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Keeping the Lights on during Superstorm Sandy: Climate Change and Adaptation and the Resiliency Benefits of Distributed Generation

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KEEPING THE LIGHTS ON DURING SUPERSTORM SANDY: CLIMATE CHANGE ADAPTATION AND THE RESILIENCY BENEFITS OF DISTRIBUTED GENERATION

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Hurricane Sandy (ultimately downgraded to "Superstorm" Sandy by the time it hit the coasts of New York and New Jersey in late October 2012) was the most lethal and destructive hurricane in 2012, resulting in 285 deaths, $68 billion in damages, and 8.5 million utility customers in the eastern United States losing power. Superstorm Sandy provided a wake-up call for electric utilities on the need to adopt a different set of long-term planning tools to improve the resilience of the electric system against anticipated extreme weather events. The experience of Superstorm Sandy provides a case study of the system resiliency benefits of distributed generation (DG) resources and microgrids, and valuable lessons that can be learned as utilities plan for increasingly frequent extreme weather events of the future.

This Article examines legal and regulatory tools available to encourage electric utilities to move in the direction of a DG-based model, and it focuses in particular on the Consolidated Edison Company of New York (Con Edison) rate proceeding in New York. In that recently concluded proceeding, utility regulators had an opportunity to consider a "traditional" approach proposed by the utility—featuring transmission and distribution infrastructure investments—alongside a competing view of a "utility of the future" offered by environmental parties, geared toward a more resilient system that integrates DG resources and microgrids. In a precedent-setting order issued by the New York State Public

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Service Commission (PSC) on February 21, 2014, the PSC required Con Edison to make significant investments "to enhance system reliability, to achieve a higher level of storm hardening and resiliency in the face of anticipated climate change and sea level rise." Con Edison was directed to take specific steps to use DG resources as an alternative to traditional infrastructure, to facilitate DG installations in its service territory, and to develop an implementation plan for microgrids in its service territory. More broadly, utilities in New York were directed to integrate predicted impacts from climate change into their long-term system planning processes.

The article also examines other legal theories that can be used in utility regulatory proceedings to move utilities toward a new utility paradigm that features DG resources, including the prudent investment standard, the doctrine of "used and useful," and the requirement to set "cost-based" rates.

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INTRODUCTION

Hurricane Sandy (ultimately downgraded to "Superstorm" Sandy by the time it hit the coasts of New York and New Jersey in late October 2012) was the most destructive hurricane in 2012 and the second costliest storm in U.S. history, resulting in $66 billion in damages and 159 deaths.[1] The storm spanned almost one thousand miles in breadth, and its intensity caused a fourteen-foot storm surge at Battery Park in lower Manhattan—a surge that exceeded previous storm tides by over three feet.[2] About 8.5 million utility customers in the eastern United States lost power during Sandy, and more than 650,000 homes were damaged or destroyed.[3] Apart from the sheer magnitude of the disaster in terms of fatalities and destruction, Superstorm Sandy provided a wake up call for energy providers and electric utilities in particular: a different set of long-term planning strategies to improve the resilience of the electric system against the anticipated extreme weather events of the future is urgently needed. One strategy is to expand the role for distributed generation (DG) resources.

The electric utility industry in the United States (and in most developed countries) generally features large, central generating stations that produce the electricity that is then transmitted along high-voltage transmission lines to local distribution systems where it is delivered to end users.[4] DG resources, in contrast, are small-

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1 AON BENFIELD, ANNUAL GLOBAL CLIMATE AND CATASTROPHE REPORT: IMPACT FORECASTING 2012, at 24 (2012), *available at* http://thoughtleadership.aonbenfield.com/Documents/20130124_if_annual_global_climate_catastrophe_report.pdf; *Billion-Dollar Weather/Climate Disasters: Table of Events*, NOAA NATIONAL CLIMATE DATA CENTER, http://www.ncdc.noaa.gov/billions/events (last visited Oct. 27, 2014).

2 Testimony of Elec. Infrastructure & Operations Panel at 14–15, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n Jan. 25, 2013) [hereinafter Elec. Infrastructure & Operations Panel Testimony], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={A3EFED44-5E61-42B6-9348-7AB59BAA8CB5}.

3 *Id.* at 15; Doyle Rice & Alia E. Dastagir, *One Year After Sandy, 9 Devastating Facts*, USA TODAY (Oct. 29, 2013, 6:19 PM), http://www.usatoday.com/story/news/nation/2013/10/29/sandy-anniversary-facts-devastation/3305985/.

4 Joel E. Eisen, *Distributed Energy Resources, "Virtual Power Plants," and the Smart Grid*, 7 ENVTL. & ENERGY L. & POL'Y J. 191, 192–93 (2012) ("Over the past 100 years, we have created an electric grid that is a complex network of large, fossil fuel-fired power plants located far from end users, with high-voltage transmission lines and lower voltage distribution lines carrying

scale generating resources located near and connected to the electrical load being served, with or without grid interconnection.[5] This Article describes how DG resources offer an alternative that has attractive features for coping with climate change.[6] Although DG resources also may have advantages as tools to reduce greenhouse gas (GHG) emissions,[7] this Article will focus primarily on the advantages of implementing DG resources as an adaptation strategy capable of improving the resiliency of the electric system in the face of the increasing frequency of extreme weather events.[8] Extreme weather events, rising sea levels, and increasing temperatures create potential threats to utility infrastructure and the delivery of electricity.[9] This Article describes how a more distributed power grid, utilizing DG resources, would avoid some of the systemic vulnerabilities of the centralized large grid, which has inherent exposures as a result of being regionally interconnected.[10] The experience of Superstorm Sandy provides a

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electricity to millions of consumers.").

5 NYS 2100 COMMISSION, RECOMMENDATIONS TO IMPROVE THE STRENGTH AND RESILIENCE OF THE EMPIRE STATE'S INFRASTRUCTURE 182 (2013) ("Distributed Generation (DG): Small electrical power generators installed in homes, businesses, and office buildings that can supply power to a location when grid power is not available.").

6 Eisen, *supra* note 4, at 193 ("Given the urgency to address climate change, [distributed energy resources] have become especially important as part of a portfolio of solutions to reduce fossil fuel use (and resulting GHG emissions) in the electricity sector of the economy and adapt to the changing climate.").

7 DG resources, if fueled by renewable resources (solar, wind, biomass and geothermal), can be an effective climate change mitigation strategy when used to displace the GHG emissions produced by large, centralized coal, oil, and natural gas-fired plants. *See* Kyle Siler-Evans et al., *Regional Variations in the Health, Environmental, and Climate Benefits of Wind and Solar Generation*, 110 PROC. NAT'L ACAD. SCI. U.S.11768, 11771 (2013), *available at* http://www.pnas.org/content/110/29/11768.full. Even non-renewable DG resources, such as high-efficiency natural gas-fired combined heat and power, or cogeneration, can provide GHG reduction benefits through increased energy efficiency achieved by eliminating the energy losses from transmission and distribution that occur over long distances. *See Combined Heat and Power Partnership, Basic Information,* EPA, http://www.epa.gov/chp/basic/index.html (last updated Feb. 13, 2015).

8 The National Climate Assessment states that "[e]xtreme weather events and water shortages are already interrupting energy supply, and impacts are expected to increase in the future." CLIMATE CHANGE IMPACTS IN THE UNITED STATES 114 (Jerry M. Melillo et al. eds., 2014), *available at* http://nca2014.globalchange.gov/report/sectors/energy.

9 NYS 2100 COMMISSION, *supra* note 5, at 20.

10 U.S. DEP'T OF ENERGY, THE POTENTIAL BENEFITS OF DISTRIBUTED

case study of the system resiliency benefits of DG resources and the lessons that can be learned as utilities plan for increasingly frequent extreme weather events.

The impact of Superstorm Sandy on the electric utilities operating in the region was unprecedented;[11] extensive power outages affected the region for days. However, many commercial and industrial facilities and educational institutions in the area (including Princeton University's campus in New Jersey and New York University's campus in lower Manhattan) were largely able to maintain operations due to on-site DG facilities, primarily cogeneration or combined heat and power (CHP) facilities.[12] DG resources can improve the resilience of the electrical grid and

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GENERATION AND RATE-RELATED ISSUES THAT MAY IMPEDE THEIR EXPANSION 2-3 (2007), *available at* https://www.ferc.gov/legal/fed-sta/exp-study.pdf ("Outages created by faults and failures in generation are rare. While transmission faults are somewhat more common, 94% of all power outages are caused by faults and failures in the distribution system.").

11 One news report noted the "unprecedented confluence of hurricane-force winds and record-high storm surges," which resulted in a "historically large" response from utilities. Jon Hurdle, *After Sandy, Utilities Face Biggest Restoration Challenge*, BREAKING ENERGY (Nov. 6, 2012, 10:30 AM), http://breakingenergy.com/2012/11/06/after-sandy-utilities-face-biggest-restoration-challenge/.

12 CHP or cogeneration facilities were "able to keep the lights on during the hurricane using microgrids." NYS 2100 COMMISSION, *supra* note 5, at 101. A CHP system is a DG resource that uses an on-site electrical generator, typically fueled by natural gas, to provide electricity and thermal energy (usually in the form of steam or water) to a single large building or, in the case of a microgrid or district energy system, to a campus or group of facilities. After capturing heat that would otherwise be wasted as a byproduct of electricity generation, a CHP system converts that heat into useful thermal energy for space heating, cooling or other processes. *Combined Heat and Power Partnership, supra* note 7. "Capturing and using the waste heat allows CHP systems to reach fuel efficiencies of up to 80%, compared with about 45% for conventional separate heat and power." ICF INTERNATIONAL, COMBINED HEAT AND POWER: ENABLING RESILIENT ENERGY INFRASTRUCTURE FOR CRITICAL FACILITIES 4 (2013), *available at* http://www.energy.gov/sites/prod/files/2013/11/f4/chp_critical_facilities.pdf. CHP systems generally do not operate independently from the electrical grid, as the grid is necessary for (1) supplemental power to meet peak electricity needs, and (2) backup power when the CHP system is unavailable because of maintenance or an outage. *Id.* Because the supply of natural gas is generally not dependent upon electricity from the grid, a CHP system can continue to operate during an outage on the grid, thereby ensuring that the host facility will be able to maintain essential operations. *Id.* In the case of the NYU campus, for example, the CHP system was able to "keep the larger buildings and core of the Washington Square campus heated and powered throughout the storm and in the weeks that followed, while surrounding buildings were cold and dark." NYS 2100 COMMISSION, *supra* note 5, at 101.

mitigate the impacts of an outage by enabling critical facilities to maintain essential operations.[13] If the electrical grid is experiencing an outage, DG systems can be configured to "island" from the grid, thereby maintaining uninterrupted power supplies to utility customers within a "microgrid."[14] That was the experience with Superstorm Sandy, where the use of microgrids and DG resources enabled provision of power to pockets of utility customers in the face of widespread outages of central power plants and associated transmission and distribution (T&D) systems.[15]

Notwithstanding the lessons learned from Superstorm Sandy regarding the potential role of DG resources in enhancing utility system resiliency, both Consolidated Edison Company of New York (Con Edison)—the utility serving New York City—and Public Service Electric & Gas Company (PSE&G)—the largest utility serving New Jersey—responded by proposing substantial rate increases to cover the expenditures in order to "harden" the utility system and reinforce the traditional central generation model (and associated T&D systems). Con Edison's rate request in New York included a commitment to spend "$1 billion in storm hardening structural improvements over the next four years."[16] PSE&G, for its part, proposed an "Energy Strong" program to spend $2.6 billion over five years to harden its system by protecting switching stations and substations, strengthening its

13 Eisen, *supra* note 4, at 193 (Distributed energy resources "help the electric grid by increasing grid reliability and resilience, making the grid less vulnerable to prolonged power failures.").

14 Microgrids are small distribution systems that can interconnect and coordinate a number of DG resources into a network capable of serving all or a portion of the energy needs of a cluster of users. MICHAEL A. HYAMS ET AL., CTR. FOR ENERGY, MARINE TRANSP., & PUB. POLICY AT COLUMBIA UNIV., MICROGRIDS: AN ASSESSMENT OF THE VALUE, OPPORTUNITIES AND BARRIERS TO DEPLOYMENT IN NEW YORK STATE S-1 (2010), *available at* http://web.mit.edu/cron/project/EESP-Cambridge/microgrid/NYS-Microgrids-Roadmap.pdf. Depending upon their configuration, microgrids can be "islanded" to operate independently from the utility grid. NYS 2100 COMMISSION, *supra* note 5, at 95 ("'Microgrids' refers to clusters of homes and buildings that share a local electric power generation and/or energy storage device while disconnected from the utility grid.").

15 NYS 2100 COMMISSION, *supra* note 5, at 101.

16 Letter from Craig S. Ivey, President, Consol. Edison Co. of N.Y., to Hon. Jeffrey C. Cohen, Acting Sec'y, N.Y. State Pub. Serv.Comm'n 1 (Jan. 25, 2013), *available at* http://www.coned.com/documents/2013-rate-filings/filing-letter-and-attachments.pdf.

pole distribution system, and undergrounding overhead distribution lines.[17]

An alternative approach would be to embrace the resiliency to climate change provided by DG resources and related innovative technology. In contrast to the "business as usual" filings of Con Edison and PSE&G, a better approach would involve a fundamental re-examination of the manner in which electric utility service is delivered, with a focus on measures that improve the resilience of the grid. Rather than relying on traditional method of preparing for the next major storm based on the weaknesses exposed by the last one, a better solution may be to realign the priorities of a utility's major capital expenditures toward investing in the "utility of the future"—a utility designed to withstand the extreme weather events that are likely to occur decades into the future.[18] A key attribute of the "utility of the future" is the ability to integrate widely dispersed DG resources and widespread deployment of microgrids, both of which work to reduce dependence on the traditional model of large, centralized generating stations and extensive (and vulnerable) T&D networks.

This Article focuses on legal and regulatory tools that can be used to encourage electric utilities to move in the direction of a DG-based model. One such tool is the use of general rate proceedings as forums to challenge the "business as usual" approach typically followed by utilities.[19] This Article focuses in

17 Petition of Pub. Serv. Elec. & Gas Co. for Approval of the Energy Strong Program at 4 (2013) (NJ BPU Dockets EO13021055 and GO13020156), *available at* https://web.archive.org/web/20140327180509/http://www.pseg.com/family/pseandg/tariffs/reg_filings/pdf/EnergyStrong.pdf [hereinafter PSE&G Petition].

18 The National Climate Assessment notes, "U.S. energy facilities and systems, especially those located in coastal areas, are vulnerable to extreme weather events." JAN DELL ET AL., CLIMATE CHANGE IMPACTS IN THE UNITED STATES, CH. 4, ENERGY SUPPLY AND USE 115 (2014) *available at* http://nca2014.globalchange.gov/report/sectors/energy. The impacts of extreme weather events "are expected to increase in the future." *Id.* at 114.

19 The "business as usual" approach is illustrated by Con Edison's January 2013 rate filing (Letter from Craig S. Ivey, *supra* note 16) and PSE&G's "Energy Strong" filing (PSE&G Petition, *supra* note 17), where the rate relief was directed toward spending on traditional T&D infrastructure rather than investments in energy efficiency and DG resources, which have been characterized as "peripheral elements of the electric system." *See* Order Approving EEPS Program Changes, Proceeding on Motion of the Comm'n Regarding an Energy Efficiency Portfolio Standard, Case No. 07-M 0548, 2 (N.Y. State Pub. Serv. Comm'n Dec. 26, 2013), *available at* http://

particular on the Con Edison rate proceeding in New York, where utility regulators had an opportunity to consider the "traditional" approach proposed by Con Edison alongside a competing view of the "utility of the future" offered by environmental parties. The latter view features less investment in T&D infrastructure in favor of DG (including high-efficiency cogeneration in particular), as well as smart grid investments to empower consumers to reduce their reliance on the grid.[20] Another such tool is the authority of regulatory agencies to direct utilities to take climate change adaptation into account in long-term system planning.[21] In New York, for example, the Columbia Law School Center for Climate Change Law and a number of other environmental and public interest organizations filed a petition with the New York State Public Service Commission (PSC) in December 2012 requesting that the PSC require utilities to address climate change through a new planning process that would focus on mitigation of natural hazards.[22]

In addition to these tools, there are legal theories that can be used in utility regulatory proceedings to push utilities toward a new paradigm that takes advantage of the resiliency benefits of DG resources. One such theory is the prudence standard in utility ratemaking,[23] which can be used to challenge expenditures by utilities on T&D infrastructure. Because DG resources allow the generation to be located closer to the load, some spending on T&D infrastructure may prove unnecessary if DG resources represent a more cost-effective solution.[24] Another legal theory involves the

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www3.dps.ny.gov/W/PSCWeb.nsf/All/06F2FEE55575BD8A852576E4006F9AF7?OpenDocument. In its December 2013 order in the Energy Efficiency Portfolio Standard (EEPS) proceeding, the New York State PSC commenced a "comprehensive inquiry and redesign" of the regulatory model necessary to support "customer based technologies as a core source of value to electric customers." *Id.* at 2, 21.

20 *See infra* Section III.A.

21 *See infra* Section III.B.

22 Petition on Natural Hazard Planning from Anne R. Siders, Assoc. Dir. of Ctr. for Climate Change Law, Columbia Law School, et al. to Hon. Jaclyn A. Brilling, Sec'y, N.Y. State Pub. Serv. Comm'n (Dec. 12, 2012) [hereinafter Columbia Petition], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc. aspx?DocRefId={A7D27EFB-2CE0-4ABE-8D22-B9D629B9C3BE}.

23 Duquesne Light Co. v. Barasch, 488 U.S. 299, 309 (1989) ("Under the prudent investment rule, the utility is compensated for all prudent investments at their actual cost when made (their 'historical' cost), irrespective of whether individual investments are deemed necessary or beneficial in hindsight.").

24 *See infra* Section III.C.

doctrine of "used and useful," which would preclude a utility from earning a return on assets that are "excessive" to its needs in providing utility service to the public.[25] Because DG resources are smaller in scale, utilities can more precisely match their generating resources with their customers' electricity demand.[26] As a result, regulators have a stronger basis for disallowing the excess generation that often results from reliance on the traditional model of large, centralized generating facilities. Finally, utility regulatory commissions, in setting "cost-based" rates, should be encouraged to reflect all the benefits of DG resources in those rates. The Energy Policy Act of 2005 (EPAct) required the U.S. Department of Energy (DOE) to conduct a study of the benefits of DG and the rate-related issues that impede its expansion;[27] DOE's February 2007 study identifies many of these benefits.[28] States have considerable discretion in setting "cost-based" rates,[29] and they should be encouraged to exercise this discretion in favor of DG solutions.

I. DG AS A CLIMATE CHANGE ADAPTATION STRATEGY: SUPERSTORM SANDY AND THE SUCCESSES OF DG RESOURCES

A. *The Impact of Superstorm Sandy on Utility Systems in the Northeast*

Prior to Superstorm Sandy, electric utilities operating in the Northeast experienced the dangers posed by storms and other extreme weather events. In 2011, for example, Hurricane Irene left

25 *See* Denver Union Stock Yard Co. v. United States, 304 U.S. 470, 475 (1938).

26 As described in Section III.D. *infra*, DG resources provide the ability to install additional generating capacity in smaller increments.

27 Energy Policy Act of 2005, Pub. L. No. 109-58, § 1817, 119 Stat. 594, 1130–31.

28 UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10.

29 California Pub. Utils. Comm'n., 133 F.E.R.C. ¶ 61,059, 11 (2010), *available at* https://www.ferc.gov/whats-new/comm-meet/2010/102110/E-2.pdf ("'[S]tates are allowed a wide degree of latitude in establishing an implementation plan for Section 210 of PURPA, as long as such plans are consistent with our regulations. Similarly, with regard to review and enforcement of avoided cost determinations under such implementation plans, we have said that our role is generally limited to ensuring that the plans are consistent with section 210 of PURPA'" (quoting American REF-FUEL Company of Hempstead, 47 F.E.R.C. ¶ 61,161, at 61,533 (1989)).

more than seven million homes and businesses without power between Folly Beach, North Carolina and Portland, Maine.[30] In New York City, over 70,000 Con Edison customers lost power as a result of Hurricane Irene, and the numbers were even higher on Long Island (over 320,000 customers) and in New Jersey (over 412,000 customers).[31] During Hurricane Irene, a Con Edison substation close to the East River experienced a 9.5-foot storm surge.[32]

In anticipation of Superstorm Sandy, Con Edison shut off power to sections of lower Manhattan in order to better protect underground equipment[33] and planned its defense measures based on the record eleven-foot storm surge recorded in 1821.[34] Con Edison believed that its system, designed to withstand a 12.5-foot storm surge, would withstand this storm.[35] But Superstorm Sandy created a fourteen-foot storm surge that flooded into the East River substation and destroyed underground equipment, leaving about 250,000 customers without power as "the blinding flash of an explosion lit the most famous skyline in the world, then plunged the bottom third of Manhattan into darkness."[36] Some referred to the area below 39th Street in Manhattan as "SoPo," or "South of Power," after five days without power.[37]

Superstorm Sandy caused five times more outages in the Con Edison service territory than Hurricane Irene, and it represented the worst natural disaster in Con Edison's history.[38] As a result of

30 *Flooding, Cleanup and Outages Well After Irene*, NBC NEWS (Aug. 29, 2011, 11:28 PM), http://www.nbcnews.com/id/44305129/ns/weather/#.

31 Jen Chung, *Power Outages in NYC Region as Hurricane Irene Arrives*, GOTHAMIST (Aug. 28, 2011, 8:33 AM), http://gothamist.com/2011/08/28/power_outages_in_nyc_region_as_hurr.php.

32 Jeff Donn, Jonathan Fahey & Dave Carpenter, *NYC Utility Prepped for Big Storm, Got Bigger One*, ASSOCIATED PRESS (Oct. 31, 2012, 1:45 PM), http://bigstory.ap.org/article/coned-prepped-big-storm-got-even-bigger-1.

33 Cara Buckley & William K. Rashbaum, *Power Failures and Furious Flooding Overwhelm Lower Manhattan and Red Hook*, N.Y. TIMES, Oct. 29, 2012, http://www.nytimes.com/2012/10/30/nyregion/red-hook-residents-defy-evacuation-warnings-drinks-in-hand.html?_r=0.

34 Donn, *supra* note 32.

35 *Id.*

36 *Id.*

37 NYS 2100 COMMISSION, *supra* note 5, at 81.

38 *Superstorm Sandy: 2013 State of the Company*, CON EDISON, http://www.conedison.com/ehs/2012-sustainability-report/engaging-stakeholders/reliability/superstorm-sandy/index.html#gsc.tab=0 (last visited Sept. 9, 2014).

Superstorm Sandy, about one-third of Con Edison's customers—1,115,000 out of 3.3 million—lost power.[39] Restoring power required replacement of 140 miles of electric cable and investigation of damages at 30,000 locations.[40] In a single week, Con Edison exhausted a supply of utility poles and transformers that normally would have lasted for six months.[41] The company was able to restore service to 98 percent of the affected customers within twelve days.[42]

It took up to two weeks or more to restore power in some parts of New York.[43] As noted in the NYS 2100 Commission Report, "[m]any of the power plants, substations, and other electric system infrastructure in the downstate region of New York are clustered in or near coastal areas, making them vulnerable to the type of flooding encountered" as a result of Superstorm Sandy.[44] Long Island's electrical system experienced "widespread devastation and outages of record number and duration"; 1.1 million customers of Long Island Power Authority (LIPA), or 90 percent of its customer base, lost power.[45] Superstorm Sandy affected forty-four of LIPA's substations, and LIPA was required to replace more than 4,500 poles and 2,100 transformers in addition to repairing about four hundred miles of distribution lines.[46]

In New Jersey, Superstorm Sandy affected about two million of PSE&G's customers and was described as the "largest and worst storm" in the utility's history.[47] Over 90 percent of PSE&G's customers lost power during Superstorm Sandy, or more than double the number of customers who experienced outages during Hurricane Irene.[48] Almost 40 percent of PSE&G's substations were affected, and about a third of its transmission lines, stretching

39 Elec. Infrastructure & Operations Panel Testimony, *supra* note 2, at 15.

40 *Superstorm Sandy: 2013 State of the Company*, *supra* note 38.

41 *Id.*

42 *Id.*

43 NYS 2100 COMMISSION, *supra* note 5, at 81.

44 *Id.*

45 *Id.*; *Long Island Power Authority Update on Hurricane Sandy*, LONG ISLAND POWER AUTHORITY (Nov. 19, 2012), http://www.lipower.org/newscenter/pr/2012/111912-update.html.

46 *Update on Hurricane Sandy*, *supra* note 45.

47 PSE&G Petition, supra note 17, at 2.

48 *Id.*.

for 1,517 miles, were interrupted.[49] In addition, almost 2,500 miles of sub transmission lines, affecting 355 different lines, were interrupted, and PSE&G experienced damage to over 2,400 utility poles, more than 1,000 transformers, and 1,282 overhead and underground distribution circuits.[50] PSE&G also replaced 320 miles of conductor between Newark and Pittsburgh.[51] PSE&G estimated that it spent $250 million to $300 million to restore its transmission and distribution system in the aftermath of Superstorm Sandy and the nor'easter that followed.[52]

B. Utility Rate Filings in the Aftermath of Superstorm Sandy: The Need for "Storm Hardening"

Within three months of Superstorm Sandy's destruction, Con Edison filed a request for a massive rate increase with the New York State PSC, with the "vast majority of the expenditures . . . relat[ing] to lessons learned from Superstorm Sandy about the vulnerability of Con Edison's system to extreme weather events."[53] Con Edison's filing letter made its case by focusing on "the need for investments and preventive measure to further strengthen critical infrastructure designed to reduce the impact of future major storms on [the utility's] customers."[54] Con Edison committed to spending $250 million on "storm protection measures" over the next two years, and the filing included approximately $1 billion in "potential storm hardening structural improvements over the next four years that are intended to reduce the size and scope of service outages from major storms, as well as to improve responsiveness and expedite the recovery process to better serve [the utility's] customers."[55] The measures for storm hardening of critical

49 *Special Edition: Superstorm Sandy*, PSE&G OUTLOOK, Dec. 2012, at 2, *available at* http://www.ragan.com/Uploads/Public/Documents/2012ECAwards/PSEG%20-%20Outlook_1212_Sandy.pdf.

50 *Id.*

51 *Id.*

52 *PSEG Estimates the Utility's Cost of Superstorm Sandy Restoration*, PSE&G (Dec. 4, 2012), http://www.pseg.com/info/media/newsreleases/2012/2012-12-04.jsp#.Uo0LMKMo670.

53 Testimony of Jackson Morris, Pace Energy & Climate Ctr. at 5, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n May 31, 2013) [hereinafter Morris Testimony], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={81F2C4EB-EE3C-4921-B0F5-C5F4C6E24EF3}.

54 Letter from Craig S. Ivey, *supra* note 16.

55 *Id.*

infrastructure incorporated "strategic undergrounding and flood protection projects."[56] Such projects involve installing flood walls to protect electric and steam equipment, raising the elevation of critical equipment in anticipation of higher flood levels, upgrading gas system equipment, and accelerating the schedule for installing submersible equipment.[57] Apart from these "storm hardening" projects, Con Edison also proposed plans "to improve the flexibility of the electric distribution system . . . ."[58] These plans involve installing additional switches and "smart grid" technology as well as reconfiguring certain networks in an effort to minimize the impact of storms on customers.[59]

Con Edison's filing did not provide itemized support for the $1 billion in "storm hardening" expenditures, which consisted of $800 million for the electric system, $100 million for the natural gas system and $100 million for the steam system during calendar years 2013, 2014, 2015 and 2016.[60] The filing identified electric system expenditures for various "storm hardening" projects, including $63.5 million for Central Operations over four years,[61] $90.5 million over four years for "capital projects that improve distribution system performance when storms occur,"[62] $240 million over four years for transmission and substation work,[63] and $215 million in 2013 and 2014 for distribution storm hardening work.[64] With respect to the remaining "storm hardening" projects included in Con Edison's $1 billion figure, the utility proposed

56 *Id.*

57 *Id.*

58 *Id.*

59 *Id.* "Smart grid" generally means modernizing the electric grid through investments in information and communications technology to enable the grid to detect and respond to changes in loads. *Smart Grid*, U.S. Dep't of Energy, OFFICE OF ELECTRICITY DELIVERY & ENERGY RELIABILITY, http://energy.gov/oe/technology-development/smartgrid (last visited Sept. 9, 2014). This automation technology allows the utility to control remote devices—such as integration of DG resources—from a central location. *Id.*

60 Testimony of Robert Mucillo, Con. Edison at 71–72, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n Jan. 25, 2013) [hereinafter Mucillo Testimony], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={3F1A34F7-1985-4A66-9D83-418CA43076CB}.

61 Elec. Infrastructure & Operations Panel Testimony, *supra* note 2, at 18.

62 *Id.* at 19–20.

63 *Id.* at 36.

64 *Id.* at 40.

implementation of a surcharge mechanism that would provide for rate recovery of costs associated with "storm hardening" projects and programs identified by Con Edison during periodic filings over the four-year period.[65] The surcharge mechanism was designed to recover both the cost of the investment and a return on the investment, in addition to operating and maintenance (O&M) costs, sales taxes, and other expenses associated with qualifying projects.[66]

PSE&G responded by filing a proposed "Energy Strong Program" with the New Jersey Board of Public Utilities (BPU) on February 20, 2013.[67] Under the Program, PSE&G proposed to invest $1.703 billion for electric service and $906 million for gas service (plus related O&M expenses) over a five-year period.[68] Over ten years, the full Energy Strong Program would spend $2.762 billion for electric service and $1.18 billion for gas service.[69] According to the filing, the purpose of the Energy Strong Program is to "harden electric and gas infrastructure to make them less susceptible to damage from extreme wind, flying debris and water damage in anticipation of . . . changing weather patterns."[70] The Program is designed to "improve the durability and stability of PSE&G's energy distribution infrastructure, making it better able to withstand the impacts of hurricanes and other severe weather events, and enabling a faster response to customers and outages than would otherwise be feasible."[71] The Program investments will also "increase the resiliency of PSE&G's electric delivery system, allowing it to recover more quickly than it would otherwise be able from damage to any of its components or to any of the external systems on which it depends."[72]

To allow prompt recovery of the costs associated with the Energy Strong Program, the PSE&G filing sought recovery of Program costs through an "Energy Strong Adjustment Mechanism," which would include a separate rider on the utility

65 Mucillo Testimony, *supra* note 60, at 75–77.
66 *Id.* at 76.
67 PSE&G Petition, *supra* note 17, at 1.
68 *Id.* at 4.
69 *Id.*
70 *Id.* at 1.
71 *Id.*
72 *Id.* at 1–2.

bill for recovery of these costs.[73] Costs recovered would include depreciation/amortization expense (to recover the cost of the Program Assets over their useful lives), return on the net investment at the weighted average cost of capital, O&M expenses associated with the Program, and certain administrative expenses.[74] Much of the Energy Strong Program is devoted to "hardening of the electric delivery infrastructure."[75] In addition to these "system-hardening" expenditures, PSE&G proposed two sub-programs "to increase resiliency of the electric delivery infrastructure."[76]

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73 *Id.* at 4.

74 *Id.* at 32.

75 *Id.* at 5. The first sub-program for "system hardening" involves station flood and storm surge mitigation for twenty-one substations affected by Superstorm Sandy and thirteen affected by Hurricane Irene and previous storms, at a cost of $1.678 billion over ten years, and it includes three mitigation options: (a) installation of flood walls, (b) raising and replacing the substation, or (c) relocating the substation. *Id.* at 5–10. The second sub-program involves setting higher outside plant design and construction standards, including upgrading about 130 miles of existing overhead 4 kV lines to 13 kV standards, at a cost of $65 million over five years; upgrading five percent of the existing 26 kV, or 60 miles of overhead construction, to 69 kV standards, at a cost of $60 million over five years; and replacing open wire with overhead spacer cable, at a cost of $10 million over five years. *Id.* at 10–12. The third sub-program involves strengthening pole infrastructure (using guying systems, larger and more closely placed poles, and non-wood poles) at a cost of $105 million over five years. *Id.* at 12–14. The fourth sub-program will rebuild and relocate backyard poles lines, at a cost of $100 million over five years. *Id.* at 14–15. The fifth sub-program, targeted undergrounding to mitigate storm impacts, includes undergrounding about twenty miles of overhead lines, at a cost of $60 million over five years; replacing about seventy-five of the devices used to serve high-rise facilities with multiple tenants, at a cost of $8 million over five years; and replacing about 200 transformers currently mounted on pads with equipment that is fully submersible, at a cost of $8 million over five years. *Id.* at 15–17. The sixth sub-program involves relocation of operations centers and the emergency response center, which are located below sea level, to a higher floor elevation, at a cost of $15 million over two years. *Id.* at 17–18.

76 The first sub-program, "Advanced Technologies," would improve "system visibility" through (1) widespread use of Supervisory Control and Data Acquisition (SCADA) field equipment and computer-based relays, at a cost of $250 million over ten years, and (2) a Distribution Management System (DMS) designed to allow every distribution circuit to be monitored and controlled remotely, at a cost of $50 million over ten years. *Id.* at 18. Other elements of the "Advanced Technologies" sub-program include improvements to communication networks to better address storm impacts, including a high-speed fiber optic network (cost of $73 million over ten years) and satellite communications (cost of $3 million over five years). *Id.* at 20. The utility also proposes to improve its system for storm damage assessment, incorporating an Advanced DMS, or ADMS, at a cost of $15 million over ten years. *Id.* at 21. Also included as part of "Advanced Technologies" are enhancements to the utility's storm management

PSE&G subsequently scaled back the scope of its Energy Strong Program from $3.942 billion to $1.22 billion under a settlement reached with other participants in the Energy Strong filing, which was approved by the New Jersey BPU on May 23, 2014.[77] Under the settlement, PSE&G will invest up to $1 billion ($600 million for the electric system and $400 million for the gas system) over three years, with recovery of the investment through the Energy Strong rate recovery mechanism.[78] PSE&G will invest an additional $220 million in its electric system, with those amounts subject to recovery through a base rate case rather than through the Energy Strong rate recovery mechanism.[79] The $1.22 billion total investment under the settlement comprises $620 million to raise, relocate, or protect twenty-nine electric switching and substations,[80] $350 million to replace and modernize 250 miles of low-pressure cast iron gas mains in areas that previously flooded or are located in FEMA flood zones,[81] $100 million for "system reconfiguration strategies" to create redundancies in the system to reduce outages,[82] $100 million for "advanced technologies" to deploy smart grid mechanisms for improved monitoring of system operations and enhanced ability to respond more quickly to needed system repairs,[83] and $50 million to raise and harden five natural gas metering stations that were flooded during Superstorm Sandy.[84] In approving the settlement,

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systems that enable gathering of information regarding damage to plants, at a cost of $50 million over four years. *Id.* at 21–22. Finally, PSE&G proposes to install expanded communications channels, to allow it to provide storm-related communications with customers, at a cost of $10 million over three years. *Id.* at 22. The second sub-program focused on improving resiliency is "Contingency Reconfiguration Strategies," which increases the number of sections within a particular loop scheme and thereby adds redundancy, at a cost of $200 million over five years. *Id.* at 22–23.

77 Order Approving Stipulation of Settlement at 3–4, 8–9, Petition of Pub. Serv. Elec. & Gas Co. for Approval of the Energy Strong Program (2013) (NJ BPU Dockets EO13021055 and GO13020156), *available at* http://www.state.nj.us/bpu/pdf/boardorders/2014/20140521/5-21-14-2I.pdf.

78 *Id.* at 5.

79 *Id.*

80 *Id.* at 9–11. This investment will be made over five years rather than three years. *Id.* at 5.

81 *Id.* at 12.

82 *Id.* at 11.

83 *Id.* at 11–12.

84 *Id.* at 12. This investment will be made over five years rather than three years. *Id.* at 5.

the New Jersey Board concluded that it was necessary to "harden" a number of PSE&G's switching and substations, and that PSE&G's overall reliability and ability to withstand storms would be enhanced by increased investments in other areas of its electric system.[85]

C. *The Performance of DG Resources During Superstorm Sandy*

Following Superstorm Sandy, the consulting firm ICF International prepared a report highlighting the role of DG resources, and CHP facilities in particular, in enhancing the resilience of critical infrastructure facilities during the extended power outages caused by Superstorm Sandy.[86] "Critical infrastructure" facilities were defined to include "those assets, systems, and networks that, if incapacitated, would have a substantial negative impact on national or regional security, economic operations, or public health and safety."[87] The ICF report includes fourteen case studies where CHP facilities improved system resiliency by "mitigating the impacts of an emergency by keeping critical facilities running without any interruption in electric or thermal service."[88] The report noted that, depending upon how the CHP system is configured, it can continue to operate independently from the electricity grid, thereby "ensuring an uninterrupted supply of power and heating or cooling to the host facility."[89]

Included in the case studies were four microgrids operated by educational institutions, where the campuses essentially disconnected from the grid and relied on self-generated power and heat. The Washington Square Campus of New York University was served during Superstorm Sandy by a 14.4-MW combined cycle CHP system that has operated since 2010.[90] The CHP system provides electricity to twenty-two campus buildings and thermal energy for thirty-seven campus buildings.[91] The system does not serve the entire NYU campus, but it was sufficient to provide the larger buildings and the essential operations at the Washington

85 *Id.* at 7.
86 ICF, *supra* note 12.
87 *Id.* at 2 (citing Patriot Act of 2001 § 1016(e), 42 U.S.C. § 5195c (2001)).
88 *Id.* at 4.
89 *Id.*
90 *Id.* at 29.
91 *Id.*

Square campus with heat and power during the storm.[92] The University's CHP system was able to isolate from the grid and go into "island" mode upon the failure of the utility grid.[93] Because of the capability of the University's CHP system, NYU and New York City officials were able to create a "command post" on the campus.[94] Princeton University in Princeton, NJ, has a district energy facility that has been in service since 1996 and provides electricity, steam, and chilled water for 150 buildings on its campus. [95] The system consists of a 15 MW natural-gas-fired CHP unit that typically provides about half of the electricity needs and all of the steam needs on the campus.[96] During Superstorm Sandy, the University was able to maintain essential services due to the CHP plant.[97] As in the case of the NYU campus, Princeton disconnected from the utility grid and relied on its CHP system to power most of its campus, with the plant meeting most of the energy needs during the two-day period (Monday evening to Wednesday evening) when grid power was unavailable.[98] In addition to providing an electricity supply, the CHP system continuously supplied steam and chilled water to the Princeton campus.[99] Two other college campuses had similar experiences. The College of New Jersey in Ewing, NJ, with its 5.2 MW gas turbine, also went into "island mode" when the grid went down, and it remained isolated from the grid for about a week until utility infrastructure issues could be resolved.[100] Salem Community College in Carney's Point, NJ, disconnected its 300 kW microturbine from the grid on Sunday morning, October 28, and it operated continuously until the morning of November 1. [101] This allowed the American Red Cross to open a disaster relief shelter in the DuPont Field House in Davidow Hall on Sunday evening.[102]

92 NYS 2100 COMMISSION, *supra* note 5, at 101.

93 ICF REPORT, *supra* note 12, at 29.

94 *Id.*

95 *Id.*

96 *Id.* at 16.

97 *Id.* It should be noted that non-critical loads (i.e., the administration building and some classrooms) were curtailed; the University's average load is 20 MW versus the 15 MW output of the CHP unit. *Id.*

98 *Id.*

99 *Id.*

100 *Id.* at 18.

101 *Id.* at 18.

102 *Id.* at 19. The three 100-kW microturbines provide about 80% of the

Eighty-five individuals took advantage of the disaster relief shelter during the storm.[103]

Several hospitals equipped with on-site DG resources also functioned normally during Superstorm Sandy and its aftermath. South Oaks Hospital in Amityville, NY, disconnected from the LIPA grid on the evening of October 28 and remained in "island mode" for about fifteen days.[104] By relying solely on five natural gas-fired reciprocating engines totaling 1.25 MW, the hospital was able to provide critical services for two weeks.[105] In Greenwich, CT, Superstorm Sandy caused a seven-day power outage in the area surrounding Greenwich Hospital.[106] Because of its 2.5-MW reciprocating engine CHP system, however, Greenwich Hospital was able to maintain normal operations throughout the outage.[107] The Christian Health Care Center (CHCC) in Wyckoff, NJ, is equipped with a 260 kW microturbine and three emergency backup generators.[108] During Superstorm Sandy, the CHCC experienced only a brief loss of power and was able to operate for 97 hours off the grid.[109] Its CHP system was able to meet all the power, heat, and hot water needs of the CHCC residents.[110]

With the benefit of on-site DG resources, one of the largest cooperative housing developments in the country, located in the Bronx, NY, was able to maintain heat and power for its sixty thousand-plus residents during Superstorm Sandy.[111] Co-op City, which sits on over 330 acres in the Bronx, includes fourteen thousand apartments, three shopping centers, six schools, and several parking garages.[112] Since 2011, it has been served by a 40 MW combined-cycle CHP facility fueled by natural gas that is capable of meeting about 95 percent of Co-Op City's electric and thermal loads.[113] Although the onsite cogeneration facility was installed primarily to achieve energy savings, its ability to operate

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electricity needs and all of the heating and cooling needs to Davidow Hall. *Id.*

103 *Id.*

104 *Id.* at 13.

105 *Id.*

106 *Id.* at 14.

107 *Id.* at 14.

108 *Id.* at 15.

109 *Id.*

110 *Id.*

111 *Id* at 21.

112 *Id.*

113 *Id.*

independently from the electrical grid during Superstorm Sandy enabled Co-op City to avoid the power outages experienced by the surrounding area.[114]

On Long Island, a district energy CHP system providing thermal energy to Nassau University Medical Center and Nassau Community College was able to continue operating throughout the storm and its aftermath without any operational issues.[115] The 57 MW CHP system, operated by Nassau Energy Corporation, continued to supply power to LIPA during this period and enabled Nassau Community College to establish an emergency shelter during Superstorm Sandy, which served over one thousand individuals for up to a month and a half.[116]

Another form of critical infrastructure—data centers that provide office telecommunications services to hundreds of companies—benefitted from on-site DG resources during Superstorm Sandy. The Public Interest Data Center at 50 West 17th Street in Manhattan, with its 65 kW natural gas-fired microturbine-based CHP system, was able to remain fully operational even though power to the building and the surrounding area was out for over two days.[117] Finally, a major manufacturing facility was able to remain open and continue operating with minimal disruption during Superstorm Sandy, due to the backup power from its CHP system.[118] The Sikorsky Aircraft Corporation in Stratford, CT, is equipped with a 10.7 MW gas turbine that satisfies 84 percent of the facility's electrical load and 85 percent of its thermal load.[119] The facility's CHP system did not experience any disruptions during Superstorm Sandy, and nine thousand Sikorsky employees were provided with food and amenities notwithstanding the power outages experienced in the local communities.[120]

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114 *Id.*

115 *Id.* at 25.

116 *Id.*

117 *Id.* at 20.

118 VIGNESH GOWRISHANKAR, CHRISTINA ANGELIDES & HANNAH DRUCKENMILLER, NATURAL RESOURCES DEFENSE COUNCIL, COMBINED HEAT AND POWER SYSTEMS: IMPROVING THE ENERGY EFFICIENCY OF OUR MANUFACTURING PLANTS, BUILDINGS AND OTHER FACILITIES 5 (2013), *available at* http://www.nrdc.org/energy/files/combined-heat-power-ip.pdf.

119 ICF, *supra* note 12, at 31.

120 GOWRISHANKAR ET AL., *supra* note 118, at 5.

D. *The Concept of Electric System Resilience*

The concept of "resilience" has broader applications outside the context of an electric utility system. C.S. Holling introduced the concept into the ecological literature in 1973 and distinguished it from the concept of stability.[121] According to Holling, stability measures the ability of an ecosystem to return to equilibrium after a disturbance; while resilience measures the ability of an ecosystem to absorb a disturbance, or the "persistence" of an ecosystem.[122] Other authors measure resilience according to the time it takes for a system to return to a stable state following a disturbance.[123] Some authors suggest that two separate variables are involved in defining resilience: resistance, which measures the size of a disturbance necessary to cause a change in structure, and recovery, which measures how quickly the system returns to its original structure.[124]

The concept of resilience is increasingly being mentioned in the context of infrastructure and essential services in the wake of recent extreme weather events.[125] The NYS 2100 Commission

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121 C.S. Holling, *Resilience and Stability of Ecological Systems*, 4 ANN. REV. ECOLOGY, EVOLUTION, & SYSTEMATICS 1, 14 (1973).

122 *Id.*

123 Lance H. Gunderson, *Ecological Resilience—In Theory and Application*, 31 ANN. REV. ECOLOGY, EVOLUTION, & SYSTEMATICS 425, 426 (2000), *available at* http://www.annualreviews.org/doi/pdf/10.1146/annurev.ecolsys.31.1.425. Resilience has also been defined as "the capacity of an ecosystem to absorb disturbance without shifting to an alternative state and losing function and services." Isabella M Côté & Emily S. Darling, *Rethinking Ecosystem Resilience in the Face of Climate Change*, 8 PLOS BIOLOGY 1 (2010), *available at* http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.1000438.

124 Gunderson, *supra* note 123, at 426.

125 *See, e.g.*, *The End of Sustainability*, where Robin Kundis Craig and Melinda Harm Benson express the view that effective mitigation of climate change has failed, and that the concept of "resilience" is a better means of addressing future challenges. Melinda Harm Benson & Robin Kundis Craig, *The End of Sustainability*, 27 SOC'Y & NAT. RESOURCES: AN INT'L J. 777, 780 (2014) ("[A] resilience approach would reorient current research and policy efforts toward coping with climate change instead of increasingly futile efforts to maintain the existing state of being."); Improving the Resiliency of Md.'s Elec. Distribution Sys., Md. Exec. Order 01.01.2012.15 (2012), *available at* http://msa.maryland.gov/megafile/msa/speccol/sc5300/sc5339/000113/016000/016239/unrestricted/20130091e-010.pdf; MEG CRAWFORD & STEPHEN SEIDEL, CTR. FOR CLIMATE AND ENERGY SOLUTIONS, WEATHERING THE STORM: BUILDING BUSINESS RESILIENCE TO CLIMATE CHANGE ix (2013), *available at* http://www.c2es.org/docUploads/business-resilience-report-07-2013-final.pdf.

Report, for example, measures resilience according to the ability of a system to continue performing its essential functions in the face of "shocks and stresses" inflicted on the system.[126] The Report also mentions the second concept associated with resilience, which is the ability to "repair and recover" following a "stress" event.[127] The New York State PSC's recent decision in the Con Edison case defined resiliency as going beyond the "hardening" of existing utility infrastructure to reduce the impact of severe storms.[128] Adopting the definition from the NYS 2100 Report, the PSC Order defined resilience as "'the ability of a system to withstand shocks while still maintaining its essential functions.'"[129]

DOE and the President's Council on Economic Advisors examined the economic benefits of grid resiliency and noted that

126 NYS 2100 COMMISSION, *supra* note 5, at 24.

127 *Id.* In contrast to resilient systems, those that are more vulnerable were described in the Report as lacking diversity or being stretched to capacity. *Id.* The NYS 2100 Commission identified several features that are common to most resilient systems, which included "having spare or latent capacity (redundancy), ensuring flexibility and responsiveness; managing for safe failure (building resistance to domino effects), and having the capacity to recover quickly and evolve over time." *Id.* Infrastructure resilience also comes into play in the context of security efforts; the Homeland Security Critical Infrastructure Task Force defines "resiliency" to mean "the capability of a system to maintain its functions and structure in the face of internal and external change and to degrade gracefully when it must." HOMELAND SEC. ADVISORY COUNCIL, REPORT OF THE CRITICAL INFRASTRUCTURE TASK FORCE 12 (2006), *available at* http://www.dhs.gov/xlibrary/assets/HSAC_CITF_Report_v2.pdf. Under this concept, "resilient infrastructure systems will be less likely to collapse in the face of natural or manmade disruptions and will limit damage when disruptions do manage to inhibit the full functionality of the system." UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10, at 7-2; *See also*, Brad Allenby & Jonathan Fink, *Toward Inherently Secure and Resilient Societies*, 309 SCIENCE 1034, 1034–36 (2005).

128 Order Approving Electric, Gas and Steam Rate Plans in Accord with Joint Proposal at 63, n. 47, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n Feb. 21, 2014) [hereinafter PSC Order], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={1714A09D-088F-4343-BF91-8DEA3685A614}.

129 *Id.* Similarly, when the U.S. Department of Energy and the President's Council on Economic Advisors examined the economic benefits of grid resiliency, they defined a more resilient grid as "one that is better able to sustain and recover from adverse events like severe weather." EXECUTIVE OFFICE OF THE PRESIDENT, ECONOMIC BENEFITS OF INCREASING ELECTRIC GRID RESILIENCE TO WEATHER OUTAGES 5 (2013), *available at* http://energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf.

the annual cost of weather-related outages ranges from $18 billion to $33 billion, with much higher costs in years with major storms.[130] According to their report, grid outages result in, among other things, "lost output and wages, spoiled inventory, delayed production, inconvenience and damage to the electric grid."[131] The report recommended continued investment in grid modernization, which would not only improve the ability of the grid to withstand severe weather, but also improve the efficiency of the grid and enhance national security.[132]

DG resources in particular have been identified as contributing to the resilience of electric utility systems. A 2002 report of the National Research Council (NRC) identified the vulnerabilities of the electric system to intentional disruptions and noted the potential role of DG resources in achieving "an intelligent, adaptive power grid."[133] According to the NRC report, an advantage of having smaller, distributed resources closer to the load centers is the creation of a "more flexible grid" that would enable "islanding to maintain key loads,"[134] as illustrated by the successful operation of microgrids following Superstorm Sandy, described above. The NRC report urged utilities to recognize the "improved security" provided by DG resources when they consider future investments in the grid.[135]

The U.S. Department of Energy Study (DOE Study) similarly identified the potential role of DG resources in improving resilience.[136] The DOE Study highlighted two resilience benefits of DG resources in particular. First, DG resources improve the flexibility of the grid by enabling customers to "island" from the grid, which can be especially important to enable critical infrastructure facilities (e.g., hospitals, fire and police stations, and emergency call centers) to continue operating during a widespread power outage.[137] Based on the track record of DG resources' ability to maintain power supplies to critical facilities during

130 EXECUTIVE OFFICE OF THE PRESIDENT, *supra* note 129, at 24.

131 *Id.* at 23.

132 *Id.*

133 NATIONAL RESEARCH COUNCIL, MAKING THE NATION SAFER: THE ROLE OF SCIENCE AND TECHNOLOGY IN COUNTERING TERRORISM 192 (2002).

134 *Id.*

135 *Id.*

136 U.S. DEP'T OF ENERGY, *supra* note 10, at 7-3.

137 *Id.*

widespread outages, the DOE Study described DG as a "viable means" for improving the resilience of the electric grid.[138] Second, DG resources reduce the vulnerability of the electric grid to terrorist attacks, through decreased reliance on large, centralized power plants and transmission lines in favor of a greater number of smaller-scale and decentralized power plants.[139] While a DG-based system would increase the number of targets vulnerable to attack, the Study observed that a smaller number of customers would be affected from such attacks on individual units.[140]

II. PROMOTING DG RESOURCES IN UTILITY REGULATORY PROCEEDINGS

A. *Advocating for the "Utility of the Future"*

In response to Con Edison's January 2013 rate filing, a group of environmental non-governmental parties (NGOs) intervened in the New York State PSC proceeding to offer "a different perspective" on the issues raised in Con Edison's rate filing.[141] The NGO parties, comprised of Environmental Defense Fund (EDF), Natural Resources Defense Council (NRDC), Pace Energy and Climate Center (Pace), and Columbia Law School Center for Climate Change Law (Columbia), observed that "the vast majority of the expenditures" driving Con Edison's request for rate relief related to the demonstrated inability of Con Edison's system to withstand severe weather events, based on the experience of Superstorm Sandy.[142] According to the NGO parties, a danger in having a "single issue"—the impact of Superstorm Sandy on Con Edison's system—drive a rate proceeding is that focusing too much on responding to the last storm may foreclose "a thoughtful, deliberate examination" of the investments that should be made in order to design more forward-looking utility systems that would be "resilient under conditions that are likely to exist for the next thirty or forty years."[143] The NGO parties undertook to articulate this different approach for Con Edison's system that would pursue the objective of resilience, and that would also produce environmental

138 *Id.* at 7-12.
139 *Id.* at 7-3.
140 *Id.*
141 Morris Testimony, *supra* note 53, at 4.
142 *Id.* at 5.
143 *Id.* at 6.

benefits and enhance economic efficiency.[144]

The NGO parties offered testimony in several specific areas. Pace's testimony addressed DG resources, microgrids and the role of energy efficiency.[145] The testimony of EDF focused on measures other than hardening that Con Edison could take to improve the resilience of its T&D systems, including advanced metering infrastructure (AMI) and smart grid investments.[146] In its testimony, NRDC addressed electric vehicle charging and time of use rates,[147] while Columbia's testimony focused on climate change impacts that New York City could expect to experience, including higher temperatures, rising sea levels, and increasing frequency of extreme weather events.[148] Collectively, the NGO parties purported to offer "elements that should be included in 'building a 21st Century resilience strategy' for Con Edison."[149]

Of particular relevance to this Article is the testimony on DG resources and microgrids offered by Pace. The Pace witness was a co-author of the ICF Report discussed in Section II.C above.[150] His testimony featured a number of the case studies from the report illustrating how fourteen facilities throughout the region, comprising educational, health, commercial, and industrial operations, were able to "power through" Superstorm Sandy

144 *Id.*

145 *Id.* at 2; *see also* Testimony of Thomas G. Bourgeois, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n May 31, 2013) [hereinafter Bourgeois Testimony I], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={EB31C202-D787-4790-8A8E-E4D94C8767C7}.

146 *See* Testimony of Paul Centolella, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n May 31, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={53AEAB04-79AF-480D-92BD-79FE1E12E138}. *See generally* Morris Testimony, *supra* note 53, at 3.

147 Morris Testimony, *supra* note 53, at 3–4; *see also* Testimony of Luke Tonachel, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n May 31, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={326F56AA-BDE2-4278-9D8A-6822643567A4}.

148 Morris Testimony, *supra* note 53, at 4; *see also* Testimony of Dr. Radley Horton, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n May 31, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={0CE5C2BD-3D0E-4FDD-8C4F-C77691D7B709}.

149 Morris Testimony, *supra* note 53, at 15.

150 ICF REPORT, *supra* note 12, at iii.

because of the availability of onsite DG resources, and CHP in particular.[151] The Pace witness cited the performance of DG resources and CHP facilities during Superstorm Sandy and its aftermath, and he concluded that the resilience of Con Edison's system could be improved if DG resources played a more prominent role in Con Edison's long-term strategy.[152] In the view of this witness, however, Con Edison devoted "very little attention" to the possible expansion of DG or CHP resources in its rate filing, and focused instead on "conventional and established measures" that would "harden" its system and strengthen its critical infrastructure.[153]

The Pace testimony noted that Con Edison had been unsuccessful in achieving DG penetration within its service territory.[154] Compared to the PlaNYC goal of 800 MW of new, clean DG resources within New York City by 2030,[155] only about 150 MW of DG resources were operating in Con Edison's service territory at the time, with an additional 75 MW of DG resources anticipated by 2017.[156] By 2030, Con Edison projected that it would have 500 MW of DG resources in its service territory, about 40 percent below PlaNYC's 800 MW goal.[157] Pace identified a number of reasons for the "unacceptably low levels" of DG penetration in Con Edison's service territory, including the failure of Con Edison's existing distribution planning process to contemplate DG solutions and Con Edison's "failure to enthusiastically encourage and to accommodate DG within its service territory."[158] According to Pace, by not incorporating DG resources into its planning process, Con Edison "is missing a huge

151 Bourgeois Testimony I, *supra* note 145, at 6–8.

152 *Id.* at 9.

153 *Id.* at 9–10.

154 *Id.* at 20.

155 THE CITY OF NEW YORK, PLANYC UPDATE 2011: A GREENER, GREATER NEW YORK 113 (2011), *available at* http://www.nyc.gov/html/planyc/downloads/pdf/publications/planyc_2011_planyc_full_report.pdf, which was released in 2007, is a long-term planning effort initiated by the Bloomberg administration to (1) prepare New York City for an additional million residents, (2) strengthen its economy, (3) address climate change, and (4) enhance the quality of life. *See About PlaNYC*, CITY OF NEW YORK, http://www.nyc.gov/html/planyc2030/html/about/about.shtml (last visited Feb. 22, 2015).

156 Elec. Infrastructure & Operations Panel Testimony, *supra* note 2, at 364.

157 *Id.*

158 Bourgeois Testimony I, *supra* note 145, at 20.

opportunity" to improve the resilience of its distribution system as well as the efficiency of the system (measured by asset utilization rates).[159]

As part of the NGO parties' vision of the "utility of the future," Pace presented a number of policy recommendations designed to force Con Edison toward more aggressively implementing DG and microgrid solutions.[160] Among other recommendations, Pace urged the New York State PSC to adopt rate incentives that would reward Con Edison financially if it took actions to encourage the development of clean DG resources, particularly high-efficiency CHP projects, within its service territory.[161] Pace also proposed that, in the case of these high-efficiency CHP projects, the price of gas delivered by Con Edison could be lowered to cover only the cost of the gas itself (i.e., the commodity cost) and not the transportation costs.[162] Another element proposed by Pace was the elimination of standby tariffs for qualifying projects.[163] To encourage utility-owned DG resources, Pace urged the PSC to consider adopting a program that would authorize Con Edison to earn higher rates of return on its investments in DG resources.[164]

With respect to microgrid development, Pace observed that progress has been "slow due to a lack of any formal statutory or regulatory guidance and high transactional costs," and urged "affirmative action by New York State lawmakers and/or

159 *Id.* As specific examples of Con Edison's "apparent unwillingness to accommodate DG within its service territory," Pace cited the experience of the Durst Organization and its skyscraper at One Bryant Park in Manhattan, where Durst on two separate occasions was forced to seek relief from the New York State PSC in response to attempts from Con Edison to increase the electricity and natural gas charges related to the CHP facility located at One Bryant Park. *Id.* at 20–21. Pace also noted Con Edison's proposal to delay replacing a number of over-duty circuit breakers in Manhattan, a situation often cited as a barrier to DG interconnection; according to Pace, these are the investments that "make the system more amenable to CHP/DG penetration," and should be accelerated rather than slowed. *Id.* at 23–24.

160 *Id.* at 27–28.

161 *Id.* at 15–16.

162 *Id.* at 16.

163 *Id.*

164 *Id.* The Pace testimony noted that it is against the utility's financial interests to encourage the development of DG resources, given that the T&D investment upon which a utility earns a return would be reduced or eliminated. *Id.*

regulators."[165] In the meantime, Pace recommended that Con Edison make the creation and interconnection of microgrids easier by streamlining the process through a standardized design and lowering the barriers to replication of the "campus style" interconnection that New York University was able to employ successfully.[166] Pace urged the PSC to require Con Edison to "issue a report demonstrating how it is integrating microgrids as a resiliency measure by summer of 2014."[167] Pace also urged the PSC to create a "microgrids collaborative" that would address the recommendations of a forthcoming study on microgrids prepared by the New York State Energy and Research Development Authority (NYSERDA).[168] The collaborative would be required to report back to the PSC and identify actual projects capable of being commenced in 2014.[169] Pace further urged that a collaborative be convened prior to the issuance of the NYSERDA study, which would facilitate the objective of creating a microgrid within a storm-impacted area so that a "center of refuge" can be created.[170]

In response to the testimony and proposals of the various parties to the rate proceeding, Administrative Law Judge Eleanor Stein presided over a collaborative group (Resiliency Collaborative) in early July 2013 to consider the various storm-hardening proposals offered by Con Edison in the proceeding and whether more "flexibility" could be incorporated into the utility's

165 *Id.* at 26. It should be noted that the New York State Legislature in 2013 passed a law requiring NYSERDA to "develop recommendations regarding the establishment of microgrids." S.-Assemb., S2608D-2013, 2013 Leg. (N.Y. 2013). The Memorandum accompanying the legislation states that "[h]ad New York State constructed microgrids to protect hospitals, first responder headquarters such as police and fire stations, emergency shelters, schools, water filtration plants, sewage treatment plants and other infrastructure, the extent of the damage caused by Super Storm Sandy would have been tremendously mitigated." *Id.* The Memorandum further states that "[t]he extent of severe damage caused by recent storms demonstrates the tremendous benefits of having microgrids in place to protect critical public health and safety infrastructure." *Id.*

166 Bourgeois Testimony I, *supra* note 145, at 26.

167 Initial Post-Hearing Brief of Pace Energy and Climate Center. at 27, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n Aug. 30, 2013), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=13-E-0030.

168 *Id.* at 27–28.

169 *Id.*

170 *Id.* at 28.

design standards.[171] Upon convening the Resiliency Collaborative, four working groups were formed to consider, among other things, the need to modify future design standards to reflect climate change and its effects, as well as alternative strategies to make the grid more resilient, including microgrids, DG resources, energy efficiency, demand response, and alternative metering technology.[172] Con Edison agreed to conduct a "Climate Change Vulnerability Study" that would reflect the latest thinking on climate change and identify the likely effects on infrastructure design standards.[173] More generally, Con Edison committed to consider resilience objectives in its practices relating to capital investments and operations.[174] A Phase II working group was formed to consider alternative strategies for achieving resilience (other than through "storm hardening" projects).[175] This working group identified several potential measures that Con Edison could take to improve resilience, including a number of measures advocated by the NGO parties in their testimony, such as DG resources, microgrids, energy efficiency (Pace), advanced metering and demand response (EDF), electric vehicles and rates based on time-differentiated pricing (NRDC), and integrating climate change into long-term planning (Columbia).[176] The goal of this working group was to develop a proposal for the PSC containing a package of measures (other than storm hardening) to achieve system resilience.[177]

Apart from the collaborative process dealing with storm hardening and resiliency issues, the parties to the rate proceeding pursued settlement discussions of the other rate case issues on a parallel track.[178] On December 31, 2013, a settlement agreement

171 CONSOL. EDISON CO. OF N.Y., STORM HARDENING AND RESILIENCY COLLABORATIVE REPORT 6 (2013), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=13-e-0030.

172 *Id.* at 6–7.

173 *Id.* at 9.

174 *Id.*

175 *Id.* at 23. The working group focused on alternative resiliency strategies is Working Group 2. *Id.*

176 *Id.*; *see supra* text accompanying notes 152–155.

177 CONSOLIDATED. EDISON CORPORATAION. OF N.Y., *supra* note 171, at 23.

178 Joint Proposal at 3, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n Dec. 31, 2013), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.asps?MatterCaseNo=13-E-0030.

among most of the parties to the proceeding, including the NGO parties, was submitted to the PSC.[179] This Joint Proposal includes a recommended rate increase over the two-year rate plan period that reflects the findings of the Resiliency Collaborative with respect to Con Edison's proposed storm hardening expenditures.[180] It also recommends that the PSC direct the continuation of the Resiliency Collaborative, including the discussions of the working group focused on alternative resiliency strategies.[181]

Additionally, the Joint Proposal contains agreements with respect to DG issues.[182] Con Edison identified significant load growth in the Brownsville section of Brooklyn requiring "significant capital investment in order to maintain reliability," and committed that it would use "non-traditional programs" such as deploying DG resources to minimize the capital investment necessary by Con Edison.[183] Con Edison responded to Pace's criticism regarding the delay in replacing "over-duty circuit breakers," which Pace had identified as an investment that would make it easier for Con Edison's system to accommodate DG resources.[184] In the Joint Proposal, Con Edison agreed that it would bear the cost of upgrading the fault current technology in those situations where the circuit was, or would be, overloaded upon the addition of DG resources, subject to a $3 million annual limit.[185] With respect to the deployment of microgrids within its service territory, Con Edison agreed that, within six months of the release of the NYSERDA microgrid study, it would file an "implementation plan" with the PSC and commence a collaborative process to evaluate whether its tariff should be modified to enable multiple customers to collectively use the output of an individual DG facility as an offset against their electrical usage.[186]

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179 *Id.* at 1–2, 4.

180 *Id.* at 51. In addition to the two-year rate plan for electric rates, the Joint Proposal provided three-year gas and steam rate plans. *Id.* at 2–3.

181 *Id.* at 50.

182 *Id.* at 96–97.

183 *Id.* at 38. As stated in the PSC Order, "Con Edison will pursue a plan to address significant load growth in the Brownsville section of Brooklyn with distributed resources as an alternative to traditional infrastructure." PSC Order, *supra* note 128, at 4.

184 Bourgeois Testimony I, *supra* note 145, at 23–24.

185 Joint Proposal, *supra* note 178, at 96.

186 *Id.* at 97. This would expand the opportunities for microgrids beyond the

The PSC received testimony regarding the Joint Proposal at a January 14, 2014 evidentiary hearing, and on February 21, 2014, it issued an order adopting the Joint Proposal.[187] The PSC Order acknowledged the prominent role of Superstorm Sandy in the proceeding, stating, "Superstorm Sandy drove home the urgency not only of emergency preparedness, but of advance planning for the impacts on the utilities of New York State of extreme weather events exacerbated by a changing climate."[188] The PSC Order characterized the expert testimony offered by the NGO Parties in the proceeding as "urging a comprehensive and longer-term approach" to the investments associated with storm-hardening, noting that the nature of infrastructure investments means they will likely last "for most of this century."[189] The Order describes the NGO proposals as "advocat[ing] generally for a broad definition of resiliency . . . to include equipment on both sides of the meter."[190] The PSC Order noted the findings of the New York City Panel on Climate Change regarding the likely impact of changing climate conditions on Con Edison's ability to provide reliable utility service, as well as the consensus of the Resiliency Collaborative that a utility system should be designed to "better withstand more frequent, violent storms and larger storm surges."[191]

The PSC Order adopted the recommendation in the Joint Proposal to continue the Resiliency Collaborative process.[192] Along with these efforts to improve the utility's adaptive capabilities, the PSC Order urged a continued commitment to climate mitigation measures in the form of efforts to reduce carbon emissions.[193] The Order noted the "broad support among the parties for these capital investments that are intended to enhance system reliability, to achieve a higher level of storm hardening and resiliency in the face of anticipated climate change and sea level rise."[194] The Order observed that the result of these investments

single-customer campus, such as in the case of New York University's Washington Square campus, to a microgrid involving multiple customers.

187 PSC Order, *supra* note 128, at 2, 8.

188 *Id.* at 62.

189 *Id.*

190 *Id.* at 66.

191 *Id.* at 62.

192 *Id.* at 67 (adopting the Collaborative Phase Two, but requiring Con Edison to report back to the Commission).

193 *Id.* at 67.

194 *Id.* at 24.

should be lower costs to customers in the future due to "greater efficiencies and stronger, more resilient systems."[195]

The PSC Order has directed a fundamental change in the manner in which Con Edison plans for future capital investments, and it requires analysis of alternative resilience strategies, including microgrids.[196] In this new approach to a cost/benefit analysis, Con Edison is required to consider "[t]he risks and probabilities of future climate events, the expected useful life of assets, the impact of outages of various duration on affected customers, and the potential risk to critical facilities."[197] The objective of such an analysis is to facilitate a comparison of the "traditional utility system" and alternative approaches.[198] Con Edison must quantify these considerations to the extent possible.[199] In describing the approach to the public, Con Edison announced in early February 2014 that, while such an analysis was difficult, it would begin conducting an economic analysis that would attempt to "quantify the benefits of preparing its infrastructure for the impacts of climate change."[200]

With respect to the application of the PSC's findings to utilities other than Con Edison, the PSC Order expressly broadened the obligation to address climate change considerations to apply to all New York utilities.[201] The Order urged New York utilities to "familiarize themselves with scientists' projections for local climate change impacts on each service territory,"[202] and "to

195 *Id.*

196 *See id.* at 67–68. The PSC Order directed Con Edison to "develop and apply a cost/benefit analysis approach for future capital investment that differs from a typical utility capital expenditures analysis and assesses the relative benefits of existing utility infrastructure and alternative resilience approaches such as microgrids."

197 *Id.* at 68.

198 *Id.*

199 *Id.*

200 Andrea Vittorio, *Con Edison to Calculate Economic Benefits of Preparing Utility for Climate Change*, DAILY ENV'T REP. (Feb. 11, 2014), http://www.bna.com/con-edison-calculate-n17179882024/. The utility spokesman added that "[e]lectric utilities haven't quantified the costs of climate change impacts, or the benefits of avoiding such costs, because that kind of economic analysis is 'tough to do . . . .'" *Id.*

201 PSC ORDER, *supra* note 128, at 71.

202 *Id.* The PSC Order noted that climate change impacts would differ from utility to utility: "[O]ther coastal and estuarine utilities also face sea level rise and storm surges, while all the State's utilities face challenges such as Hurricane Irene and Tropical Storm Lee, nor'easters, floods, severe winds, increased

integrate these considerations into their system planning and construction forecasts and budgets."[203]

The PSC Order was noteworthy in several respects. First, the PSC largely rejected the "business as usual" approach offered by Con Edison, which responded to Superstorm Sandy by proposing massive traditional investments in T&D infrastructure to "harden" the system against future storms.[204] In its place, the PSC enunciated a strategy much more focused on improving the resilience of the utility grid, which may depart from T&D infrastructure investments depending upon the outcome of an innovative cost-benefit analysis that Con Edison must apply to its future capital investments.[205] The Order points out that systems designed with resilience objectives should result in the lowest rates to customers in the long term.[206] Second, the PSC Order, by adopting the Joint Proposal and the specific commitments therein, recognized the valuable role that DG resources and microgrids can play in improving the resilience of a utility system in the face of future extreme weather events.[207] The PSC Order requires Con Edison to take specific steps to pursue integration of DG resources in its service territory and to investigate the feasibility of microgrid installations.[208] Third, the PSC adopted broader policies directing

ambient heat, and extreme heat events." *Id.* at 71–72.

203 *Id.* at 72. It should be noted that following Superstorm Sandy, Section 66 of New York's Public Service Law was amended to increase the role of the PSC with respect to oversight and enforcement of emergency plans. *See* Order Approving Electric Emergency Plans at 2, 2013 Elec. Emergency Plan Review, Case No. 13-E-0198, (N.Y. State Pub. Serv. Comm'n Aug. 16, 2013), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=13-e-0198&submit=Search+by+Case+Number. Section 66(21)(a), as amended, specifies the contents to be included in emergency plans, requires annual filing of emergency plans by utilities, and requires the PSC to review and approve the utility filings. *Id.* at 2, app. 2.

204 PSC Order, *supra* note 128, at 24.

205 *Id.* at 67–68.

206 *Id.* at 24.

207 *Id.* at 70.

208 *Id.* It should be noted that the PSC subsequently instituted a new proceeding, called Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, to explore the role of distribution utilities in a system based on deployment of DG resources. Order Instituting Proceeding at 1-2, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Case 14-M-0101, (N.Y. State Pub. Serv. Comm'n Apr. 25, 2014), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=14-m-0101&submit=Search+by+Case+Number. A Report and Proposal prepared by the Department of Public Service staff, attached to the

all utilities to integrate climate change adaptation into their long-term system planning.[209] Given the long-lived nature of infrastructure facilities, the Order directs that these investments be based on strategies promoting resilience to withstand future climate change and sea level rise, rather than historical experience.[210]

B. *Requiring Climate Change Planning by Utilities*

Another available legal tool to encourage utilities to consider the climate change adaptation and mitigation benefits of DG resources is imposition of a requirement, through either a regulation or administrative order, that utilities engage in a process of long-term planning that considers the risks posed by climate change and the measures available to utilities for mitigating those risks. In December 2012, a group of environmental and civic organizations in New York petitioned the New York State PSC for just such a regulation.[211] Led by the Columbia Law School Center for Climate Change Law, the petitioners urged the New York State PSC to require utilities in New York to consider how future extreme weather events may affect their infrastructure and their ability to provide utility service, and to develop plans for mitigating those risks.[212] According to the petition, Superstorm Sandy demonstrated that "infrastructure that has historically been safe from extreme weather events cannot be assumed to be safe from future events."[213]

In support of their request, petitioners cited the remarks of Governor Andrew Cuomo, who had urged that an anticipated increase in "extreme weather type situations" be taken into account in "reforming" the region's infrastructure.[214] Petitioners also noted

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Order Instituting Proceeding, present a possible new utility business model in which DG resources become a "primary tool in the planning and operation of electricity systems." *Id.* at 4.

209 PSC Order, *supra* note 128, at 71–72.

210 *Id.* at 72.

211 Columbia Petition, *supra* note 22, at 1.

212 *Id.* at 1. The other petitioners were Earthjustice, Environmental Advocates of New York, Natural Resources Defense Council, New York League of Conservation Voters, Pace Energy & Climate Center, Riverkeeper, Inc., and Municipal Art Society of New York. *Id.* at 9.

213 *Id.* at 3.

214 Ken Lovett, *Hurricane Sandy Death Toll in NY at 26; Gov. Cuomo Blames Climate Change for Increase in Storms*, N.Y. DAILY NEWS, Oct. 31,

Mayor Bloomberg's statement in the New York City Panel on Climate Change 2010 Report, where the Mayor observed that planning for climate change is less expensive "than rebuilding an entire network after a catastrophe."[215] Echoing this observation, the Petition stated that smart planning could indeed reduce the costs of future extreme weather events.[216]

For legal authority supporting the requested relief, petitioners relied on the general responsibility of the New York State PSC to ensure that New York utilities provide "safe and reliable service."[217] They cited Section 5[2] of the New York Public Service Law, which requires the PSC to encourage "corporations subject to its jurisdiction to formulate and carry-out long-range programs . . . for the performance of their public service responsibilities," and Section 66, which requires electric corporations to submit "storm plans" for review and approval by the PSC.[218] Pursuant to this authority, the PSC requires electric utilities to develop and file emergency response plans describing measures to deal with storms and similar events.[219] The Petition states that "[e]valuating risks to existing infrastructure and taking account of future climate predictions are essential to ensuring safe, secure and reliable access to utility services for the residents and

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2012, 1:30 PM, http://www.nydailynews.com/blogs/dailypolitics/hurricane-sandy-death-toll-ny-26-gov-cuomo-blames-climate-change-increase-storms-blog-entry-1.1692640. Governor Cuomo further stated, "I think part of learning [from] this is the recognition that climate change is reality. Extreme weather is a reality. It is a reality that we are vulnerable. And if we're going to do our job as elected officials, we're going to need to think about how to redesign, or as we go forward, make the modifications necessary so we don't incur this type of damage. For us to sit here today and say this is a once-in-a-generation and it's not going to happen again, I think would be short-sighted." *Id.*

215 Michael R. Bloomberg, *Foreword* to *Climate Change Adaptation in New York City: Building a Risk Management Response: New York City Panel on Climate Change 2010 Report*, 1196 ANNALS N.Y. ACAD. SCI. 1, 1 (2010), *available at* http://onlinelibrary.wiley.com/doi/10.1111/j.1749-6632.2009.05414.x.pdf.

216 Columbia Petition, *supra* note 22, at 4.

217 *Id.* at 5. Section 30 of the N.Y. Public Service Law states that "continued provision of [such services] to all residential customers without unreasonable qualifications or lengthy delays is necessary for the preservation of the health and general welfare and is in the public interest." N.Y. PUB. SERV. LAW § 30 (McKinney 2003).

218. Columbia Petition, *supra* note 22, at 5 (citing N.Y. PUB. SERV. LAW § 5[2] (MCKINNEY 2003) and N.Y. PUB. SERV. LAW § 66 (MCKINNEY 2003)).

219 *Id.* (citing N.Y. COMP. CODES R. & REGS. tit. 16, § 105 (2014)).

businesses of New York."[220]

According to the Petition, natural hazard mitigation plans should include four main elements. The first is incorporation of both hazard mitigation and disaster response planning efforts, including an evaluation of infrastructure.[221] Second, the plans should not be based on historic observations, but should incorporate future predictions of climate.[222] The Petition states, "[a] common weakness in existing natural hazard mitigation planning is its failure to account for the predicted severity of future storms and its reliance on historic trends . . . when available evidence indicates that storm surge and rainfall will be greater in the future than what has been seen historically."[223] A third requirement is that utilities coordinate with each other and with state and city officials, with an opportunity for all stakeholders to have input.[224] Finally, the plans should be reviewed at regular intervals to reflect new information on climate predictions and to assess the adequacy of mitigation efforts.[225] According to the Petition, plans meeting these requirements "would prepare utility infrastructure throughout the state for future extreme weather events, which are expected to be more severe than those seen in the past, and to ensure the reliable provision of vital service to New York citizens."[226]

The New York State PSC has not taken formal action on the Petition.[227] In response to the Petition, the PSC's acting secretary issued a letter noting that Governor Cuomo's then recent State of the State Address had described a need to address climate change through storm hardening measures and "resilience planning."[228]

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220 *Id.*

221 *Id.* at 6.

222 *Id.*

223 *Id.* at 7.

224 *Id.* at 6.

225 *Id.*

226 *Id.* at 8.

227 *See* Petition of Center for Climate Change Law at Columbia University Regarding Natural Hazard Planning, Matter No. 12-02754, (N.Y. State Pub. Serv. Comm'n Dec. 12, 2012), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=12-02754&submit=Search+by+Case+Number, which shows no further action taken in the docket other than a letter from Acting Secretary Cohen.

228 Letter from Acting Secretary Jeffrey C. Cohen in Response to the Center for Climate Change Law, Petition of Center for Climate Change Law at Columbia University Regarding Natural Hazard Planning, Matter No. 12-02754,

The letter also stated that PSC Staff was in the process of considering the approaches to infrastructure planning that would serve the "best interests of ratepayers" over the "long term."[229] As a practical matter, many of the issues raised by the Petition were included as part of the Con Edison rate proceeding that was later filed with the New York State PSC.[230] In his testimony to the New York State PSC, for example, the witness for the Environmental Defense Fund urged the PSC to require Con Edison to develop a long-term plan that focuses on enhanced grid resilience and addresses the "potential impacts of climate change, including storm surge, sea level rise, more severe storms, and extreme heat."[231] The testimony claimed that historical climate experience was no longer valid as a basis for long-term planning.[232] Columbia Law School's Center for Climate Change Law also filed testimony in the proceeding and criticized Con Edison's "storm-hardening efforts" for emphasizing measures deemed to be necessary based on the experience of Superstorm Sandy rather than looking forward to the measures necessary to cope with the anticipated impacts of climate change, such as sea level rise.[233] Columbia,

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1 (N.Y. State Pub. Serv. Comm'n Jan. 16, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={33FC06DC-93B3-411A-AB3B-FD5603B7FD65}.

229 *Id.*

230 Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=13-E-0030; *see* text accompanying notes 207–09.

231 Testimony on Behalf of Environmental Defense Fund at 5, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n May 31, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={53AEAB04-79AF-480D-92BD-79FE1E12E138}.

232 *Id.* at 8 (quoting *Executive Summary* of *Climate Change Adaptation in New York City: Building a Risk Management Response: New York City Panel on Climate Change 2010 Report*, 1196 ANNALS N.Y. ACAD. SCI. 7, 8 (2010), *available at* http://onlinelibrary.wiley.com/doi/10.1111/j.1749-6632.2009.05398.x/pdf).

233 Post Hearing Brief of the Columbia Center for Climate Change Law at 8, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n Sept. 10, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={C7889A83-F9B7-4072-8DCF-75741788D8BB}. According to Columbia, "Con Edison's current planning procedures are focused on storm mitigation based on historic, experienced events rather than projected future events." *Id.*

along with Natural Resources Defense Council, Pace Energy & Climate Center, Environmental Defense Fund, and the City of New York, addressed this shortcoming, at least in part, by entering into a stipulation with Con Edison requiring the utility to use updated flood plain maps when it develops its design standards for capital projects that are geared toward resilience—or storm hardening—objectives.[234] The Stipulation refers to Federal Emergency Management Agency (FEMA) Preliminary Work Maps issued in June 2013 and requires Con Edison to account for the impact of future climate change for projects located within the one hundred-year floodplains by imposing a design objective based on the threat posed by a one hundred-year flood plus three feet.[235]

As discussed in the preceding Section, the issues raised in the Con Edison proceeding were resolved in accordance with a Joint Proposal adopted by the New York State PSC in its order issued in February 2014.[236] Although the PSC noted in its order that the settlement by its terms is specific to Con Edison, the PSC also addressed the applicability of climate change impacts to other utilities by expressly broadening the obligation to address these issues to include all utilities.[237] As noted in the preceding Section, New York utilities were urged to examine projections by scientists regarding local climate change impacts, noting that climate change impacts would differ from utility to utility.[238] By requiring utilities "to consult the most current data to evaluate the climate impacts anticipated in their regions over the next years and decades" and "to integrate these considerations into their system planning and construction forecasts and budgets,"[239] the PSC Order granted the essential elements of the relief requested in the Petition.

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234 Climate Change Stipulation, Rates, Charges, Rules & Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 13-E-0030 (N.Y. State Pub. Serv. Comm'n July 19, 2013), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={207C8972-2BE0-4BC3-8B12-420E99B70C10}.

235 *Id.* The stipulating parties also agreed on "the value of increasing the resiliency of Con Edison's infrastructure," and agreed "to advocate to the Commission ratemaking treatment and cost recovery for resilience- or storm hardening-related capital projects" that were consistent with the terms of the Stipulation. *Id.*

236 PSC Order, *supra* note 128, at 73.

237 *Id.* at 71.

238 *Id.*

239 *Id.* at 72.

C. *The Role of the Prudence Standard*

The prudence standard in utility ratemaking can also be an effective tool in utility retail rate proceedings to promote the integration of DG resources in utility system planning. Prudence has been described as "an essential constituent" of utility regulation.[240] When an electric utility seeks to increase its rates, it bears the burden of proof to demonstrate that the expenditures underlying the proposed rate increase are "reasonable and prudent."[241] As stated by the New York Court of Appeals, the utility has the burden "to justify its conduct" and to demonstrate that it "acted reasonably, under the circumstances at the time."[242] In the context of justifying significant capital expenditures, a utility seeking to fulfill this burden of proof generally must show that it followed a sound decision making process and properly considered the facts that it knew or should have known at the time it reached its decisions.[243] The prudent investment standard has been described as "'an analog of the common law negligence standard" for utility regulators in determining whether utility investments should be excluded from rate base.'[244] The burden on the utility is to demonstrate that the investment was "necessary and appropriate, or resulted in no additional costs."[245]

To satisfy the burden of proof that a capital expenditure is necessary and reasonable—and therefore recoverable in rates—a number of states have required a utility to demonstrate that it identified and evaluated alternatives to the particular investment. The Kentucky Public Service Commission (PSC), for example, requires that a utility seeking a certificate of convenience and necessity for construction of electric facilities "must demonstrate

240 Long Island Lighting Co. v. Pub. Serv. Comm'n of State of N.Y., 523 N.Y.S.2d 615, 620 (N.Y. App. Div. 1987).

241 Cent. Vermont Pub. Serv. Corp., 83 P.U.R.4th 532, 566 (Vt. Pub. Serv. Bd. 1987).

242 Long Island Lighting Co., 523 N.Y.S.2d at 620.

243 Gulf States Utils. Co. v. La. Pub. Serv. Comm'n, 578 So. 2d 71, 85 (La. 1991) (citing Re Cambridge Elec. Light Co., 86 P.U.R.4th 574 (Mass. Dep't Pub. Utils. 1987)).

244 *Id.* at 84–85 (quoting Appeal of Conservation Law Found., 127 N.H. 606, 637 (1986)).

245 *Id.* at 85 (citing Union Elec. Co., 40 F.E.R.C. 61,046 (1987); Long Island Lighting Co. v. Pub. Serv. Comm'n of N.Y., 523 N.Y.S.2d 615 (N.Y. App. Div. 1987); Cent. Vermont Pub. Serv. Corp., 83 P.U.R.4th 532 (Vt. Pub. Serv. Bd. 1987)).

that a thorough review of all reasonable alternatives has been performed."[246] Such review necessarily involves consideration of whether such alternatives may result in a lower cost over time to utility ratepayers. While selection of a higher-cost alternative does not necessarily indicate "wasteful duplication" under the Kentucky statute, the Kentucky PSC has adopted "the principle of least-cost [as] one of the fundamental foundations utilized when setting rates that are fair, just, and reasonable."[247] The Washington Utilities and Transportation Commission (WUTC) similarly requires evaluation of alternatives as part of a utility's prima facie case to demonstrate the prudence of a resource acquisition. In a 1993 decision involving Puget Sound Power and Light Company, the WUTC directed that the utility, for each of its resources acquisitions, identify the resource alternatives that were available to it at the time it made the decision to contract for the resource at issue.[248]

With respect to the evaluation of DG resources as an alternative to utility investments in T&D infrastructure, the California Public Utility Commission (PUC) expressly requires the three investor-owned utilities subject to its jurisdiction to evaluate DG resources as possible alternatives to distribution system upgrades.[249] In Minnesota, a utility seeking to construct transmission lines must demonstrate that there is not a more cost-effective means of meeting the demand for electricity.[250] Included among the possible alternatives to be considered are deployment of DG resources, improvements to existing generating and transmission facilities, and scaling up load-management programs.[251]

Based on this precedent under the prudent investment standard, utility expenditures on T&D infrastructure can be challenged in rate proceedings by showing that use of DG

246 Kentucky Power Co., 2013 WL 5592919, at *16 (Ky. Pub. Serv. Comm'n 2013).

247 *Id.* The PSC also stated that the "least-cost principle" is incorporated within Ky. Rev. Stat. Ann. § 278.020(1), which is the statute requiring a certificate of convenience and necessity for construction of electric facilities. *Id.*

248 Puget Sound Power & Light Co., 1993 WL 500137, at *17 (Wash. Utils. & Transp. Comm'n 1993).

249 Elec. Util. Res. Planning, 2004 WL 3057972, at *31 (Cal. Pub. Utils. Comm'n Dec. 16, 2004).

250 Application of Otter Tail Power Co., 2007 WL 2505697, at *17 (Minn. Office of Admin. Hearings 2007).

251 *Id.*

resources may result in a lower-cost alternative for the utility than additional investments in T&D infrastructure. The contention is that because DG resources allow the generation to be located closer to the load, some spending on T&D infrastructure may be subject to disallowance as unnecessary expenditures under the prudent investment standard. An example of such a challenge is Pace's testimony in Con Edison's 2009 electric rate proceeding.[252] In that proceeding, Con Edison sought an increase in its electric rates of $854 million.[253] Infrastructure investment accounted for $170 million of the requested revenue requirement increase, and was the largest single item driving the need for rate relief.[254] Given the extent to which investment in T&D infrastructure was driving the need for Con Edison to seek rate relief, Pace intervened in the case to "explore[] the extent to which Con Edison considers using additional investments in DG, whether utility-owned or customer-owned, as a means of avoiding or delaying investment in T&D infrastructure."[255]

Pace's discovery focused on whether Con Edison evaluated the deployment of DG resources as an alternative in the various T&D infrastructure projects Con Edison proposed for rate recovery in its filing.[256] According to Pace's testimony, Con Edison claimed to have explored various options for reducing the need for infrastructure investment.[257] In an attempt to satisfy its burden to demonstrate the reasonableness of its proposed T&D infrastructure expenditures, Con Edison followed a "least cost evaluation process" that included various "least cost option[s]" such as the installation of additional equipment, examining demand-side options in the area, rerouting electrical load to a nearby substation having available capacity, or building a new substation.[258] Pace expressly inquired about Con Edison's evaluation of DG as part of

252 Testimony of Thomas G. Bourgeois, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 09-E-0428 (N.Y. State Pub. Serv. Comm'n Aug. 28, 2009) [hereinafter Bourgeois Testimony II], *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=09-e-0428&submit=Search+by+Case+Number.

253 *Id.* at 9.

254 *Id.*

255 *Id.*

256 *Id.* at 18.

257 *Id.*

258 *Id.* at 18–19.

this "least cost evaluation process."[259] Con Edison's response was that DG was evaluated, inasmuch as DG resources were technically included as part of its "Targeted DSM Program."[260] Noting that there was no participation by DG providers in Con Edison's Targeted DSM Program—which Pace claimed was due to the "restrictive parameters of the Program"—Pace stated it was "hollow" for Con Edison to hold out this Program as a true evaluation of DG resources as cost-effective alternatives to T&D investment.[261] Citing the results of its discovery, Pace challenged Con Edison's claim that DG resources were integrated into its planning process as possible alternatives to T&D investment.[262] As its requested relief, Pace asked that Con Edison be required in future proceedings to show, as part of its burden of proof for recovering T&D costs in rates, that it evaluated DG resources as an alternative to making additional investment in T&D infrastructure.[263]

The issues Pace raised were addressed in a settlement agreement between Con Edison and the other parties to the rate proceeding.[264] Under the Joint Proposal filed with the New York State PSC on November 24, 2009, Con Edison agreed to convene a DG Collaborative to investigate a number of DG-related issues that arose in the case. These issues included a "physical assurance" requirement imposed on DG resources seeking to participate in Con Edison's DSM programs, the extent to which Con Edison included DG resources in its long-range electric plan, the terms under which Con Edison provides electric service to a campus facility where an on-site DG resource provides all or part of the customer's electrical or thermal requirements, and the quantitative value of using DG resources to defer infrastructure investment.[265] The DG Collaborative was assigned the task of developing protocols for Con Edison's T&D planning process that incorporate

259 *Id.*

260 *Id.* at 19.

261 *Id.*

262 *Id.*

263 *Id.*

264 Joint Proposal, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 09-E-0428 (N.Y. State Pub. Serv. Comm'n Nov. 23, 2009), *available at* http://documents.dps.ny.gov/public/Common?ViewDoc.aspx?DocRefId={16AFDDC3-0F68-45B9-B27CDFA48744B3A2}.

265 *Id.* at 57.

the possible use of DG resources as a means of providing load relief, with the express requirement that DG resources were to be considered on a comparable basis with other measures.[266] The Collaborative was also charged with exploring options for funding investments in DG resources in those situations where they could be deployed as alternatives to T&D investments.[267] The Joint Proposal specified that the types of DG to be considered by the Collaborative included CHP and solar, as well as energy storage technologies.[268] The Joint Proposal was adopted by the New York State PSC in March 2010.[269]

The DG Collaborative convened on April 12, 2010, and held eleven meetings over the succeeding six months.[270] On November 2, 2010, Con Edison filed the Report of the DG Collaborative with the New York State PSC.[271] One of the issues the DG Collaborative dealt with was the "physical assurance" requirement that Con Edison applied in administering its Targeted DSM program; the result of this "physical assurance" requirement was to effectively impose a 100 percent reliability requirement for DG resources connected to its system.[272] This requirement meant that either the customer with DG resources had to isolate its load from the grid and rely solely on the DG resource, or the customer had to be willing and able to reduce its load if the DG resource was unavailable.[273] This was seen as a barrier to DG resources, inasmuch as Con Edison was imposing a reliability requirement on

266 *Id.*

267 *Id.*

268 *Id.*

269 Order Establishing Three-Year Electric Rate Plan, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 09-E-0428 (N.Y. State Pub. Serv. Comm'n Mar. 26, 2010), *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={60F5E842-B7B6-43CC-A589-8C16347B59FD}.

270 Distributed Generation Collaborative Report, at 2, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consol. Edison Co. of N.Y. for Elec. Serv., Case No. 09-E-0428 (N.Y. State Pub. Serv. Comm'n Nov. 2, 2010) [hereinafter DG Collaborative Report], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={B731E2D5-83A9-4954-9F15-694699915503}.

271 *Id.*

272 *Id.* at 4; Bourgeois Testimony I, *supra* note 145, at 12.

273 Bourgeois Testimony I, *supra* note 145, at 12.

the resources greater than it expected from its own system.[274] As a result of the DG Collaborative process, there was some movement by Con Edison, which promised to ease this physical assurance requirement in some limited situations.[275] Con Edison also committed that over the twenty-year period of its Electric System Long Range Plan, it would "seek to integrate energy efficiency, DG, and demand response ("DR") to further the goals of deferring new infrastructure investments."[276] Con Edison further acknowledged that while "traditional infrastructure investments are one way to address capacity and reliability constraints on the system . . .[i]n some cases, demand side solutions may be more effective and will also help meet [Con Edison] objectives to reduce the impact of energy distribution and use on the environment."[277]

Pace and NRDC pursued a similar strategy in another rate proceeding before the New York State PSC related to the requested rate increase of Niagara Mohawk Power Corporation (Niagara Mohawk), a subsidiary of National Grid.[278] In January 2010, Niagara Mohawk filed a case with the New York State PSC seeking an increase of $392 million, or 12 percent, in its electric rates over a three-year period.[279] According to the

274 Bourgeois Testimony II, *supra* note 252, at 13.

275 Bourgeois Testimony I, *supra* note 145, at 12; *see also* DG Collaborative Report, *supra* note 270, at 4–5.

276 DG Collaborative Report, *supra* note 270, at 5.

277 *Id.* at 6. Notwithstanding these statements by Con Edison in the DG Collaborative Report, Pace testified in the 2013 Con Edison rate case that "the DG Collaborative was unsuccessful in getting Con Edison to think any differently about integrating DG into its long-term planning process." Bourgeois Testimony, *supra* note 145, at 12. Pace observed that Con Edison's "DG Strategy," as enunciated in the DG Collaborative Report, is "passive rather than proactive." *Id.* at 13. As described by Pace, "the results of the DG Collaborative are that Con Edison will continue to 'study' the issue for the next few years, take another five years to develop an 'implementation strategy,' and maybe after 10 years customers will see streamlined interconnections, two-way communications, and the possibility of microgrids." *Id.* Pace concluded that Con Edison "has not been motivated to consider DG and microgrids as solutions," and thus the PSC "must step in to protect ratepayers and require swifter action." *Id.*

278 *See* Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corporation, Case No. 10-E-0050 (N.Y. State Pub. Ser. Comm'n), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=10-e-0050&submit=Search+by+Case+Number.

279 Letter from Peter G. Flynn, Deputy Gen. Counsel, Nat'l Grid to Jaclyn Brilling, Secretary, N.Y. State PSC 2 (Jan. 29, 2010), *available at*

Pace/NRDC testimony in the proceeding, a major component driving Niagara Mohawk's request for rate relief was the utility's existing and planned expenditures on T&D infrastructure.[280] Pace/NRDC pointed out that Niagara Mohawk proposed "to invest $541 million, $649 million, and $629 million in electric transmission and distribution infrastructure in calendar years 2011, 2012, and 2013."[281] According to Pace/NRDC, the role of T&D infrastructure investment as a driver in Niagara Mohawk's need for rate relief warranted an examination of the extent to which Niagara Mohawk evaluates "non-wires alternatives" as measures that could possibly be used to avoid or defer investments in T&D infrastructure.[282] Pace/NRDC defined "non-wires alternatives" to include demand-side management, DG, and customer energy efficiency.[283] Pace/NRDC cited in particular to a report summarizing a comprehensive management audit of Niagara Mohawk, which concluded that such non-wires alternatives, as well as smart grid initiatives, were "not regularly considered" in Niagara Mohawk's system planning process.[284] Based on their discovery during the proceeding, Pace/NRDC claimed that the utility's planning engineers lacked "well-developed tools" for evaluating measures on the customer side of the meter (including DSM and DG resources) as alternatives to traditional T&D infrastructure investments.[285] Pace/NRDC also stated that Niagara Mohawk had failed to analyze the possible role that either customer-owned or utility-owned DG could have in deferring or avoiding T&D expansion projects.[286]

Pace/NRDC concluded that Niagara Mohawk's record on

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https://www2.dps.ny.gov/ETS/jobs/display/download/2836571.pdf.

280 Testimony of James M. Van Nostrand, at 10, Niagara Mohawk Power Corp., Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corporation, Case No. 10-E-0050 (N.Y. State Pub. Serv. Comm'n July 14, 2010), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=10-e-0050&submit=Search+by+Case+Number.

281 *Id.* at 9 (quoting the testimony of Thomas B. King) (internal quotation marks omitted).

282 *Id.* at 10 (internal quotation marks omitted).

283 *Id.* In other words, traditional T&D infrastructure investment constituted the "wires," and any measure that reduced investment in the "wires" was a "non-wires alternative."

284 *Id.* at 10–11.

285 *Id.* at 12 (internal quotation marks omitted).

286 *Id.* at 16–17.

evaluation of non-wires alternatives to traditional T&D infrastructure investment was "disappointing," and that there was "no sense of urgency on the issue" as the utility "continue[d] on its 'business as usual' path of making substantial—and possibly imprudent—investments in its T&D infrastructure, to the tune of over $1.7 billion over the next three years."[287] As in the 2009 Con Edison rate case, Pace/NRDC sought similar relief and urged the PSC to require Niagara Mohawk to show in future proceedings, as part of its burden of proof for recovering T&D costs in rates, that it evaluated non-wires alternatives as a means of deferring or avoiding additional investment in T&D infrastructure.[288] In other words, Niagara Mohawk should be required to show "as an integral component of its T&D planning that it has explored non-wires alternatives and determined them not to be cost-effective as compared to traditional wires investments."[289] Pace/NRDC further recommended that Niagara Mohawk be required to develop a "pilot program" that would demonstrate the potential use of non-wires alternatives to avoid or delay T&D investment.[290] Such a program would involve the utility identifying an area where additional capacity is needed and developing a strategy that incorporates non-wires solutions to demonstrate how such solutions can be integrated into the T&D planning process.[291]

Niagara Mohawk indicated that it would consider implementing a program on a pilot basis to allow it to gather more information on the potential for non-wires alternatives, as well as emphasizing the need to ensure that costs associated with such an effort would be recovered in rates.[292] But it opposed imposition of a requirement that it address non-wires alternatives in future rate case presentations for the recovery of T&D system investments, citing the progress already underway at the utility on this issue, the "nascent stage of development" of non-wires alternatives

287 *Id.* at 19.

288 *Id.* at 20.

289 *Id.*

290 *Id.* at 20–21.

291 *Id.* at 21–22.

292 Initial Brief of Niagara Mohawk Power Corp., at 161, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corporation, Case No. 10-E-0050 (N.Y. State Pub. Serv. Comm'n Oct. 8, 2010), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=10-e-0050&submit=Search+by+Case+Number.

throughout the country, and the fact that analysis of non-wires solutions requires consideration of site-specific circumstances.[293] In their Recommended Decision issued November 17, 2010, Administrative Law Judges William Bouteiller and Rudy Stegemoeller concluded that "[i]t is clear that Pace/NRDC perceive [Niagara Mohawk] as having dragged its heels" and, at the same time, that "National Grid is promising to move promptly and effectively to undertake a pilot program."[294] They directed that these parties make a proposal in their briefs on exception for a timeline of activities over the subsequent two to three years that would explore the use of non-wires alternatives in the utility's service area.[295]

In its brief on exceptions to the PSC, Niagara Mohawk set forth a proposed course of action, as agreed upon with Pace/NRDC.[296] The plan contemplated collaborative discussions between Pace/NRDC and Niagara Mohawk, designed to develop a framework under which customer-sited options (energy efficiency investments and DG resources) would be considered as alternatives to traditional infrastructure investments, followed by identification of a range of possible pilot proposals demonstrating deployment of these non-wires alternatives.[297] These proposals would then be presented to the Department of Public Service Staff for its input and consideration, followed by comment from a larger group of interested parties.[298] In its order on January 24, 2011, the PSC adopted the proposal for evaluation of non-wires alternatives,

293 *Id.* at 163.

294 Recommended Decision, at 226, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corporation, Case No. 10-E-0050 (N.Y. State Pub. Serv. Comm'n Nov. 17, 2010), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=10-e-0050&submit=Search+by+Case+Number.

295 *Id.* at 116–17 (The parties were directed to set forth a "preferred course of action for the next twenty-four to thirty-six months for the approach that should be taken (including a timetable for action and a list of critical path milestones) to address the use of non-wires alternatives in the Niagara Mohawk service area.").

296 Brief on Exceptions of Niagara Mohawk Power Corp. d/b/a National Grid, at 46, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corporation, Case No. 10-E-0050 (N.Y. State Pub. Serv. Comm'n Dec. 8, 2010), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=10-e-0050&submit=Search+by+Case+Number.

297 *Id.*

298 *Id.*

finding that "a cooperative effort between [Niagara Mohawk] and Pace/NRDC, followed by input from Staff and other parties, is an efficient use of resources toward this important goal."[299]

In its April 2012 rate filing, Niagara Mohawk reported its progress on the collaborative process.[300] According to its report, the utility has been working collaboratively with Pace and NRDC to explore the potential for a pilot program for non-wires alternatives.[301] The work includes development of a "principles document," to be agreed upon by Niagara Mohawk, Pace and NRDC, that will guide the non-wires alternative implementation strategy.[302] Niagara Mohawk reported that a desired outcome of the collaborative process would be the identification of suitable pilot projects that it would present to the Commission for consideration.[303] In May 2012, Pace/NRDC and Niagara Mohawk executed a "Non-Wires Alternatives Principles" document that commits National Grid to investigate the feasibility of using "non-wires alternatives" as a means of improving the efficiency of investments in its T&D system.[304] "Non-wires alternatives" were defined broadly to include measures on the customer's side of the meter such as energy efficiency, demand response, and deployment of DG resources.[305] The document acknowledges that the full integration of these resources "requires analysis of the

299 Order Establishing Rates of Electric Service, at 67, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corporation, Case No. 10-E-0050 (N.Y. State Pub. Serv. Comm'n Jan. 24, 2011), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=10-e-0050&submit=Search+by+Case+Number.

300 Testimony and Exhibits of Electric Infrastructure and Operations Panel at 109, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Niagara Mohawk Power Corp. d/b/a National Grid for Elec. Serv., Case No. 12-E-0201(N.Y. State Pub. Serv. Comm'n 2012), *available at* http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=12-e-0201&submit=Search+by+Case+Number.

301 *Id.*

302 *Id.* Niagara Mohawk, Pace and NRDC subsequently agreed upon this "principles document." Email from Thomas R. Bourgeois, Deputy Director, Pace Energy & Climate Center, to author (Feb. 23, 2014, 19:42 EST) (on file with author).

303 Testimony and Exhibits of Electric Infrastructure and Operations Panel, *supra* note 300, at 109.

304 *Non-Wires Alternatives Principles*, attachment to email from Thomas Bourgeois, Deputy Director, Pace Energy & Climate Center, to author (Feb. 23, 2014, 19:42 EST) (on file with the author).

305 *Id.* at 1.

specific costs and benefits of the various components of [non-wires alternatives] and their compatibility with wires based solutions," and reports that "new screening tools are being developed and incorporated into [National Grid's] planning processes."[306]

D. *The "Used and Useful" Doctrine and the Role of DG Resources in Avoiding Excess Capacity*

Under the "used and useful" standard, a utility is allowed to include in its rate base (upon which it earns a return, or profit) only those assets that are "used and useful" in rendering utility service to its customers.[307] Generating electricity that is in excess of the utility's current needs to meet the demands of its customers is subject to disallowance by regulators on the grounds that the assets used to generate the electricity are not "used and useful."[308] Because the optimal size for additions of nuclear, coal, and natural gas-fired generating stations under the traditional utility-scale central generating station model is fairly large, investments by utilities in new generating capacity are said to be "lumpy," or available only on a substantial scale.[309] This large scale contrasts sharply with the more steady and smooth growth in demand typically experienced by retail electric utilities.[310] As a result, the resource additions under the traditional utility-scale model often result in a short-term mismatch between loads and resources, thereby potentially exposing utilities to disallowances for excess capacity under the "used and useful" principle.[311] This principle can come into play as a legal tool for promoting DG resources by demonstrating that these resources are a means of avoiding the "lumpiness" associated with the central generation model. Simply stated, DG resources allow the addition of smaller increments of

306 *Id.*

307 Denver Union Stock Yard Co. v. United States, 304 U.S. 470, 475 (1938).

308 William Baumol & Gregory Sidak, *The Pig in the Python: Is Lumpy Capacity Investment Used and Useful?,* 23 Energy L.J. 383, 383—84 (2002).

309 *Id.* at 385.

310 The U.S. Energy Information Administration projects growth in total electricity demand of about 0.9 percent per year from 2012 to 2040. 2014 U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2014 MT-16 (2014), *available at* http://www.eia.gov/forecasts/aeo/.

311 Richard J. Pierce, Jr., *The Regulatory Treatment of Mistakes in Retrospect: Canceled Plants and Excess Capacity*, 132 U. PA. L. REV. 497, 513 (1984).

new resources to match the utility's loads with more precision.

A 2002 article by William Baumol and Gregory Sidak used the analogy of a pig and a python to illustrate the concept of generation capacity as a "lumpy" investment.[312] In an ideal situation, a "business entity can add productive capacity in infinitesimally small increments," thereby achieving a marginal cost curve that is "smooth over a range of output."[313] Where an investment is "lumpy," however, the curve has a "jerky, stair-step appearance."[314] According to the Baumol and Sidak analogy, "[g]eneration capacity is our pig, and the electric utility our python."[315]

When capacity constrains the utility's output, the utility must add capacity in discrete amounts having some minimum efficient size. A utility, for example, cannot add one kilowatt of generation capacity at a time, but rather must add all of the capacity inherent in a single generator or a single power plant. This inability to add capacity in tiny, tailor-made increments means that new capacity will often give the utility more capacity than it immediately needs.[316]

As stated by Baumol and Sidak, "the technology of pigs and pythons imposes certain physical constraints: if there is to be any python meal at all, it must consist of at least a minimum-sized pig."[317] While the pig provides "current sustenance" for the python, "the pig is also the python's lumpy investment in future nourishment."[318]

Several cases illustrate the risk of a regulatory disallowance associated with "lumpy" generating additions that result in excess capacity that fails the "used and useful" test. In *Kansas Gas and Electric Company v. State Corporation Commission*, the Supreme Court of Kansas upheld the Kansas State Corporation Commission's determination to exclude over $900 million in investment in the Wolf Creek Generating Station from the utilities' rate base; the disallowed portion reflected the investment associated with 641 MW that represented "excess physical

312 Baumol & Sidak, *supra* note 308, at 385.
313 *Id.*
314 *Id.*
315 *Id.*
316 *Id.*
317 *Id.*
318 *Id.*

capacity," because that portion of the plant was not "used or required to be used" to provide utility services to current customers.[319] In *Iowa-Illinois Gas & Electric Co. v. Iowa State Commerce Commission*, the Iowa Supreme Court upheld a decision by the Iowa State Commerce Commission (SCC) to reduce the utility's return on investment in capacity that was found to be excessive.[320] The Iowa SCC determined that the utility possessed almost 200 MW of generating capacity in excess of its needs, due largely to the addition of 125 MW from the utility's share of a new generating unit, the Ottumwa Generating Station.[321] The Court upheld the SCC's use of a complicated formula that effectively reduced the rate of return, on a graduated scale, on that portion of the plant found to be excess to the utility's need.[322] The Court ruled that a utility is not constitutionally entitled to earn a fair rate of return on the part of an investment that turns out to be

319 Kansas Gas & Elec. Co. v. State Corp. Comm'n, 720 P.2d 1063 (Kan. 1986). The Wolf Creek Nuclear Generating Station is approximately 1200 MW. *About Wolf Creek*, WOLF CREEK NUCLEAR OPERATING CORPORATION, http://wolfcreekplant.com/ (last visited Sept. 15, 2014). It should be noted that the effect of the Kansas SCC's decision to exclude the investment from the rate base was to deny a return or profit on this investment; the utilities were allowed to recover the investment itself through depreciation. 720 P.2d at 1083. See also *Public Service Co. of New Mexico*, in which the New Mexico Public Service Commission applied a financial health test and the "used and useful" test to balance investor and ratepayer interests in its denial of 365 MW of excess capacity in base load generation investments from the utility's rate base. Pub. Serv. Co. of N.M., 101 P.U.R.4th 126 (N.M. Pub. Serv. Comm'n 1989). *See also* Otter Tail Power Co., 44 P.U.R.4th 219 (N.D. Pub. Serv. Comm'n 1981), where the North Dakota Public Service Commission addressed the issue of 66 MW of excess capacity associated with the Coyote lignite generating facility by disallowing the allocable common equity return associated with the investment representing the capacity found to be in excess of the utility's needs. 44 P.U.R.4th at 228. Under this treatment, said the Public Service Commission, "the company's shareholders and ratepayers share the burden of excess capacity costs." *Id. See also* Elec. Power Co-Op, Inc., 1994 WL 794132, at *2 (La. Pub. Serv. Comm'n 1994), which involved a finding that Cajun Electric Power Cooperative's investment in the River Bend Nuclear Plant "failed the 'used and useful' standard set forth by the Louisiana Supreme Court in *Central Louisiana Electric Co. v. Louisiana Public Service Commission*, 508 So. 2d 1361 (La. 1987)." As a result, Cajun's rates were reduced by $30.23 million to implement the determination that "River Bend is excess to Cajun's demand requirements, excess to Cajun's base load needs, and uneconomic." 1994 WL 794132, at *2.

320 Iowa-Illinois Gas & Elec. Co. v. Iowa State Commerce Comm'n, 347 N.W.2d 423, 428 (Iowa 1984).

321 *Id.* at 428. The SCC defined "excess" to be the utility's electric generating capacity exceeding 125 percent of its actual annual peak load during 1980. *Id.*

322 *Id.*

unnecessary, irrespective of whether the utility's initial decision to undertake the investment was prudent.[323]

In *Philadelphia Electric Co. v. Pennsylvania Public Utility Commission*, the Pennsylvania PUC excluded the least economical generating units from the electric company's rate base in order to account for 775 MW of generating capacity in excess of what was determined to be necessary in order to meet peak demand and a reserve margin.[324] The basis for the order, according to the Court, was the finding that excess generating capacity is not "used and useful" in rendering service to utility customers.[325] In upholding the decision of the Pennsylvania PUC, the Court stated that whether or not a prudently constructed generating asset can be included in a utility's rate base depends upon the unit being "used and useful" in providing utility service to the public during the applicable period of the ratemaking process.[326] The Texas Court of Appeals in *El Paso Electric Co. v. Public Utility Commission of Texas* affirmed a decision of the Texas Commission to exclude from a utility's rate base a portion of its investment in a nuclear power plant to protect "Texas ratepayers from the massive cost burden of unneeded capacity."[327] The treatment afforded by the PUC excluded a portion of the capital costs associated with the utility's investment in the Palo Verde Nuclear Generating Station until such time as the excess capacity "is transformed into capacity 'used and useful to' [El Paso] in providing service to local ratepayers."[328]

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323 *Id.* at 429. In *Iowa Public Service Co.*, 46 P.U.R.4th 339 (1982), the Iowa SCC established a formula for reducing a utility's rate of return by an amount proportionate to the amount of excess capacity on the utility's system. Professor Pierce referred to this solution as "the most promising approach to the difficult problem of regulatory treatment of excess capacity." Pierce, *supra* note 311, at 540–41. According to Professor Pierce, this approach "has the advantage of permitting the Commission to impose a financial penalty that is meaningful but less extreme than the penalty of totally disallowing excess capacity in rate base." *Id.* at 541. It also allows the size of the financial penalty to be correlated with the magnitude of the forecasting error. *Id.*

324 Philadelphia Elec. Co. v. Pa. Pub. Util. Comm'n, 433 A.2d 620, 622 (Pa. 1981).

325 *Id.* at 623.

326 *Id.* The Court affirmed the PUC's decision to exclude $25 million from the rate base because it was attributable to excess capacity. *Id.* at 624.

327 El Paso Elec. Co. v. Pub. Util. Comm'n of Tex., 917 S.W.2d 846, 857 (Tex. Ct. App. 1995).

328 *Id.* at 858.

As noted above, a premise of the Baumol and Sidak analysis is that capacity can be added only through large-scale additions.[329] Rather than a "continuous function of output," lumpy capacity involves incremental generating capacity in quantities that are "of considerable size relative to total current demand,"[330] thereby creating excess capacity when the plant achieves commercial operation.[331] Although the excess capacity disappears over time as customer loads grow, Baumol and Sidak point out that "[a]t the moment it disappears altogether . . . yet another such lumpy facility may be brought on line—and the excess capacity appears all over again."[332] Thus, these authors conclude that "the typical history of lumpy investment is one in which so-called *excess capacity is almost never absent*."[333] Professor Richard Pierce, for his part, acknowledges that it may be desirable in some circumstances to have excess capacity "because of indivisibilities in generating increments and large economies of scale in generation."[334]

Recent data from the U.S. Energy Information Administration (EIA) confirm these indivisibilities and the "lumpiness" associated with the traditional central generation model. In its Annual Energy Outlook 2014 Early Release, the EIA lists the "cost and performance characteristics of new central station electricity generating technologies." [335] The representative size listed for the traditional central generation technologies—nuclear, pulverized coal, natural gas-fired combined cycle combustion turbines, and integrated coal gasification combined cycle (IGCC)—are all in excess of 400 MW, with nuclear at 2,236 MW, "scrubbed coal" at 1,300 MW, IGCC at 1,200 MW, and pulverized coal with carbon sequestration at 650 MW.[336] Natural gas-fired combined cycle

329 Baumol & Sidak, *supra* note 308, at 385 ("A lumpy investment is one that is only available on a substantial scale; when acquired, the investment significantly expands the firm's total capacity.").

330 *Id.*

331 *Id.* at 390.

332 *Id.*

333 *Id.* (emphasis in original).

334 Pierce, *supra* note 311, at 539.

335 U.S. ENERGY INFORMATION ADMINISTRATION, AEO2014 EARLY RELEASE, TABLE 8.2 COST AND PERFORMANCE CHARACTERISTICS OF NEW CENTRAL STATION ELECTRICITY GENERATING TECHNOLOGIES, *available at* http://www.eia.gov/forecasts/aeo/assumptions/pdf/table8_2_2014er.pdf.

336 *Id.*

generating units are listed at 620 MW and 400 MW, respectively.[337] In contrast, the technologies commonly used for DG resources, identified as "Distributed Generation—Base" and "Distributed Generation—Peak," in the EIA data, are listed at 2 MW and 1 MW respectively, while another commonly used DG technology—fuel cells—is listed at 10 MW.[338] A CHP unit can be deployed in a variety of sizes, depending upon the desired thermal load. For illustrative purposes, the ICF Study cited above uses 1.5 MW as the generator capacity for CHP.[339]

With the availability of DG resources, the "lumpy" investment problem is dramatically reduced. It can no longer be said that the capacity increment for electric generating resources can be provided only through large increments, as observed by Baumol and Sidak.[340] The "inability to add capacity in tiny, tailor-made increments," a valid observation when made by Baumol and Sidak twelve years ago, is no longer true today.[341] The "indivisibilities in generating increments" to which Professor Pierce referred are no longer indivisible.[342] Rather, DG resources enable utilities to add generation in smaller increments that more precisely match the gradual increase in utility loads, thereby avoiding the "jerky, stair-step appearance" of the supply curve cited by Baumol and Sidak. Nor is the reserve margin observed by Professor Pierce[343] as necessary now; the more nimble DG resources can address those situations where a reserve margin was considered desirable.

Not only are DG resources increasingly available and flexible, they are also becoming cost competitive with central generating units in many circumstances. For example, EIA's 2014 Annual Energy Outlook Early Release lists the total "[o]vernight capital cost" associated with DG resources at $1,485/kW and $1,783/kW, respectively,[344] while the same figure for nuclear is $5501/kW, for

337 *Id.* The 620 MW figure refers to conventional combined cycle units, while the 400 MW figure is for advanced combined cycle units. Simple cycle natural gas-fired units are listed at 210 MW for advanced and 85 MW for conventional. *Id.*

338 *Id.*

339 ICF, *supra* note 12, at 41 tbl.A-2.

340 Baumol & Sidak, *supra* note 308, at 385.

341 *Id.*

342 Pierce, *supra* note 311, at 539.

343 *Id.*

344 U.S. ENERGY INFORMATION ADMINISTRATION, *supra* note 335. The total

"scrubbed coal new" is $2,925/kW, for IGCC is $3,771/kW, and for pulverized coal with carbon sequestration is $6,567/kW.[345] Natural gas-fired combined cycle generating units are listed at $915/kW and $1,021/kW, respectively.[346] In the case of CHP, the ICF Study cited above uses $1,800/kW as the installed cost for a 1.5 MW CHP unit.[347] Thus, the "large economies of scale in generation" cited by Professor Pierce in his 1984 article no longer clearly favor large central generating units.[348] DG resources are cost-competitive in many settings. As discussed in Section III.E below, it is important that the pricing policies for integrating DG resources reflect the true costs and benefits associated with DG resources in order for this option to be evaluated properly alongside the traditional central generation resources.

E. *The Role of Cost-Based Ratemaking*

The utility ratemaking principle that rates should reflect costs provides another tool available in utility regulatory proceedings to push utilities towards a new paradigm featuring DG resources. Ratemaking statutes uniformly require utility rates to be "just and reasonable"[349] or "fair, just, reasonable and sufficient."[350] The requirement of "just and reasonable" rates has commonly been interpreted to require rates that are cost-supported or, stated differently, that rates be set according to the "cost-causation" principle.[351] In keeping with a leading case interpreting the statutory standard under Section 4 of the Natural Gas Act, a number of decisions from the Federal Energy Regulatory Commission (FERC) and associated judicial opinions have interpreted the "just and reasonable" language as establishing a

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"overnight capital cost for Distributed Generation—Base" is $1,485/kW, and $1,783/kW for "Distributed Generation—Peak." *Id.*

345 *Id.*

346 The $915/kW figure refers to conventional combined cycle units, while the $1021/kW figure is for advanced combined cycle units. Simple cycle natural gas-fired units are listed at $673/kW for advanced and $971/kW for conventional. *Id.*

347 ICF, *supra* note 12, at 41 tbl.A-2.

348 Pierce, *supra* note 311, at 539.

349 Section 205 of the Federal Power Act, for example, requires rates, terms, and conditions to be "just and reasonable" and "not unduly discriminatory or preferential." 16 U.S.C. § 824d (2012).

350 WASH. REV. CODE § 81.108.030 (2014) ("In establishing the rates, the commission shall assure that they are fair, just, reasonable, and sufficient.").

351 K N Energy, Inc. v. FERC, 968 F.2d 1295, 1300 (D.C. Cir. 1992).

requirement that rates approved by utility regulators must "reflect to some degree the costs actually caused by the customer who must pay them."[352] FERC determines whether utilities have complied with this "cost causation principle" "by comparing the costs assessed against a party to the burdens imposed or benefits drawn by that party."[353]

The principle of cost-based utility ratemaking comes into play as a regulatory tool by directing regulators, in setting "cost-based" rates, to reflect all the benefits of DG resources in those rates. In other words, the costs assessed against a customer—in the form of rates paid by that customer—should reflect "costs actually caused by the customer."[354] As noted above, EPAct required DOE, in consultation with FERC, to conduct a study of the benefits of DG and the rate-related issues that impede their expansion.[355] The DOE Study identified many of the benefits that should be taken into account in setting "cost-based" rates.[356] These benefits include increased system reliability,[357] improved power quality,[358] the provision of ancillary services,[359] shaving peak loads through customer-sited generation,[360] and the ability of DG resources to provide power quality benefits[361] and an emergency supply of power.[362] Other possible benefits of DG resources noted in EPAct

352 *Id; see also* Alabama Elec. Coop., Inc. v. FERC, 684 F.2d 20, 27 (D.C. Cir. 1982) ("Properly designed rates should produce revenues from each class of customers which match, as closely as practicable, the costs to serve each class or individual customer.").

353 Midwest ISO Transmission Owners v. FERC, 373 F.3d 1361, 1368 (D.C. Cir. 2004) (citing *K N Energy*, 968 F.2d at 1300).

354 *Id.*

355 Energy Policy Act of 2005, Section 1817, directed the Secretary of Energy to analyze how cogeneration and small power production, otherwise known as DG, provide benefits to T&D systems. In accordance with Section 1817, the study includes those benefits received "either directly or indirectly by an electricity distribution or transmission service provider, other customers served by an electricity distribution or transmission service provider and/or the general public in the area served by the public utility in which the cogenerator or small power producer is located." Energy Policy Act of 2005, Pub. L. No. 109-58, § 1817 (a) (1) (B) 119 Stat. 594.

356 UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10, at i–iii.

357 Energy Policy Act of 2005, Pub. L. No. 109-58, § 1817(a)(2)(A)(ii) 119 Stat. 594.

358 *Id.* § 1817(a)(2)(A)(ii).

359 *Id.* § 1817(a)(2)(A)(iii).

360 *Id.* § 1817(a)(2)(A)(iv).

361 *Id.* § 1817(a)(2)(A)(v).

362 *Id.* § 1817(a)(2)(A)(vi).

include avoiding investments in generating plants and T&D infrastructure,[363] reducing land use effects and the costs of right-of-way acquisition,[364] and increasing the security of the grid against acts of terrorism.[365] EPAct also required DOE to identify regulatory barriers (in the form of the charges or practices followed by utilities) that may interfere with deployment of DG resources.[366]

In its major findings, the DOE Study concluded that DG resources offer potential benefits to electric system planning and operations by using DG to reduce peak loads, to provide ancillary services such as reactive power and voltage support, and to improve power quality.[367] According to the DOE Study, all of these uses to meet local system needs may lead to increased reliability of the electric system.[368] Quantifying reliability benefits, however, has proven challenging. One energy analyst observed that there are no widely accepted financial metrics to quantify the benefits associated with energy security and reliability.[369] A group of researchers at Oak Ridge National Laboratory attempted a quantitative assessment of the benefits of DG resources in 2003 and concluded that many benefits are difficult to quantify, given that the value depends on site-specific characteristics about the particular DG resource and the location on the grid where it is interconnected.[370] The DOE Study reached a similar conclusion[371]

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363 *Id.* § 1817(a)(2)(A)(vii).

364 *Id.* § 1817(a)(2)(A)(viii).

365 *Id.* § 1817(a)(2)(A)(ix).

366 *Id.* § 1817(a)(2)(B). The U.S. Department of Energywas directed to include an analysis of "any rate-related issue that may impede or otherwise discourage the expansion of cogeneration and small power production facilities, including a review of whether rates, rules, or other requirements imposed on the facilities are comparable to rates imposed on customers of the same class that do not have cogeneration or small power production." *Id.*

367 UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10, at iii.

368 *Id.*

369 Peter Asmus, *Building the Business Case for Commercial Microgrids,* NAVIGANT RESEARCH BLOG (Jan. 15, 2014), http://www.navigantresearch.com/blog/building-the-business-case-for-commercial-microgrids.

370 OAK RIDGE NAT'L LAB., PUB. NO. TM-2003/20, QUANTITATIVE ASSESSMENT OF DISTRIBUTED ENERGY RESOURCE BENEFITS, 1 (2003), *available at* http://www.tnmp.ornl.gov/sci/ees/etsd/pes/pubs/116227.pdf.

371 UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10, at iv ("calculating DG benefits requires a complete dataset of the operational characteristics for a specific site, rendering the possibility of a single, comprehensive analysis tool, model, or methodology to estimate national or

and also noted the absence of "standard data, models, or analysis tools" for quantifying the value of DG resources.[372]

Notwithstanding these challenges, there are a few examples where regulators have successfully quantified the benefits of DG resources and reflected these benefits in the ratemaking process. In California, for example, utility regulators attempted to quantify some of the benefits of DG resources in order to calculate utility buyback rates that would achieve the objective of promoting the development of efficient CHP generation.[373] The California "Waste Heat and Carbon Emissions Reduction Act" amended the California Public Utilities Code to require utilities to offer to purchase, at a price set by the California PUC, electricity generated by certain CHP generators and delivered to the grid.[374] The California PUC sought confirmation from FERC that in setting the "avoided cost" rate for utility purchases of electrical output from CHP units, the PUC would have flexibility in the avoided cost calculation in order to promote development of more efficient CHP facilities.[375] In particular, the California PUC sought to reflect the benefits to the utility of avoiding investment in T&D infrastructure by authorizing an increase in the avoided cost calculation by 10 percent for CHP systems located in transmission-constrained areas.[376] This increment was intended to capture the ability to avoid the construction of T&D facilities that would otherwise be needed.[377] FERC clarified that, so long as the costs "are real costs that would be incurred by utilities," they "may be

regional benefits highly improbable.").

372 *Id.* at iii.

373 Order Granting Clarifications and Dismissing Rehearing, S. Cal. Edison Co., 133 FERC ¶ 61,059, 61,262 (2010).

374 CAL. PUB. UTIL. CODE § 2841(a), (b)(2) (West 2007).

375 S. Cal. Edison Co., 133 FERC ¶ 61,059, at ¶ 61,265. Under the Public Utility Regulatory Policies Act of 1978 (PURPA), a utility is required to purchase the output from "qualifying facilities" at the utility's "incremental cost of alternative electric energy," or "avoided costs," which reflects the costs that the utility avoids by purchasing the output from the qualifying facility rather than the purchase it would otherwise make. 16 U.S.C. § 824a-3(b), (d) (2006). "Avoided costs" is defined as "the incremental cost to an electric utility of electric energy or capacity or both which, but for the purchase from the qualifying facility . . . , such utility would generate itself or purchase from another source." 18 C.F.R. § 292.101(b)(6) (2010).

376 S. Cal. Edison Co., 133 FERC ¶ 61,059, at ¶ 61,267.

377 *Id.*

accounted for in determination of avoided cost rates."[378] Although FERC declined to address whether the specific amount of 10 percent is justified by avoided costs, it authorized the California PUC to include such an "adder" or "bonus" to the extent it was based on "an actual determination of the expected costs of upgrades to the distribution or transmission system that [purchasing from qualifying CHP units] will permit the purchasing utility to avoid."[379]

Minnesota passed legislation in 2013 requiring a determination of the value of distributed solar photovoltaic (PV) installations.[380] Researchers produced an extensive analysis quantifying the benefits produced by interconnecting distributed solar PV facilities to the utility grid.[381] The 2013 legislation required quantification of a number of benefits from distributed PV, including the value of fuel costs, environmental benefits, and avoidance of line losses experienced in the T&D system and generation and transmission capacity costs.[382] The legislature's goal was to produce a tariff for buyback rates that the utility would pay for solar-generated power, with tariff rates that would capture the value of electricity generated by distributed PV sources.[383] Setting the rates correctly would make the utility and its ratepayers "indifferent" between customer-supplied electricity from solar PV and from the utility's conventional resources.[384] Under the methodology filed with the Minnesota PUC in January 2014, a value was placed on the fuels cost avoided by the utility based on the PV output displacing natural gas-fired units during PV operating hours.[385] Similarly, the PV unit would allow the utility to avoid generation capacity cost—the capital cost of generation the

378 *Id.* ¶ 61,268.

379 *Id.*

380 The legislation passed by Minnesota in 2013 allows investor-owned utilities in the state to apply to the Public Utility Commission (PUC) for a Value of Solar (VOS) tariff as an alternative to the net metering provisions that would otherwise apply to purchases from the output of solar installations. MINN. STAT. § 216B.1637 (2014).

381 CLEAN POWER RESEARCH, MINNESOTA VALUE OF SOLAR: METHODOLOGY ii (2014), *available at* https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7bEE336D18-74C3-4534-AC9F-0BA56F788EC4%7d&documentTitle=20141-96033-02.

382 *Id.*

383 *Id.* at 1.

384 *Id.*

385 *Id.* at 4, 5.

utility would build to meet peak load—as well as transmission capacity and distribution capacity costs—the capital cost of transmission and distribution facilities that will not have to be built.[386] The methodology also allows for "adders" for location-specific avoided costs, to allow higher rates to be paid in those parts of the service territory that are capacity-constrained.[387]

In what has been described as a "groundbreaking methodology," Minnesota added a "climate factor" to utility rates that attempts to reflect the potential dollar damage to society associated with extreme weather events caused by climate change.[388] The "avoided environmental cost" is calculated based on the "social costs" of carbon dioxide (CO_2) emissions determined by the federal government and on the externality costs for non-CO_2 emissions (including particulate matter (PM_{10}), carbon monoxide (CO), lead (Pb), and nitrogen oxide (NO_X)) developed by the Minnesota PUC.[389] In the sample calculation of the "Value of Solar" tariff, 13.5 cents per kWh would be paid for the output of a solar PV installation.[390] Nearly half of that amount, or 6.6 cents/kWh, represents the avoided fuel cost, while 3.1 cents/kWh represents the avoided environmental cost.[391]

As noted above, EPAct also required DOE to identify the obstacles to integration of DG resources in the form of "any rate-related issue that may impede or otherwise discourage the expansion of cogeneration and small power production facilities."[392] The DOE Study found a number of current impediments arising from regulations and ratemaking policies, including practices relating to standby rates and the failure to account for the impact of lost revenue on utilities.[393] Moreover, the DOE Study noted that there has been a failure to develop a utility business model under which it would make sense for utilities to invest in DG resources.[394] A great deal of attention has recently

386 *Id.* at 4.

387 *Id.* at 33.

388 Peter Behr, *Minn. Tries to Put a Climate Value on Rooftop Solar*, E&E NEWS (Jan. 2, 2014), http://www.eenews.net/stories/1059992297.

389 CLEAN POWER RESEARCH, *supra* note 381, at 39.

390 *Id.* at 42.

391 *Id.*

392 Energy Policy Act of 2005, Pub. L. No. 109-58, § 1817(a)(2)(B), 119 Stat. 594.

393 UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10, at 8-1.

394 *Id.* at iii.

been focused on the incompatibility of the utility business model with the widespread deployment of DG resources.

In January 2013, the Edison Electric Institute—the trade industry organization for investor-owned electric utilities in the United States[395]—published a report, *Disruptive Challenges*, which highlighted the challenges to the electric utility industry posed by widespread deployment of DG resources.[396] The report identified a convergence of factors—including the declining costs of DG resources—that potentially could "challenge and transform" the electric utility industry."[397] *Disruptive Challenges* identified a number of emerging DG technologies that could provide competition for utility-provided services, including solar PV, fuel cells and micro wind turbines, as well as technologies that provide ancillary services, such as electricity storage from batteries and electric vehicles.[398] According to the report, the traditional utility model of centralized generation could be threatened as these DG technologies become more cost-competitive.[399] The report concluded that, as DG resources achieve increased penetration in the future, the industry and its stakeholders will need to respond to these challenges to minimize the impact of the "disruptive forces," particularly distributed resources.[400]

The Pace witness in the Con Edison proceeding cited *Disruptive Challenges* as a possible explanation for Con Edison's apparent strategy to discourage rather than encourage the development of DG resources in its service territory.[401] He described it as "alarming" that while the recommendations in the NYS 2100 Commission report would encourage utilities to promote energy efficiency and renewable energy, the leading electric industry trade organization was characterizing these same measures as "threats." [402] Other industry observers have noted the

395 *Mission & Vision*, EDISON ELEC. INST., http://www.eei.org/about/mission/Pages/default.aspx (last visited Sept. 4, 2014).

396 PETER KIND, EDISON ELECTRIC INSTITUTE, DISRUPTIVE CHALLENGES: FINANCIAL IMPLICATIONS AND STRATEGIC RESPONSES TO A CHANGING RETAIL ELECTRIC BUSINESS 1 (2013), *available at* http://www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf.

397 *Id.*

398 *Id.* at 3.

399 *Id.*

400 *Id.* at 17.

401 Morris Testimony, *supra* note 53, at 14.

402 *Id.*

threat posed to the utility business model by DG resources. For instance, Rhone Resch, President and CEO of the Solar Energy Industries Association, stated in January 2014 that utilities needed to "embrace" DG resources as part of their business model or risk being "overrun" in a manner similar to what incumbent telephone companies have experienced over the past decades as the telecommunications industry has evolved.[403]

CONCLUSION

The electric power system of the future is likely to be fundamentally different—both structurally and operationally—from the power systems of yesterday. The rapid pace of technological development, coupled with growing consumer demand for a clean, reliable, resilient, and flexible power supply, is already shaping the transformation occurring in the U.S. electric power sector. The inability of the centralized energy production and delivery model to respond to system stresses was exposed by Superstorm Sandy, which hit the northeast coast of the United States in October 2012 and left millions of electric utility customers without power. Although extended power outages affected the region for days, new DG technologies allowed many commercial and industrial facilities and educational institutions to maintain their essential functions. The experience with Superstorm Sandy demonstrated the urgent need to adopt a different set of long-term planning strategies to improve the electric system's resilience and ability to cope with the anticipated extreme weather events of the future. Expanding the role of DG resources will play a critical part in achieving a more resilient utility system.

The traditional utility business model, however, poses a major barrier to greater penetration of clean technology resources and achieving a DG-based model. The Edison Electric Institute's *Disruptive Challenges* highlights the tensions between actions that utilities should be taking to promote a more resilient utility system—integrating DG resources seamlessly and facilitating microgrid installations—and the actions necessary to preserve the revenue streams upon which the utility business model is based. A comprehensive legal and regulatory strategy will be necessary to encourage electric utilities to move in the direction of a resilient,

403 *Experts Weigh Impact of Distributed Generation on Utility Business Model* (E&ETV webcast Jan. 28, 2014), http://www.eenews.net/tv/videos/1771.

DG-based model.

The recently concluded Con Edison case before the New York State PSC provides a good example of using a general rate proceeding as a forum to challenge the "business as usual" approach typically followed by utilities. In that case, utility regulators had an opportunity to consider the "traditional" approach proposed by Con Edison—which featured $1 billion of "storm hardening" T&D infrastructure investments over four years—alongside a competing view featuring the latest thinking about available technology and measures to improve the long-term resiliency of the utility system. The result of that proceeding was a landmark decision by the New York State PSC requiring utilities to integrate climate change adaptation and system resiliency into their long-term planning processes, as well as to take specific steps to accommodate DG integration and creation of microgrids. The PSC Order provides a template for other state regulatory commissions to reject rate relief based on a "business as usual" model relying on traditional T&D infrastructure and "storm hardening" investments in favor of forward-looking strategies that better prepare utility systems for the extreme weather events of the future.

Another such tool is the inherent authority of regulatory agencies to direct utilities to take climate change adaptation into account in long-term system planning, as invoked by the petition filed with the New York State PSC in December 2012. Whether an administrative rule or order can be used to encourage utilities to consider the climate change adaptation and mitigation benefits of DG resources through long-term hazard mitigation planning depends upon the statutory authority of the applicable regulatory agency. In New York, the Public Service Law likely provides the PSC with the broad statutory authority necessary to impose such a requirement on its jurisdictional utilities. As described above, the issue was largely subsumed within the Con Edison rate proceeding, and thus the specific relief granted by the PSC on this issue was, on its face, limited to Con Edison. At the same time, it is clear from the PSC Order that all utilities under its jurisdiction will be expected to evaluate anticipated climate change impacts within their service territories and to integrate consideration of these issues in their long-term system planning and infrastructure investments.

Fundamental principles in utility ratemaking, such as the

prudence and "used and useful" standards, can also be used in utility regulatory proceedings to push utilities toward a new utility paradigm that takes advantage of the resiliency benefits of DG resources. Under the prudence standard, utility expenditures on traditional T&D infrastructure can be challenged on the grounds that a DG-based approach may represent a more cost-effective solution. Two New York State PSC proceedings—Con Edison's 2009 electric rate case and National Grid's 2010 electric rate case—demonstrate the availability of this strategy to force utilities to integrate DG-based solutions into their long-term system planning. Both resulted in collaborative processes that allowed a deeper analysis of the opportunities of integrating DG-based solutions into utilities' system planning. The "used and useful" standard, which has historically come into play to preclude a utility from earning a return on large generating assets under the central generation model that may be "excess" to public demand, also may be used to promote DG resources, given DG resources' ability to achieve a better match with the gradual growth in customers' electricity demand. With the increasing cost-competitiveness of DG resources as compared to large, centralized generating stations, regulators have a viable alternative to accepting the excess capacity associated with the "lumpiness" of new generating additions. With cost-effective and appropriately-sized DG resources as an alternative, regulators may have a basis for disallowing the excess generation that often results from reliance on the traditional model of large, centralized generating facilities.

Finally, the required use of cost-causation principles in setting "just and reasonable" rates provides another tool for pursuing a DG-based strategy that promotes system resilience. If regulators set rates that reflect all the benefits of DG resources—particularly the reliability and resilience benefits—a DG-based model may be able to compete effectively on a cost basis with the traditional centralized generating resources. The DOE Study of the benefits of DG resources, required by the Energy Policy Act of 2005, itemizes the various categories of benefits associated with DG resources, as well as the rate-related issues that impede their expansion. That the *Disruptive Challenges* report identified the "falling costs of distributed generation and other distributed energy resources" as one of the converging factors that is "expected to challenge and transform the electric utility industry" confirms the threat posed by

DG resources to the utility business model.[404] The DOE Study suggests that utilities and their regulators have been attempting to diminish this threat by imposing "rate-related impediments that discourage DG."[405] In exercising their wide discretion in setting "cost-based" rates, states should be encouraged to use their authority in favor of DG solutions rather than against them, as exemplified by Minnesota's efforts to establish a "Value of Solar" tariff and the California PUC's decision to recognize avoided T&D costs in setting DG buyback rates. These states' efforts demonstrate the feasibility of capturing the benefits of DG resources in rates.

404 KIND, *supra* note 396, at 3.

405 UNITED STATES DEPARTMENT OF ENERGY, *supra* note 10, at 8-1.