult to justify. According to the Electric Power Research Institute (EPRI), "System planners have always had the option of configuring the system to maximize distribution service during major outages. Historically, however, the associated costs have not been viewed as prudent."[33] The destruction caused by Superstorm Sandy in 2012, or the more recent Hurricane Matthew, suggests that the situation has changed. Due to the increasing frequency of extreme weather events, regulators and utilities alike are increasingly seeing the importance of investing in innovative solutions.

It is evident, by the efforts described above, that IOUs are exploring opportunities to enhance resilience through strategic renewable integration but have not yet been able to move out of the piloting and demonstrating phase. Designing cost-effective programs that price resilience services at a level that customers are willing to pay for remains a challenge. But, in this era of regulatory reform, technology advancement, and evolving customer expectations, utilities are rising to that challenge and discovering they are well positioned to partner with DER providers to capture a piece of the renewable microgrid market. The IOUs profiled above are developing mixed ownership models that could unlock value for all participants—the customer, the DER provider, and the utility. In doing so, they are defining how resilience solutions might be deployed at scale. However, there continues to be challenges to implement these solutions within existing regulatory frameworks. Considering the grid modernization and utility business model reform efforts that are happening not only in New York, but also in California, Hawaii, Minnesota, Maryland and several other states, it is likely that various IOUs will be given the regulatory license to innovate. Whether those reforms will drive innovation fast enough to keep customers' lights on during future catastrophic weather events remains to be determined.

Endnotes

1. Dan T. Ton and W-T. Paul Wang, *A more resilient grid: The U.S. Department of Energy joins with stakeholders in an R&D plan,* IEE Power & Energy Magazine, May/June 2015, http://energy.gov/sites/prod/files/2016/06/f32/A%20More%20Resilient%20Grid.pdf.

2. John McCue, Suzanna Sanborn and Andrew Slaughter, *From growth to modernization: The changing capital focus of the US utility sector,* Deloitte Center for Energy Solutions, June 2016, http://www2.deloitte.com/us/en/pages/energy-and-resources/articles/utility-investments.html.

3. *Before And After the Storm - Update March 2014, A compilation of recent studies, programs, and policies related to storm hardening and resiliency,* Edison Electric Institute, March 2014, http://www.eei.org/issuesandpolicy/electricreliability/mutualassistance/Documents/Before%20and%20After%20the%20Storm.pdf.

4. Olivia Chen, "US Installed Microgrid Capacity to Grow 115% and Reach 4.3GW Over the Next 5 Years," Greentechmedia.com, August 9, 2016, http://www.greentechmedia.com/articles/read/US-Installed-Microgrid-Capacity-to-Grow-115-And-Reach-4.3-GW-Over-Next-Fiv.

5. *The Ultimate Resiliency Plan: Microgrids and the Continued Segmentation of Electric Grid Assets,* presentation by Omar Saadeh of GTM Research at Clean Energy Connections event, New York, NY, November 18, 2015, video file retrieved from: https://www.youtube.com/watch?v=mOy6vNRynnI&feature=youtu.be.

6. Olivia Chen, "US Installed Microgrid Capacity to Grow 115% and Reach 4.3GW Over the Next 5 Years," Greentechmedia.com, August 9, 2016, http://www.greentechmedia.com/articles/read/US-Installed-Microgrid-Capacity-to-Grow-115-And-Reach-4.3-GW-Over-Next-Fiv.

7. *The Ultimate Resiliency Plan: Microgrids and the Continued Segmentation of Electric Grid Assets,* presentation by Omar Saadeh of GTM Research at Clean Energy Connections event, New York, NY, November 18, 2015, video file retrieved from: https://www.youtube.com/watch?v=mOy6vNRynnI&feature=youtu.be.

8. Herman K. Trabish, "Public purpose microgrids: Mixed-ownership models spur utility investment in growing sector," Utilitydive.com, August 30, 2016, http://www.utilitydive.com/news/public-purpose-microgrids-mixed-ownership-models-spur-utility-investment-i/425296/.

9. Chen-Ching Liu, "Distribution systems: Reliable but not resilient?," Institute of Electrical and Electronics Engineers (IEEE) Power & Energy Society, June 2015, http://sites.ieee.org/pes-enews/2015/05/08/distribution-systems-reliable-but-not-resilient/.

10. Oregon's Restructured Electric Utility Industry, Electricity Service Suppliers' Guide – Version 15, copyright Portland General Electric Company, January 2016.

11. "Pacific Northwest Smart Grid Demonstration Project Success Stories: Portland General Electric," Bonneville Power Administration, December 2014, https://www.bpa.gov/Projects/Initiatives/SmartGrid/DocumentsSmartGrid/Success-Stories-PGE.pdf.

12. Ibid.

13. Ibid.

14. Hall, Jeni, Email correspondence to author, September 28, 2016.

15. Spak, Brian. Phone interview with Brian Spak on September 15, 2016.

16. Ibid.

17. Herman K. Trabish, "Oregon saddles up to implement trailblazing energy storage mandate," Utilitydive.com, November 17, 2015, http://www.utilitydive.com/news/oregon-saddles-up-to-implement-trailblazing-energy-storage-mandate/409222/.

18. Spak, Brian. Phone interview with Brian Spak on September 15, 2016.

19. Amendment to Illinois Senate Bill 1585, filed May, 12, 2016.

20. Commonwealth Edison, "ComEd Awarded Grant from Department of Energy for Microgrid Controller," Commonwealth Edison, September 16, 2014, https://www.comed.com/News/Documents/newsroomreleases_09162014.pdf.

21. Svachula, Joe. Phone interview with Joe Svachula on September 15, 2016.

22. Shay Bahramirad, *SHINES Kickoff Presentation - Commonwealth Edison Company,* presented at the SHINES Technical Kickoff Meeting, Washington, DC, May 18, 2016, http://energy.gov/eere/sunshot/downloads/shines-kickoff-presentation-commonwealth-edison-company.

23. Katherine Tweed, "ComEd Looks to Build Microgrid Clusters to Support the 'Community of the Future'," Greentechmedia.com, March 18, 2016, http://www.greentechmedia.com/articles/read/can-comed-build-a-community-of-the-future.

24. Elisa Wood, "ComEd Microgrid Wins Grid Modernization Funding; DOE Boosts Solar, Energy Storage," Microgridknowledge.com, January 22, 2016, https://microgridknowledge.com/more-grid-modernization-funding/.

25. GTM Research and SEIA, *US Solar Market Insight Report – Q3 2016,* updated September 12, 2016, http://www.seia.org/research-resources/us-solar-market-insight.

26. Svachula, Joe. Phone interview with Joe Svachula on September 15, 2016.

27. "DPS – Reforming the Energy Vision," copyright New York State Department of Public Service, http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument.

28. *National Grid Proposed REV Demonstration Project Filing*, submitted to New York Public Service Commission, July 1, 2015, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BEA2A51A0-24F3-4FBE-AD4F-17DFCF776AE2%7D.

29. Ibid.

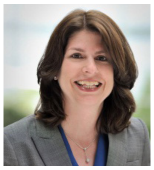
30. GE Global Research, "GE, Utility, Government, and Academia Partner on Microgrid Project," December 10, 2014, http://www.geglobalresearch.com/news/press-releases/ge-utility-government-academia-partner-underground-microgrid-project-improve-electricity-reliability-nys-north-country.

31. *National Grid Proposed REV Demonstration Project Filing*, submitted to New York Public Service Commission, July 1, 2015, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BEA2A51A0-24F3-4FBE-AD4F-17DFCF776AE2%7D.

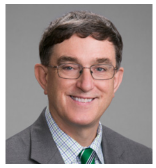
32. Ibid.

33. *Enhancing Distribution Resiliency: Opportunities for Applying Innovative Technologies,* Electric Power Research Institute, January 2013.

Let's talk



Marlene Motyka
US Renewable Energy Leader
Deloitte Transactions and
Business Analytics LLP
mmotyka@deloitte.com
+1 973 602 5691
@MarleneMMotyka



Andrew Slaughter
Executive Director
Deloitte Center for Energy Solutions
Deloitte Services LP
anslaughter@deloitte.com
+1 713 982 3526

Key contributor

Julia Berg
Analyst, Deloitte Center for Energy Solutions
Deloitte Services LP

Deloitte Center *for*
Energy Solutions

The Deloitte Center for Energy Solutions (the "Center") provides a forum for innovation, thought leadership, groundbreaking research, and industry collaboration to help companies solve the most complex energy challenges.

Through the Center, Deloitte's Energy & Resources group leads the debate on critical topics on the minds of executives—from the impact of legislative and regulatory policy, to operational efficiency, to sustainable and profitable growth. We provide comprehensive solutions through a global network of specialists and thought leaders.

With locations in Houston and Washington, DC, the Center offers interaction through seminars, roundtables and other forms of engagement, where established and growing companies can come together to learn, discuss, and debate.

www.deloitte.com/us/energysolutions

@Deloitte4Energy