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Microgrids: Legal and Regulatory Hurdles for a More Resilient Energy Infrastructure

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NOTE

Microgrids: Legal and Regulatory Hurdles for a More Resilient Energy Infrastructure

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Natural disasters and climate change have made it apparent that energy infrastructure needs to be modernized and microgrids are one type of technology that can help the electricity grid become more resilient, reliable, and efficient. Different states have begun developing microgrid pilot projects including California, New York, Connecticut, and Pennsylvania. The City of Pittsburgh, Pennsylvania is the first city to propose implementing "energy districts" of microgrids that will serve as critical infrastructure, in the first phase, and then expand to commercial and community settings. This large project involves many shareholders including public utilities, government agencies, and private entities. Utilizing microgrids on such a large scale raises issues regarding its classification, as energy generation or energy storage, and whether it should be regulated by public utilities, private entities, or municipalities. In a state like Pennsylvania where the energy market has been deregulated, there is strong concern on what the public utilities involvement will be with microgrid projects.

This Note focuses on the regulatory issues that are raised with the construction and operation of microgrids at such a large scale in Pittsburgh. It addresses the difficulties that arise when

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implementing microgrids in a deregulated energy market state such as Pennsylvania, where little to no statutory language exists regarding microgrids. It will give an overview of proposed Pennsylvania legislation that may impact a public utilities' control over microgrid technology and the benefits and costs when examining the extent of the public utilities' role regarding ownership and control of microgrids in a deregulated energy market.

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I. INTRODUCTION

As observable impacts of global climate change continue to increase in severity and as traditional energy infrastructure ages, the push towards renewable forms of energy has never been greater. Society has evolved, outstripping the existing electrical

infrastructure, often referred to as the "traditional grid," rendering it obsolete.[1] Not only is current electrical technology outdated, but it is unable to withstand the stresses of more powerful and frequent weather events, causing widespread power outages.[2] Throughout recent years, this influx of extreme, and often disastrous, weather events has encouraged legislators and policymakers to focus attention on implementing technology that will provide added resiliency to existing infrastructure and withstand storms to the degree of Hurricanes Sandy and Ike.[3] Specific federal policies have been enacted to address decreasing reliability of the traditional grid, and rising damage mitigation and repair costs that result from grid failures.[4] Arguably, these policies also reflect a response to the trends seen in the last decade of traditional energy sources such as the decline in oil imports, decrease in coal production, and the rise in natural gas production.[5]

As a potential means to modernize energy infrastructure and strengthen the grid's reliability, resiliency, and efficiency, Congress introduced the idea of the "Smart Grid"[6] through the Energy Independence and Security Act of 2007.[7] The Smart Grid enhances the existing electrical system by utilizing sensors, controls, "advanced metering systems," and other technologies[8] that enable "real-time sensor data, weather information, and grid modeling."[9] This new technological approach can provide "rapid information about blackouts and power quality[,] as well as

1. Kevin B. Jones et al., *The Urban Microgrid: Smart Legal and Regulatory Policies to Support Electric Grid Resiliency and Climate Mitigation*, 41 FORDHAM URB. L. J. 1694, 1698 (2015).

2. *Id*. at 1699–1700.

3. *See id*. at 1701.

4. *See id*.

5. *See* JOSEPH P. TOMAIN & RICHARD D. CUDAHY, ENERGY LAW IN A NUTSHELL 55 (3d ed. 2017).

6. *Grid Modernization and the Smart Grid*, U.S. DEP'T OF ENERGY. A Smart Grid uses "cutting-edge technologies, equipment, and controls that communicate and work together to deliver electricity more reliably and efficiently." *Id*.

7. Jones, *supra* note 1, at 1701.

8. JIM LAZAR, ELECTRICITY REGULATION IN THE US: A GUIDE (SECOND EDITION) 168 (2016).

9. U.S. DEP'T OF ENERGY, ENTERPRISE TRANSITION PLAN 14 (2011), https://perma.cc/CX2K-WSPT.

insights into system operation for utilities."[10] In contrast, under the existing "traditional grid" system, there are slow response times when blackouts or brownouts occur, with even short blackouts having strong fiscal impacts on the affected regions.[11]

The development and utilization of smarter technology allows for the integration of a microgrid, which is defined as "a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid."[12] The market for microgrid technology is expected to expand in the future, but efforts must be taken to address the obstacles associated with implementation of such a new energy storage and generation paradigm.[13]

This Note discusses the benefits of shifting towards an electrical infrastructure system that utilizes microgrid technology and addresses the risks and barriers that such technology will face in policymaking and implementation. Part II provides an overview of microgrid technology and discusses how microgrids transform existing infrastructure by improving reliability and resiliency. Part III discusses the history of the technology's implementation and examines successfully executed microgrid pilot projects throughout the United States. Finally, through the application of Pittsburgh, Pennsylvania's innovative plan to develop energy districts, referred to as a "grid of microgrids," as a solution to aging infrastructure, Part IV highlights risks and regulatory issues that

10. *Id.*

11. PRESIDENT'S COUNCIL OF ECON. ADVISERS & U.S. DEP'T OF ENERGY, ECONOMIC BENEFITS OF INCREASING ELECTRIC GRID RESILIENCE TO WEATHER OUTAGES 3, 7 (2013), https://perma.cc/9Q2Y-X7WL. DOE statistics estimate that between 2003 and 2012, power outages in the United States cost the economy an average of $18 to $33 billion. *Id.* at 3. In years where major storms occurred, like Hurricane Ike in 2008, that cost increased from $40 billion to $75 billion, and similarly in 2012 when Superstorm Sandy hit, costs ranged from $27 billion to $52 billion. *Id.*

12. Jones, *supra* note 1, at 1697.

13. Robert Walton, *Navigant: Solar-plus-storage microgrid adoption 'more than just a fad',* UTILITY DIVE (Jan. 10, 2017), https://perma.cc/7LPX-GY2N. In 2016, "GTM Research estimated there were 156 operational microgrids in the country, making up 1.54 GW of capacity, and that number is expected to rise to 3.71 GW by 2020." *Id.*

will likely affect implementation of microgrids.[14] Additionally, Part IV addresses the extent of the role that public utilities can play in controlling microgrid technology, as well as the potential risks associated with a general lack of legislation or policy surrounding microgrid implementation.

II. BENEFITS OF MICROGRIDS: A SMART GRID TECHNOLOGY

The microgrid is a form of Smart Grid technology that is considered the "ultimate implementation of smart grids" due to its ability to adapt and disconnect from the central grid[15] and function independently as a "power island."[16] Generally, a microgrid remains connected to the central grid, but under normal operating conditions, it is able to disconnect from the central grid when grid power is interrupted and will subsequently go into what is referred to as "island mode" operation.[17] Consumers connected to the microgrid are thus able to continue receiving power undisturbed through the microgrid's own frequency and voltage.[18] Microgrid technology allows for either functioning as a separate system from the utility grid that powers the area (the central grid), or continuous system connection with the central grid.[19] When connected or disconnected from the central grid, microgrids can use a combination of power sources, including but not limited to batteries, fuel cells, and solar and wind energy.[20] Currently, the dominating power source tends to be diesel through traditional combined heat and power ("CHP") and natural gas but a

14. CITY OF PITTSBURGH, PA, BEYOND TRAFFIC: THE SMART CITY CHALLENGE 23 (2016), https://perma.cc/9CFC-YWPJ [hereinafter PITTSBURGH VISION NARRATIVE].

15. The traditional utility infrastructure where the source for power generation comes from a centralized distribution facility. *See* Elisa Wood, *What is a Microgrid?*, MICROGRID KNOWLEDGE (Aug. 21, 2017), https://perma.cc/53DV-BRLW.

16. Jones, *supra* note 1, at 1702–03 (defining a power island as "an energized section of circuits separate from the larger system").

17. *Id.* at 1697.

18. *Id.* at 1702–03.

19. *Id.* Microgrids are capable of standing alone, or there can be multiple microgrids connected to one another. *Id.* at 1703.

20. *Id.* at 1712.

progression towards utilizing renewable energy has developed throughout recent years.[21]

The goals of a microgrid are similar to those of a smart grid in that microgrids seek "to maximize services provided by generation and storage assets through embedded intelligence, while dramatically boosting efficiencies, thereby minimizing costs."[22] However, microgrid implementation employs a bottom-up approach, focusing on potential solutions from the customer's end, rather than a top-down approach, which is used by the Smart Grid, and employs strategies targeting the central grid.[23] The bottom-up approach provides a greater benefit to the end-use customer because the microgrid allows for more flexibility, catering specifically to the customer's needs.[24] Through utilization of the bottom-up approach, microgrids enhance energy infrastructure reliability by disconnecting from the centralized grid when there is a power outage or other system failure, preventing power disruption.[25]

While reliability focuses on strategies to minimize power outages for users, resiliency is concerned with avoiding the outages altogether.[26] "Resiliency is determined by measuring both the functionality of the system during an event that could disrupt service and the ability of the system to recover if service is interrupted."[27] Measuring resiliency is less challenging when the microgrid is located on a single property, with a single owner, and

21. Jones, *supra* note 1, at 1704. The European Union and China are leading contributors in renewable energy projects, behind the United States. Amjad Ali et al., *Overview of Current Microgrid Policies, Incentives and Barriers in the European Union, United States and China*, 9 SUSTAINABILITY 1, 2 (June 2017) https://perma.cc/F24L-YDFY. The EU has employed multiple directives to reach its energy goal so that by 2020, 20% of its energy consumed will be through renewable sources. *Id.* at 5. China's 12th Five-Year Plan highlights its goal for increasing renewable energy source consumption of "11.4% of its primary energy from non-fossil sources in 2015 and 15% in 2020." *Id.* at 13.

22. Peter Asmus, Microgrids: *Friend or Foe for Utilities?,* 153 PUB. UTIL. FORT. 18, 19–20 (2015).

23. *Id.* at 20.

24. *Id.*

25. *Id.* at 20–21.

26. Jones, *supra* note 1, at 1747.

27. *Id.*

only one electric meter storing the data.[28] Improvement in technology has allowed for microgrids to move to a multi-user area, but this has added complexities that need to be addressed through regulatory and statutory schemes.[29]

III. EARLY CASES OF SUCCESSFUL MICROGRID PROJECTS

Early cases of successful microgrid projects are located in sectors such as hospitals, universities, schools, and municipalities.[30] This success can be attributed to factors such as structural design benefits, the ability to handle the increased energy usage, appropriate load balancing that results in ease of control under a single owner, and ease of funding for the projects.[31] The projects discussed in this Part exhibit factors discussed above and can serve as building blocks for larger projects to mirror as more complex and larger microgrids are developed.

A. University of California, San Diego ("UCSD") Microgrid

The microgrid at University of California, San Diego ("UCSD") is one of the most advanced in the country.[32] The UCSD microgrid supplies electricity and heating to a 450-hectare campus and utilizes Smart Grid analytics to produce, distribute, monitor, and store energy, analyzing the data to make energy more efficient and reduce cost.[33] The microgrid technology consists of gas turbines, steam, and solar-cells that supply "85% of campus electricity needs, 95% of its heating, and 95% of its cooling."[34] This setup

28. DAN LEONHARDT ET AL., PACE ENERGY & CLIMATE CENT., MICROGRIDS & DISTRICT ENERGY: PATHWAYS TO SUSTAINABLE URBAN DEVELOPMENT 5 (2015), https://perma.cc/6X9Q-7LBQ.

29. *See infra* Part IV.

30. EMMETT ENVTL. L. & POL'Y CLINIC, MASSACHUSETTS MICROGRIDS: OVERCOMING LEGAL OBSTACLES 6 (2014) https://perma.cc/M3SN-LLHX [hereinafter MASSACHUSETTS MICROGRIDS].

31. *Id.* at 6–7. The structural design benefits result from the fact that these projects tend to be located in clusters of buildings. *Id.*

32. Jones, *supra* note 1, at 1705. UCSD has a partnership with the local utility company, San Diego Gas and Electric ("SDG&E") and "uses engineering and [IT] firms to test and implement state-of-the-art technology." *Id.* at 1705–06.

33. *Id.* at 1707–08.

34. *UCSD*, BERKELEY LAB, https://perma.cc/TC7S-XZ89.

"reduces the demand" placed on the centralized grid and allows San Diego Gas and Electric ("SDG&E"), the local utility serving the area, to "further expand their transmission and distribution system ("T&D")."[35] By diversifying its energy storage, making improvements on traditional energy resources, like CHP, and utilizing renewable sources, such as fuel cells powered by bio gas from a sewage treatment plant, UCSD's microgrid system provides a noteworthy example of the microgrid's ingenuity and contribution to greenhouse gas emissions reductions.[36]

B. Philadelphia Navy Yard Microgrid

The Navy Yard in Philadelphia offers another example of how a successful microgrid can function.[37] The Navy Yard, a former military base, is now a 1,200-acre commercial urban development property that was conveyed to the Philadelphia Authority for Industrial Development ("PAID").[38] Philadelphia Industrial Development Corporation ("PIDC") is a public-private economic development corporation that oversees microgrid project implementation on the site on behalf of PAID.[39] Historically, the Navy Yard had its own electric distribution grid that PIDC retained when the site was decommissioned as a shipbuilding facility, making the infrastructure ideal for microgrid development.[40] PIDC began to make energy infrastructure updates at the Navy Yard in 2014, focusing on implementing Smart Grid and distribution generation technologies through partnerships with corporations, institutions, and some private sector companies.[41] In March 2016, the U.S. Department of Energy

35. Jones, *supra* note 1, at 1709. "[T]he school also saves more than $800,000 a month when compared to buying all of its energy from the grid" *Id.* at 1708.

36. *Id.* at 1708–09.

37. *Id.* at 1713.

38. *Id.* The Navy Yard is "home to more than 11,000 employees and 143 companies, with active initiatives on sustainable building and innovative energy management." *Id.* at 1714.

39. *U.S. Department of Energy Names the Navy Yard as Location for Testing Micro-PMU Technology*, THE YARD BLOG (Mar. 29, 2016), https://perma.cc/M4TA-5PZH [hereinafter THE NAVY YARD].

40. *See* Jones, *supra* note 1, at 1713–14.

41. THE NAVY YARD, *supra* note 39. These institutions include PECO, an electric gas and utility company in Pennsylvania, Pennsylvania State University,

("DOE") even selected PIDC's site for a pilot study program on "new technology for advanced electrical distribution and controls."[42] This program aligns with PIDC's goal of improving the management of power delivery through testing of a new control technology called micro- Phasor Measurement Units ("micro-PMUs").[43] On a local scale, the micro-PMUs will give real-time data analytics being used on a commercial functioning microgrid.[44] As this technology is fine-tuned, it has the potential to be successfully implemented into future microgrid projects.

Uniquely, the Navy Yard is not subject to Pennsylvania's utility regulations because it has its own electrical distribution grid.[45] Under Pennsylvania law, the Navy Yard is not considered a public utility so long as PIDC does not sell electricity outside of its borders.[46] As a result, the Navy Yard is not regulated by the Pennsylvania Utility Commission ("PUC"), allowing PIDC to set its own rates and to make alterations to grid infrastructure without PUC's approval.[47] This situation is ideal for implementation of microgrids as PIDC enjoys the opportunity to experiment with technologies in efforts to further its green initiatives without being constrained by PUC requirements.[48]

C. State Initiatives in the Aftermath of Hurricane Sandy

1. Connecticut

Following the devastating infrastructure damage and power outages caused by Hurricane Sandy, Connecticut established a statewide microgrid program to improve the State's future electric

GE Grid Solutions, PJM,a regional transmission organization, and DTE Energy, an electric and gas utility. *Id.*

42. *Id.*

43. *Id*. PMUs serve as sensors that monitor the quality of electric power flowing through large power transmission lines and communicate this critical data in real time to the transmission grid operator; micro-PMUs are capable of doing this on a smaller scale. *Id.*

44. *Id.*

45. Jones, *supra* note 1, at 1714; *see also* 66 PA. CONS. STAT. ANN. § 102 (West 2004) (defining a public utility).

46. *Id.*

47. *Id.*

48. *Id.*

infrastructure resiliency.[49] In response to the catastrophic event, the Connecticut General Assembly passed a statute authorizing the state to give grants to local municipalities, allowing them to fund the development of microgrids that will serve as a back-up when power outages occur.[50] These community-based microgrids connect to a centralized grid but, in the event of a power outage, the microgrid can continue to generate power for small areas, such as schools, libraries, and gas stations.[51]

2. New York

New York also responded to Hurricane Sandy's devastation in a proactive way through Governor Andrew Cuomo's program, "Reimagining New York for a New Reality," which is "aimed at extreme weather resiliency and response."[52] This came in the form of a $40 million grant to aid in constructing multiple community-scale microgrids, promoting third-party owners.[53]

The Brooklyn Microgrid is an example of a successful project that came out of Governor Cuomo's program.[54] The Brooklyn Microgrid is set up as "peer-to-peer energy trading system" in which solar panel arrays are placed on rooftops of buildings, interwoven into a network where residents and third-party businesses can opt in to participate in trading energy credits amongst themselves.[55] This caters specifically to the needs of the consumers by allowing community members to identify personal energy demand.[56] Brooklyn's Microgrid Project is off the centralized grid and functions on its own in the event of power outages.[57] New York General City Law permits the local

49. *Id.* at 1747–48.

50. Jones, *supra* note 1, at 1747 (citing 16 CONN. GEN. STAT. § 16-243y(b) (2012) ("[t]he Department of Energy and Environmental Protection shall establish a microgrid grant and loan pilot program to support local distributed energy generation for critical facilities.")).

51. *See* Jones, *supra* note 1, at 1747–48.

52. *Id.* at 1728. This program is now called Reforming the Energy Vision ("REV"). Diane Cardwell, *Solar Experiment Lets Neighbors Trade Energy Among Themselves*, N.Y. TIMES (Mar. 13, 2017), https://perma.cc/P7S5-Q2XD.

53. Jones, *supra* note 1, at 1727–28.

54. Cardwell, *supra* note 52.

55. *Id.*

56. *Id.*

57. *Id.*

legislature to enable this type of project by allowing the City to "grant franchises or rights to use the streets, waters, water front, public ways and public places of the city," furthering New York City's goal towards more resilient and independent infrastructure.[58]

IV. RISKS AND REGULATORY ISSUES WHEN IMPLEMENTING MICROGRIDS ON A LARGER SCALE

While Connecticut and New York have begun to employ various microgrid initiatives by weaving language relating to microgrids into state and local law, many complex regulatory issues and risks related to microgrid implementation have yet to be addressed. Recent microgrid initiatives in Pittsburgh, Pennsylvania provide an overview of the various issues that can arise when local officials attempt to implement microgrid technology on a city-wide scale.

A. Pittsburgh's Energy Vision

In the 1980's, the City of Pittsburgh ("City") was victim to the steel industry crash and, as a result, the City lost a large percentage of its population.[59] This population decrease, combined with detrimental health effects due to poor air quality, injuries, and fatalities associated with dated infrastructure, have since motivated local and state officials to take measures to improve the City's health, economy, and quality of life for residents and workers of Pittsburgh.[60]

In December 2015, the U.S. Department of Transportation ("DOT") launched a "Smart City Challenge" in which the agency called for mid-sized cities to submit new and creative solutions to address the many challenges facing city transportation infrastructure.[61] In response, the City submitted a project proposal, referred to as Energy Vision, "to create the next

58. Jones, *supra* note 1, at 1739 (quoting N.Y. GEN. CITY LAW § 20(10)).

59. PITTSBURGH VISION NARRATIVE, *supra* note 14, at 6–7.

60. *See id*. at 1–2. The City of Pittsburgh has the highest rates of asthma in the state due to the close proximity to transportation infrastructure. *Id*. at 1.

61. U.S. DEP'T OF TRANSP., SMART CITY CHALLENGE, https://perma.cc/L5NH-8BZP [hereinafter SMART CITY CHALLENGE].

generation of public infrastructure," described as "an adaptive, living communication and data platform that allows the City . . . to respond to the transportation and energy needs of residents efficiently and equitably."[62] To effectuate this vision, Pittsburgh implemented "SmartPGH" which integrates existing networks with what the plan calls a "system-of-systems" ("SoS") approach.[63] The Energy Vision will foster collaboration between major transportation, energy, and communication players towards implementing the future infrastructure with one important piece being the distribution of energy districts[64] via microgrids.[65]

Pittsburgh is an ideal city to employ a grid of microgrids, the first of its kind, because it contains the requisite foundational infrastructure.[66] This is exhibited through the five actively operating distributed energy systems within the city, such as the Duquesne University's Cogeneration plant and the NRG Pittsburgh site, that will serve as the framework to execute Pittsburgh's Energy Vision.[67]

Pittsburgh's Energy Vision began with a Memorandum of Understanding ("MOU") between the National Energy Technology Laboratory ("NETL") and the City.[68] The City's Energy Vision

62. PITTSBURGH VISION NARRATIVE, *supra* note 14, at 2.

63. *Id.* at 2–3; *see also* Ali Mostafavi, *A System-of Systems Framework for Exploratory Analysis of Climate Change Impacts onCivil Infrastructure Resilience*, SUSTAINABLE & RESILIENT INFRASTRUCTURE 1, 3 (2018), https://perma.cc/EEJ9-8ZF2. A "systems-of-systems approach" is the "combination of a set of different systems [that] forms a larger system of systems that performs a function not performable by a single system alone where the existence and interaction of several independent/interdependent systems and players' interactions affect resilience." *See also* Ali Mostafavi, *A System-of-Systems Approach for Integrated Resilience Assessment in Highway Transportation Infrastructure Investment*, INFRASTRUCTURES 1, 2 (Dec. 2017), https://perma.cc/ST79-T92U.

64. Existing distributed energy systems in Pittsburgh that will serve as the framework to enable connectivity for microgrid development throughout the city. Project Information, NAT'L ENERGY TECH. LAB., https://perma.cc/HLN4-ENYJ [hereinafter NETL Pittsburgh Project Information].

65. PITTSBURGH VISION NARRATIVE, *supra* note 14, at 2–3.

66. *Id.*

67. NETL Pittsburgh Project Information, *supra* note 64.

68. *Id.* The MOU entered into on July 15, 2015 lists the scope of the activities that will modernize Pittsburgh's energy grid. It highlights the additional companies, organizations, and agencies that will be partnering with NETL to complete the work, including regional and local organizations, private companies, foundations, and academia. This includes: "the University of Pittsburgh's Center

includes the creation of a network of small-scale, distributed energy systems that will be separate from the centralized grid, come from a variety of energy sources, and use multiple kinds of "advanced distributed energy sources such as microturbines, . . . DC power delivery, combined heat and power ("CHP"), reciprocating engines, fuel cells, energy storage devices (e.g., batteries), advance power electronics, photovoltaics, and wind turbines."[69] Initially, the grid will serve universities, hospitals, critical infrastructure, and data centers, and in later phases will connect "commercial and community/utility capacities."[70] Local energy systems already in place in Pittsburgh will be used as the foundation for microgrid development and to facilitate the organization of communities into energy districts.[71]

While many projects are still in the conceptual and planning stages, University of Pittsburgh's Energy GRID ("GRID") Institute has taken the lead on the research and development components of the Energy Vision and are currently participating in major projects that are finding technological solutions for a successful grid of microgrids.[72] GRID has partnered with a local utility company, Duquesne Light, to build a 3-watt microgrid on Duquesne's Woods Run campus with plans to use wind and solar power, in combination with natural gas, as its main fuel sources.[73] The completion of GRID's state-of-the-art, utility-scale Electric Power Technologies Lab at the Pittsburgh Innovation Center will enable GRID to advance its research on energy systems, engage more community organizations, and receive participation from

for Energy, the Urban Redevelopment Authority of Pittsburgh, the National Academies of Science, Duquesne Light, NRG Energy, the University of Pittsburgh Medical Center, Peoples Gas, Oxford Development, Hillman Foundation, RK Mellon Foundation, Heinz Endowment, and the RAND Corporation." *Id.*

69. *Id.* While most projects are currently in the concept and development phase, University of Pittsburgh's Energy GRID Institute is leading the way for the Energy Vision with research into developing infrastructure for a first of its kind DC powered delivery system using solar and wind renewables. Dr. Gregory Reed & Dr. Katrina Kelly, *Pittsburgh Steels Up for Microgrid Leadership*, ENERGY TIMES (Jan. 3, 2018), https://perma.cc/L5XK-GHGG.

70. *Id.*

71. Elisa Wood, *Will America's Steel City Build the First Grid of Microgrids?*, MICROGRID KNOWLEDGE (May 16, 2017), https://perma.cc/J336-YFZ8.

72. Reed & Kelly, *supra* note 69.

73. *Id.*; Andrew Burger, *Pittsburgh Steps Up City-scale Microgrid Initiative,* MICROGRID KNOWLEDGE (May 23, 2018), https://perma.cc/Z952-PZEV.

industry.[74] University of Pittsburgh is working on funding for a 30-watt campus-wide microgrid which will serve its 132 acre campus that includes University of Pittsburgh Medical Center facilities.[75]

The five energy systems that already exist throughout the City and will serve as the groundwork for future microgrid development include: Pittsburgh Allegheny County Thermal ("PACT"), which will support the Downtown Energy District; Duquesne University's Cogeneration Plant, which has potential to support the Uptown Energy District; NRG Pittsburgh site, which will support the Northshore Energy District; Bellefield Boiler Plant, which has the potential to support the Oakdale Energy District; and Carrillo Steam Plant in Oakland, which has the potential to support the Oakland Energy District.[76] Additionally, there are distributed energy and microgrid projects that are currently in development.[77] Microgrids placed throughout the City will serve key local amenities such as the Pittsburgh Medical Center and other major institutions.[78]

B. Pennsylvania Legislation Shaping Policy for Microgrids

A project executed on a city-wide scale may provide a blueprint for other cities' future microgrid development; however, this type of microgrid development raises issues regarding state and local regulation. In 1996, in accordance with national trends, the Pennsylvania State Legislature enacted the Electricity Generation Customer Choice and Competition Act ("Act") in efforts to

74. Reed, *supra* note 69.

75. Burger, *supra* note 73.

76. NETL Pittsburgh Project Information, *supra* note 64.

77. *Id*. NRG Energy is designing a new heat and power plant in the Uptown District. The Brunot Island power station will serve Pittsburgh's Northside commercial districts. The 2nd Avenue Energy District project, complete with garage and rooftop photovoltaic solar and battery storage for electric vehicle charging stations, serves the 2nd Avenue corridor from Homestead to Downtown Pittsburgh. The Larimer Energy District, a community-based microgrid, will be part of the redevelopment of Pittsburgh's East End neighborhood. The ALMONO Energy District, a mixed use development in Hazelwood, will operate on almost exclusively renewable-based distributed energy. The Duquesne Light Company will install a microgrid in their Woods Run operations on Pittsburgh's Northside to investigate challenges and solutions for integration of distributed energy technologies. *Id*.

78. *Id*.

deregulate the energy market and promote energy efficiency and the use of renewable energy.[79]

Adoption of the Act broke up the monopolies that utilities had on the energy market, separating the market into two categories: "electric generation suppliers" ("EGSs") and "electric distribution companies" ("EDCs").[80] In Pennsylvania, EGSs are not regulated by the State PUC and, therefore, these electric supply companies are able to set less-expensive rates than their EDC counterparts, providing customers with the opportunity to choose cheaper energy suppliers.[81] The Act also capped "costs, generation, transmission and distribution rates . . . at 1996 levels[,]" which were set to expire on December 31, 2009.[82] EDCs were required to purchase their electricity from independent generators which encouraged wholesale market competition.[83]

Following adoption of the Act, Pennsylvania lawmakers enacted the Alternative Energy Portfolio Standard Act ("AEPSA") to "promote conservation and environmental stewardship by reducing reliance on traditional sources of electric generation" with the ultimate goal being diversification of energy sources.[84] AEPSA required Pennsylvania utility companies to purchase a set amount of power from alternative sources such as solar, wind, and biofuels.[85] Accordingly, PUC established an alternative energy credits program pursuant to AEPSA.[86] Under AEPSA, EDCs can

79. 66 PA. CONS. STAT. §§ 2801–15 (1996); Andrew Maykuth, *The power of choice, 20 years later*, PHILLY.COM, https://perma.cc/W9H7-STBV.

80. 66 PA. CONS. STAT. § 2804(3); Maykuth, *supra* note 79. Currently, about 30 states have a form of deregulated energy markets within the United States. *Map of Deregulated Energy States & Markets*, ELECTRIC CHOICE, https://perma.cc/7R52-L7GA.

81. 66 PA. CONS. STAT. §§ 2804(2), 2806(a); *see* Maykuth, *supra* note 79.

82. 66 PA. CONS. STAT. § 2804(4); *Pennsylvania Electric Restructuring*, 3954 PUC UTIL. REG. NEWS 8 (2010). As of 2011, generation, transmission, and distribution rate caps have expired resulting in potential price increases to consumers. *The Expiration of Electric Generation Rate Caps*, PA. PUC, https://perma.cc/SHW9-V9UZ.

83. 66 PA. CONS. STAT. § 2806(a).

84. Christina Alam, *It's not Always Sunny in Philadelphia: The Problem with the Pennsylvania Solar Initiatives*, 16 U. PITT. J. TECH. L. & POL'Y 208, 215 (2016).

85. *Id.* at 212–13.

86. *Id.* at 216; 73 PA. CONS. STAT. § 1648.2 (2007). Section 2 of AEPSA defines an "alternative energy credit" as a tradable instrument "used to establish, verify and monitor compliance with the act." A unit of credit equals "one megawatt hour of electricity from an alternative energy source." *Id.*

either produce the energy credits from solar voltaic technologies or buy the credits as a tradeable instrument.[87] EDCs are required to purchase a set amount of these credits and submit documentation to establish proof of compliance with the program.[88]

Net metering is also a concept that was introduced after the implementation of AEPSA, whereby customers are able to sell back unused energy to the EDCs.[89] However, Pennsylvania legislators prematurely implemented these renewable energy policies before evaluating potential negative effects it could have on their solar energy market.[90]

These laws caused problems because EDCs increase their revenue by selling electricity.[91] They have set rates for their electricity that are established under ratemaking cases[92] and cannot be increased except during the ratemaking process.[93] Thus, EDCs are *sale driven* by the increased electricity that they sell.[94] As electricity from distributed generation comes into the picture and customers do not require electricity from the EDCs, their revenue is reduced.[95] Pennsylvania EDCs have little incentive to become involved in electricity from distributed generation technology, like microgrids, if they are not going to make a profit since most of these companies are investor owned utilities.[96]

87. Alam, *supra* note 84, at 216.

88. ARRIPA v. Pa. Pub. Util. Comm'n, 966 A.2d 1204, 1207 (Pa. Commw. 2009).

89. Alam, *supra* note 84, at 217.

90. *Id*. at 226. By allowing customers to sell back their unused energy to the utilities, this can cause the utility to incur additional costs that they have to pass along to their customers. While a small group of customers reap the benefits of net-metering, the remainder of the utilities' customers are impacted with higher costs. *See id.* at 210-11.

91. *Id*. at 221.

92. *Id*. This is the process that public utilities must go through to adjust electricity prices, ensuring fair prices to consumers via a public review process and approval by the regulatory commission. *Id*.

93. *Id*.

94. *Id*. (emphasis added).

95. Alam, *supra* note 84, at 221.

96. *Id*. at 226; *see also* Lazar, *supra* note 8, at 11. Investor owned utilities (IOUs) are utilities owned by "private companies, subject to state regulations financed by a combination of shareholder equity and bondholder debt." *Id*.

C. Lack of Statutory Language to Clarify Whether a Microgrid is a Distribution Service or a Form of Energy Generation

Classification of microgrid structure has resulted in underinvestment in such technology.[97] This classification ultimately dictates how the source should and will be regulated.[98] There is no certainty as to whether microgrids are considered traditional utilities or conventional distributed energy resources ("DER") and, under Pennsylvania law, microgrid structure is not explicitly defined.[99] Consequently, the category under which a microgrid may fall can depend on the project for which it is being implemented.[100] If the microgrid is classified as a form of energy generation—i.e. a "package of services"—then it operates in the competitive private sector.[101] Conversely, if it is classified as part of the distribution system, then it is treated as a utility and is regulated by the PUC.[102] Currently, if a microgrid is defined as a "public utility," it may be subject to legal challenges since there is no clarification within Pennsylvania law as to whether a microgrid is considered distribution or generation.[103]

Currently, the closest term that relates to a microgrid under Pennsylvania law is a "customer-generator."[104] If a microgrid is

97. *See generally* Jones, *supra* note 1, at 1718–19 (discussing legal hurdles when defining a microgrid).

98. *See id*.

99. *Id*. at 1718.

100. *See id*. at 1718–19.

101. Elisa Wood, *Why Pennsylvania Utilities Want to Build Public Purpose Microgrids: Legislative Hearing*, MICROGRID KNOWLEDGE (June 22, 2017), https://perma.cc/MY34-X7BG [hereinafter as Public Purpose Microgrid].

102. *Id*.

103. *See* 66 PA. CONS. STAT. § 102 (2018). A public utility is "any person or corporation now or hereafter owning or operating in this Commonwealth equipment or facilities for . . . producing, generating, transmitting, distributing . . . electricity . . . for the public for compensation . . . [but] does not include . . . any building or facility owner/operators who hold ownership over and manage the internal distribution system serving the building or facility and who supply electric power and other related electric power service." *Id*.

104. Jones, *supra* note 1, at 1718 (quoting 73 PA. STAT. ANN. § 1648.2). A "customer-generator" is defined as "a non-utility owner or operator or a net metered distributed generation system . . . who make[s] their systems available to operate in parallel with the electric utility during grid emergencies as defined by the regional transmission organization or where a microgrid is in place for the primary or secondary purpose of maintaining critical infrastructure . . ." *Id*.

classified as a "customer-generator," participation in net metering and receiving AEC would be permitted.[105] In other states, such as California, New York, and Connecticut, state law allows for particular exemptions for other entities similarly defined as a "customer-generator," including electric corporations.[106] If a microgrid owner is not considered an electric distribution utility, then it will not be subject to a ratemaking case nor additional approvals as required under the designated state PUC.[107] When the microgrid is not bound by the PUC, it may be subject to distribute the energy more limitedly in scope and authority.[108] The uncertainty of how to define a microgrid can clearly impact type of revenue generation and customer/owner incentives.[109]

As Pittsburgh's Energy Vision exemplifies, microgrid projects involve numerous stakeholders, so policies must clearly establish which parties are responsible for managing the various elements of microgrid systems. This assignment of responsibility involves determining which entity will be liable for microgrid system failures and malfunctions. There is no clear statutory or regulatory language that specifies how limited a particular company's liability may be in regard to the microgrid, especially if the grid is not classified as an electric distribution utility. Large-scale microgrid projects, such as Pittsburgh's Energy Vision, will likely include third-party involvement, either through the technology generating energy from the grid or analytics. Legal battles may ensue down the line if a particular company's duties towards the microgrid are not spelled out, but the company is ultimately held responsible for problems with the microgrid.

D. Attitudes Toward Public Utility's Role in Microgrid Pilot Projects

The role that public utilities play in the deregulated energy market adds complexity to the debate about ownership control over the microgrid. PUCs have been cautious to grant utility companies

105. Jones, *supra* note 1, at 1718.
106. *Id.* at 1754.
107. *Id.*
108. *Id.*
109. *See id.* (discussing issues with qualifying a microgrid under the public utility model).

full ownership control over microgrids as the following proposals by utility companies in Pennsylvania and Maryland, both states with deregulated energy markets, will illustrate.[110]

On May 18th, 2016, PECO Energy Company ("PECO"), a large EDC in Pennsylvania, submitted a petition before the Pennsylvania PUC to approve its Microgrid Integrated Technology Pilot plan and requested the PUC to issue a declaratory order to recover the costs for the microgrid.[111] In its plan, PECO proposed to "build, own, and operate" a community microgrid in Concord Township, Pennsylvania, for the purpose of "enhanc[ing] system reliability, resiliency and security as envisioned under [PECO's] electric Long-Term Infrastructure Improvement Plan ("LTIIP")."[112] PECO also proposed to construct two integrated microgrids that would be capable of providing "power to three government facilities and twenty-seven public accommodations."[113] Further, PECO asserted that the microgrids would be connected to the main grid and would be capable of operating in "island mode," which PECO anticipated would occur approximately 28 hours per year.[114]

Per PECO's petition, after constructing the microgrid, it planned to seek recovery of the costs "that [were] not recoverable through its electric Distribution System Improvement Charge ("DSIC") in a future distribution base rate case" by splitting up the cost to all of its customers.[115] The DSIC is "a surcharge on customers' bills to accelerate the replacement of existing aging facilities that otherwise will occur if the utility must wait until the

110. *See infra* Part IV(D).

111. *See In re* PECO Energy Company for (1) Approval of Its Microgrid Integrated Technology Pilot Plan and (2) Issuance of a Declaratory Order Regarding the Recovery of Microgrid Costs at 1, No. P-2016-2546452 (May 18, 2016) (on file with Pa. Pub. Util. Comm'n) [hereinafter *In re* PECO Microgrid].

112. *Id*. at 1–2. In October 2015, PUC approved PECO's electric LTIIP to enhance its energy infrastructure and modernize [its] distribution system. PECO presented in the plan that part of the investment would be the development of microgrids. PUC required that PECO file a separate "petition for a Major Modification or an amended LTIIP in order to implement a future microgrid." PECO's petition submitted on May 18, 2016 was for that purpose. *Id*. at 4–5

113. *Id*. at 10.

114. *Id*. at 16.

115. *Id*. at 1, 16. The following costs would be recovered and paid for by PECO's customers: "(1) one-time development costs; (2) one-time engineering, procurement and construction ("EPC") costs; and (3) annual operation and maintenance ("O&M") expense." *Id*. at 16.

completion of a rate case to begin receiving a return on its investment."[116] PECO argued that since the pilot program was furthering the development of technology that can be implemented on a larger scale across PECO's region in the future, all of its customers would benefit from it.[117] PECO's petition to build, own, and operate its own microgrid, and to additionally recover the costs from its customers, is a new idea that has yet to be addressed in the State of Pennsylvania.[118]

PUC provided a public comment period for interested parties to weigh-in on the Microgrid Integrated Technology Pilot, and the project was met with backlash.[119] Industrial, retail, and private investment companies voiced a number of concerns relating to the project's "cost-effectiveness, capabilities, proposed cost recover, and compliance with the provisions of the Pennsylvania Public Utilities Code."[120] According to an expert witness, Matthew White, on behalf of the Retail Energy Supply Association ("RESA"), permitting PECO to own the power generation of a microgrid would be defined as a "utility owned DER" and would conflict with Pennsylvania's policy of unbundling the EDCs and EGSs.[121] Mr. White argued that this would slow down the development of DERs in Pennsylvania, and private companies would not be compelled to invest in this type of DER.[122] He additionally testified that

116. PA. PUB. UTIL. COMM'N, SYSTEM IMPROVEMENT CHARGES DISTRIBUTION AND COLLECTION 1, https://perma.cc/SV3K-M3AN.

117. *In re* PECO Microgrid, *supra* note 111, at 8.

118. *Id*. at 1–2.

119. Joint Petition for Leave to Withdraw Pleadings to Permit Microgrid Collaborative Process at 3–4, In re PECO Energy Company for (1) Approval of Its Microgrid Integrated Technology Pilot Plan and (2) Issuance of a Declaratory Order Regarding the Recovery of Microgrid Costs, No. P-2016-2546452 (Oct. 27, 2016) (on file with Pa. Pub. Util. Comm'n) [hereinafter PECO Withdrawal for Microgrid].

120. *Id*. at 3. Direct Energy, the Philadelphia Area Industrial Energy Users Group ("PAIEUG"), and the Retail Energy Supply Association ("RESA") all filed petitions to intervene in response to PECO's petition. *Id*.

121. Direct Testimony of Matthew White ex rel. Retail Energy Supply Association at 3, In re PECO Energy Company for (1) Approval of Its Microgrid Integrated Technology Pilot Plan and (2) Issuance of a Declaratory Order Regarding the Recovery of Microgrid Costs, No. P-2016-2546452 (Aug. 4, 2016) (on file with Pa. Pub. Util. Comm'n) [hereinafter White Testimony].

122. *Id*. at 2–3. RESA is a diverse and broad group of retail energy suppliers that promote sustainable, efficient, and customer-oriented competitive retail energy markets. *Id*. at 2 n.1.

repercussions would occur in the future when PECO is guaranteed the full cost of recovery from its ratepayers, and it would be influenced to build DERs even when it does not make sense with the current market.[123] This would potentially put an increased burden on the ratepayers, the customers of PECO's service.[124] RESA opposed PECO's argument to qualify DERs as distribution costs and, instead, argued that DERs are generation costs that should not be distributed among customers.[125]

On October 27, 2016, due to these interested-party concerns and objections, PECO withdrew its petition, stating that it wanted to work collaboratively with its stakeholders to better address the issues brought up during testimony in order to develop improved microgrid technology in the future.[126] PECO's "novel plan" was the first in Pennsylvania to demonstrate the complexity of public-utility owned microgrids in a deregulated energy market state.[127]

Similar concerns were addressed when Baltimore Gas and Electric ("BG&E") presented to the Maryland Public Service Commission ("PSC") a plan to build, own, and operate a public purpose microgrid.[128] Maryland is also a deregulated energy market state, and BG&E proposed to recover the cost of this project by monthly billing of its customers "through a new microgrid rider to BGE's Electric Service Tariff."[129] Privately-owned retail energy companies such as IGS Energy and NRG Energy expressed similar concerns for BG&E's proposal to those of RESA in response to PECO's petition for a microgrid: if this proposal were to pass it would work against the idea of deregulated ESGs decreasing the incentive for private investment.[130] Although the Maryland PSC ultimately rejected the proposal, the State's concerns focused primarily on substantive aspects of the proposal, concentrating

123. *Id*. at 7.

124. *Id*.

125. *Id*. at 6.

126. PECO Withdrawal for Microgrid, *supra* note 119, at 4.

127. *See* White Testimony, *supra* note 121, at 4.

128. Letter from Daniel W. Hurson, Assistant Gen. Counsel, BGE on BGE's Pub. Purpose Microgrid Proposal to David J. Collins, Exec. Sec'y, Maryland Pub. Util. Comm'n. (Dec. 18, 2015) [hereinafter BG&E Proposal].

129. *Id*. at 3.

130. *See generally* Baltimore Gas and Electric Co.'s Request for Approval of its Public Purpose Microgrid Proposal, Pub. Serv. Comm'n of Md. No. 9416 (July 19, 2016) [hereinafter BGE PSC Decision].

less on the potential policy repercussions of an EDC controlling generation.[131] Their main concerns included:

> (1) whether particular needs of the location and customers were really considered since there was a lack of input from the customer and county where the project was going to be placed and if this type of project would best serve that particular community;
>
> (2) there was no contemplation of renewable energy options where the "Proposal [did not] capture the full breadth of potential benefits that public purpose microgrids could offer through fuel-diverse generation;"
>
> (3) although BG&E argued that customers would still have retail choices for the energy suppliers, when the microgrid would go into island mode, customers would be obligated to "BG[&]E's Standard Offer Service" and thus have no access to other options.[132]

Essentially, the Commission asserted that the proposal was premature and, although its attitude was not negative towards allowing an EDC to own an ESG, the method that BG&E chose to attempt to recover costs in this proposal would not benefit the community.[133]

E. Proposal of House Bill 1412: Amendments to Restructure the Electric Utility Industry

To clarify some of the public utility owned EGS problems discussed above, House Bill 1412 ("H.B. 1412"), a bipartisan bill, was introduced to Pennsylvania state lawmakers on May 9, 2017.[134] The bill is supported by large public utility companies of the region, like PECO, who are heavily involved in Pittsburgh's Energy Vision.[135] H.B. 1412 would allow public utilities to build

131. *See id*. at 18.

132. *Id*. at 11–16.

133. *Id*. at 18.

134. Elisa Wood, *Pennsylvania Tackles a Big One: Who Pays for Utility Microgrids?,* MICROGRID KNOWLEDGE (June 2, 2017), https://perma.cc/Y6M4-2NY4 [hereinafter Wood HB1412]. H.B. 1412 was introduced on May 9, 2017, sponsored by Representative Stephen Barrar and was referred to the Committee on Veterans Affairs and Emergency Preparedness. *Id*.

135. Wood, *Public Purpose Microgrid*, *supra* note 101. PECO Energy and Duqusne Light representatives were among a few of the industry companies that testified and shared support before the House of Veterans Affair and Emergency Preparedness Committee. *Id*.

public purpose microgrids that serve a "societal role, such as protection of power supplied to water, police, hospitals, communications and other critical services during an emergency."[136] Specifically, H.B. 1412 serves the public interest by "facilitat[ing] the diversity of electric supply options, including the addition of distributed energy" and by "enhanc[ing] the grid's electric distribution, resiliency and operational flexibility."[137]

Main arguments for public purpose microgrids revolve around the idea that in the event of a natural disaster, such as a hurricane, if the centralized grid goes down, the microgrid can kick in and provide energy to the surrounding community.[138] Further, a growing number of lawmakers argue that public purpose microgrids can aid in combatting cyberterrorism in that the microgrid would function as a back-up power source in the event of a cyberattack on the centralized grid.[139]

Further, H.B. 1412 would allow utilities to recover rate costs for microgrids if they are "reasonable, prudently incurred expenses to operate and maintain the facility."[140] So long as expenses meet this standard, this provision of H.B. 1412 provides public utilities with an incentive to build microgrids in areas where customers have low-electric reliability, knowing they will recover costs on their investment.[141] However, under H.B. 1412, cost recovery would be available only after a PUC performance review of the PUC-approved pilot projects.[142]

These benefits to public utilities would be possible because Title 66 of the Pennsylvania Consolidated Statutes would be amended by adding language defining "microgrid," "pilot programs," "energy storage," among other terms related to distribution and generation energy resources.[143] Significantly, under section 2816(c), the amendment defines "recovery" and states that "an electric distribution company shall be permitted to

136. *Id.*

137. Wood HB1412, *supra* note 134.

138. Wood, *Public Purpose Microgrid*, *supra* note 101.

139. *Id.*

140. Wood HB1412, *supra* note 134.

141. *Id.*

142. Wood, *Public Purpose Microgrid*, *supra* note 101.

143. *See* H.B. 1412, Gen. Assemb., 2017 Sess. (Pa. 2017) [hereinafter Pa. H.B. 1412] (proposing amendment to Title 66 of the Pennsylvania Consolidated Statutes adding section 2816).

recover in the electric distribution company's distribution rates . . . a pretax on, and a return of, the original cost of an energy storage facility or microgrid constructed . . . and the reasonable, prudently, incurred expenses to operate and maintain the facility."[144] These amendments provide the PUC with full discretion to approve the microgrid pilot program and to thereafter "determine the circumstances under which the ownership, development, and deployment of energy storage and microgrids by electric distribution companies may be in the public interest."[145]

EDCs such as PECO, Duquesne Light, and others are backing H.B. 1412, as it would provide these companies with more control over DERs.[146] The bill may be a solution to reverse the negative impacts that the Alternative Energy Portfolio Standard Act had on its state EDCs, including loss of revenue and decrease in investment.[147] However, other industries have asserted the opposite.[148] For example, RESA has expressed its disapproval for the bill and, in response, argued that it is not necessary for utilities to develop microgrids, as the private sector can be relied upon to develop microgrids.[149] RESA contended that allowing utilities rate recovery would inhibit the private sector's ability to compete.[150]

Similar arguments made in PECO's initial petition for construction of their public purpose microgrid also apply here.[151] H.B. 1412 defines a microgrid as "[a] group of interconnected loads and distributed energy resources . . . that acts as a single controllable entity with respect to an electric distribution company's distribution system . . . and operate either connected to the distribution system or in island mode."[152] This explicitly defines a microgrid being connected to an EDC distribution system, thus enabling a microgrid to be regulated by PUC.[153] Such regulation of the microgrid would allow public utility companies, like PECO, to build microgrids with a guarantee of a return of its

144. *Id.* § 2816(c).
145. *Id.* § 2816(b).
146. Wood, *Public Purpose Microgrid, supra* note 101.
147. *See supra* Part IV(B).
148. *Id.*
149. *Id.*
150. *Id.*
151. Pa. H.B. 1412, *supra* note 143.
152. *Id.*; § 2816(e).
153. *See* Wood HB1412, *supra* note 134.

investment via their customers.[154] However, this approach may result in unexpected costs that can overburden the customer that is not reaping the benefits of the microgrid.[155]

Further, RESA's expert witness, Mr. White, argues that in a competitive-private market, the only customers that are going to share the burden are those actually utilizing the service and thus more strategic investment and building will occur.[156] This means that the projects will likely be smaller, more economically efficient, and lower in cost than if the microgrid was built by its public utility counterparts.[157] Although it is within the public interest for PUC to act as the gatekeeper in approving a utility's pilot program, this puts less incentive for private DER developers to pursue microgrid projects when there is a greater chance that the utilities will have reasonably and prudently incurred expenses covered.[158] However, the utility would be incentivized to build more if the only way for them to make a return on their investment is by the size of the project.[159]

Pittsburgh Energy Vision has attracted private DER companies to participate as there are opportunities for investment in un-tapped markets.[160] Continuing deregulation of electricity generation would promote a competitive market for these companies and would provide customers the freedom to choose pricing.[161] Statistics have shown that the deregulation of the Pennsylvania electricity market has had a positive impact.[162] However, research conducted at the Pennsylvania Utility Law Project concluded that low-income customers enrolled in assistance programs paid more for the competitive market than

154. *Id.*
155. White Testimony, *supra* note 121, at 6.
156. *See id*. at 7.
157. *Id*. at 8.
158. Pa. H.B. 1412, *supra* note 143.
159. White Testimony, *supra* note 121, at 8.
160. *See* PITTSBURGH VISION NARRATIVE, *supra* note 14, at 3.
161. *See* White Testimony, *supra* note 121, at 7.
162. *See* Christina Simeone & John Hanger, *Case Study of Electric Competition Results in Pennsylvania,* KLEINMAN CENTER OF ENERGY POLICY 3 (Oct. 28, 2016), https://perma.cc/K5WB-WMU3 (comparing Pennsylvania's retail average state wide electricity prices at 15% higher than the national average, prior to restructuring of its electricity generation market, to prices dropping 0.1% lower than the national average in 2015, after deregulation of the state's electricity generation took place).

they would have had they remained with the default utility company options.[163]

Under the Electricity Generation Customer Choice and Competition Act, EDCs may create customer assistance programs ("CAP") that allow low-income customers affordable utilities.[164] To enroll in the program, residents must have a total "household income at or below 150 percent of the federal poverty guidelines [and must] have demonstrated an inability to afford their utility bills without assistance."[165] In effect, due to the deregulation of electric generators and distributors, CAP customers are only required to pay a fixed amount to the EDC, and the EDC recovers the rest of the cost through its non-CAP customers. This difference is referred to as the "CAP discount."[166] On the other hand, the EGS receives its full payment from the EDC regardless of the price that CAP customers pay for the generation.[167] Portions of CAP customer bills are "paid by other residential ratepayers through CAP."[168] When a CAP customer pays more than the utility price through a competitive supplier, non-CAP customers must absorb this cost, resulting in increased prices due to the cost recovery setup of the EDCs.[169]

To minimize the financial burden on its non-CAP customers, PECO proposed a "price ceiling" on CAP shopping prices that would require an agreement from ESGs that wanted to participate as CAP suppliers "to charge a rate for electricity supply to CAP customers that is at or below PECO's . . . 'price ceiling.'"[170] However, the Pennsylvania PUC rejected the CAP ceiling

163. Anabel Genevitz, *Basic Utility Needs Simply Unaffordable For Some Families: From the Legal Intelligencer*, REGIONAL HOUSING LEGAL SERVICE (Apr. 12, 2017), https://perma.cc/N9ZH-39P6.

164. 66 PA. CONS. STAT. § 2804(9) (1996).

165. Genevitz, *supra* note 163.

166. Coal. for Affordable Util. Serv. & Energy Efficiency in Pa. v. Pa. Pub. Util. Comm'n, 120 A.3d 1087, 1090 (Pa. Commw. Ct. 2015).

167. *Id.*

168. Genevitz, *supra* note 163.

169. *Id.* Research shows that when CAP customers switched to a competitive supplier instead of the default EDC, they were paying more. "For all five of the electric utilities in the state that currently allow CAP customers to switch to a competitive supplier, the data shows that it has cost, on average, approximately $7 million more per year than it would have had all CAP customers remained on a default service." *Id.*

170. *Coal. For Affordable Util. Serv.*, 120 A.3d. at 1090.

proposal.[171] On behalf of PECO CAP customers, the Coalition for Affordable Utility Services and Energy Efficiency appealed the PUC's rejection, but the Commonwealth Court of Pennsylvania concluded that the Customer Choice and Competition Act does not grant the PUC the authority to limit prices charged by the ESGs.[172] Additionally, the court noted that placing a ceiling on the CAP shopping prices would limit customers' ability to choose and stated that a "clear and effective customer education program will create an environment where . . . CAP customers will actively seek shopping opportunities that could provide them savings or additional benefits over continuing to receive default services from PECO."[173]

Consideration of the financial impacts on low-income customers is an important factor that the Pittsburgh Energy Vision must consider. While additional resources have been adopted to further assist those involved in customer assistance type programs, if the implementation of microgrids falls within the realm of deregulated ESGs, lower-income customers may continue to experience negative financial impacts.[174] While there is Pennsylvania statutory language that ensures "assist[ance for] low-income customers to afford electric service," this power is given to the PUC meaning, in order for the assistance to be provided, the electricity source needs to be one that can be regulated by the Commission.[175] The City of Pittsburgh's Energy Vision calls for a collaborative effort between the City, private companies, retail companies, public utilities, and institutions.[176] However, what needs to be taken into consideration is where decision-makers will lie in regards to the competitive wholesale power markets. Policymakers and legislators that maintain loyalty to the traditional utility business model will dictate how the microgrids will be managed.

Similar to one of Connecticut's approaches to microgrid development, Pennsylvania could establish state or federal subsidies or grants to fund municipal construction and

171. *Id.* at 1092.
172. *Id.* at 1091.
173. *Id.* at 1092.
174. Genevitz, *supra* note 163.
175. *See* 66 PA. CONS. STAT § 2804(9) (1996).
176. *See* PITTSBURGH VISION NARRATIVE, *supra* note 14, at 2.

implementation of microgrids.[177] Although DOT awarded Pittsburgh a federal grant, the grant can only be used specifically for transportation costs in regard to the City's "SmartPGH" plan.[178] Additional state subsidies or grants could be geared more towards the balancing cost for low-income qualifying residents, ensuring they get equal benefits as other customers while not impacting the cost of the utility price itself. Private companies, like NRG Energy, are striving to keep the energy market deregulated and are against utilities subsidies, but there could be strict oversight by the PUC to ensure that the subsidies are not discriminatory towards low-income customers.

As other states, such as New York, have demonstrated, there is a growing shift away from the traditional utility business model as developing energy infrastructure moves to more renewable resources.[179] Competition in the wholesale power market has shown that there is success by moving away from the traditional utility business model. Rather than trying to mold the traditional model of centrally-controlled energy to fit new technology, Pennsylvania could adapt with the new technology and implement the bottom-up approach. This would give the customer more control on the individual microgrid level and employ community-based collaborative development into the State's energy regulations.[180] Moreover, such an approach gives more opportunity to move towards renewable energy sources since large power plants would not have the incentive of furthering the traditional energy sources, like coal and nuclear power. Rather, they would be forced to compete with private companies that are moving towards cleaner energy.

RESA proposed that H.B. 1412 be modified to allow for collaboration of utilities, suppliers, consumer advocates, and others in efforts to generate a greater benefit to the end user and increase transparency.[181] If utilities are unable to recover rates and more microgrids are employed utilizing "intentional islanding," utility companies will continue to lose revenue and

177. Jones, *supra* note 1, at 1747; *see supra* Part III(C).
178. *See* SMART CITY CHALLENGE, *supra* note 61.
179. *See* Cardwell, *supra* note 52.
180. *See* Asmus, *supra* note 22, at 20.
181. Wood, *Public Purpose Microgrid*, *supra* note 101.

society will witness the dissolution of the utility business model.[182] With little language in Pennsylvania law addressing microgrids, this is an opportune time to shape where the State's energy industry will lead.

V. CONCLUSION

This Note has highlighted complexities that microgrids encounter in supporting a more reliable, resilient, and efficient energy infrastructure. As legal and regulatory frameworks develop around this innovative infrastructure, focusing on the role that public utilities are going to play is key. Main concerns associated with municipalities' integration of microgrid infrastructure have been illuminated by the Pittsburgh Energy Vision. The City of Pittsburgh has more power in their hands than expected. Keeping a close eye on the policies that ultimately roll out from this project is necessary because this may shape the direction that other green district projects across the country will pursue in the future.

182. Jones, *supra* note 1, at 1743–44.