STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE: APPLICATION OF NTE CONNECTICUT, LLC FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION, MAINTENANCE AND OPERATION OF AN ELECTRIC POWER GENERATING FACILITY OFF LAKE ROAD, KILLINGLY, CONNECTICUT	DOCKET NO. 470 JANUARY 18, 2019

PRE-FILED TESTIMONY OF PAUL J. HIBBARD ON BEHALF OF NTE CONNECTICUT LLC

I. INTRODUCTION AND SUMMARY OF CONCLUSIONS

Q. Please state your full name, business address and occupation.

A. My name is Paul J. Hibbard. I am a Principal at Analysis Group, Inc., an economic, finance and strategy consulting firm headquartered in Boston, Massachusetts, where I work on energy and environmental economic and policy consulting. My business address is 111 Huntington Avenue, 14th Floor, Boston, Massachusetts, 02199.

Q. Please describe your background and experience that help inform your opinions in this matter.

A. I have been with AGI for approximately twelve years, first, from 2003 to April 2007, and most recently, from August 2010 to the present. From April 2007 to June 2010 I served as Chairman of the Massachusetts Department of Public Utilities ("MA DPU") and also

served as a member of the Massachusetts Energy Facilities Siting Board ("EFSB"), the New England Governors' Conference Power Planning Committee, and the NARUC Electricity Committee and Procurement Work Group. I also served as State Manager for the New England States Committee on Electricity and as Treasurer on the Executive Committee of the 41-state Eastern Interconnect States' Planning Council. My experience as Chairman of the MA DPU and as a Board Member of the EFSB includes considering and deciding on issues relating to need, costs and benefits in the zoning, permitting and siting of major energy infrastructure in the Commonwealth of Massachusetts, including power plants, transmission lines, and fuel transport pipelines.

Before that I worked in energy and environmental consulting and with state energy and environmental agencies. I hold an M.S. in Energy and Resources from the University of California, Berkeley, and a B.S. in Physics from the University of Massachusetts at Amherst. A more detailed description of my relevant background and experience and my curriculum vitae are attached as Exhibit 1.

Q. Did you submit prior testimony on this matter?

A. Yes, I filed testimony last year as part of the Application which was eventually withdrawn by NTE.

Q. Have your opinions changed since that time?

A. No, they have not. In fact, as discussed in detail in this testimony, developments over the intervening year have strongly amplified the need and benefits of KEC to Connecticut and the New England Region, in particular its potential role in addressing pressing reliability, competitive market and environmental challenges.

Q. After reviewing the Connecticut Siting Council ("CSC" or "Council") application docket[1] and related information about the proposed Killingly Energy Center ("KEC"), do you have any opinions about the need for KEC to ensure the reliability of the electric power supply and to develop a competitive electricity market in Connecticut and the region?

A. Yes.

Q. Please summarize those opinions.

A. Based on my review of KEC and the regional power system context, I believe the Council should find that KEC is necessary and needed for the reliability of electric supply of Connecticut and the New England region, and that KEC will, in addition to enhancing reliability, contribute to the competitiveness and efficiency of the New England Independent System Operator ("ISO-NE") wholesale electricity markets for the following reasons:

- KEC would represent an efficient and dispatchable generating resource connected to the high-voltage system[2] close to load in Connecticut, and with the ability to provide Connecticut and the ISO-NE system with a **full range of essential reliability services**, including frequency response, voltage control, spinning and non-spinning reserves, automatic generation control, fast ramping capability, and flexible operating modes (i.e., baseload, cycling, and peaking generation).

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[1] DOCKET NO. 470 - NTE Connecticut, LLC application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a 550-megawatt dual-fuel combined cycle electric generating facility and associated electrical interconnection switchyard located at 180 and 189 Lake Road, Killingly, Connecticut, Connecticut Siting Council, Opinion, May 11, 2017.

[2] CSC Findings of Fact, No. 192.

- KEC's fuel supply plan includes a firm gas transportation contract along with dual-fuel capability. This will provide exactly the type of **fuel security** needed to address Connecticut's and New England's most pressing system resilience/reliability challenge - the dependence on natural gas, particularly during winter months. A partial list of support for this point would include the cold snap in the 2017/2018 winter, ISO-NE's continuous focus on fuel security in winter operations, recent Federal Energy Regulatory Commission ("FERC") decisions on retaining aging, inefficient generating assets for fuel security reasons (with costs to be borne by all New England consumers), and new ISO-NE reliability review procedures and market design proposals focused on fuel security.[3] These and other factors amplify the reliability value and price-hedging benefits of KEC's comprehensive "defense-in-depth" approach to fuel management and fuel security. I will elaborate on each of these points in greater detail below.
- KEC contains all of the fast-acting, flexible and dispatchable operating characteristics needed to **fully support the expanded integration of variable renewable resources** at the grid-connected and distributed levels.
- KEC's fuel and operating efficiency means that it will represent a **low-emitting resource** capable of frequently displacing higher-emitting, less efficient and more

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[3] For a summary of the 2017/2018 cold snap see ISO-NE, *Winter 2017/2018 recap: Historic cold snap reinforces findings in Operational Fuel-Security Analysis,* April 25, 2018 available at http://isonewswire.com/updates/2018/4/25/winter-20172018-recap-historic-cold-snap-reinforces-findings.html; For ISO-NE focus on fuel security issues see ISO-NE, *Operational Fuel-Security Analysis*, January 17, 2018; For recent FERC decisions related to New England reliability see 164 FERC ¶ 61,022, July 13, 2018 and 165 FERC ¶ 61,202, December 3, 2018; For new ISO-NE reliability review procedures see S&P Global Market Intelligence, *ISO-NE proposes changes designed to retain resources needed for fuel security*, September 5, 2018.

costly energy producing resources, thus reducing greenhouse gas and other air emissions in Connecticut and the region.

- Recent developments highlight the **unique reliability and market value** of KEC. First, several factors are likely to accelerate the retirement of older, less efficient, and higher-emitting power plants in southern New England, including but not limited to (1) lower caps on carbon dioxide ("CO_2") implemented by the Northeast states in the Regional Greenhouse Gas Initiative ("RGGI"), and regulations establishing a more stringent cap on CO_2 emissions from power plants in Massachusetts, (2) continued suppression of energy market revenues due to sustained low fuel (gas) costs and growth in low variable cost renewable resources; and (3) implementation of the Competitive Auction with Sponsored Policy Resources ("CASPR") adjunct to the Forward Capacity Market ("FCM"). Second, ISO-NE's actions and efforts suggest a heightened level of anxiety over the impact of fuel security on efficient wholesale market outcomes and reliable system operations - such actions include retaining Mystic Generating Station capacity for fuel reliability reasons; the development and proposed implementation of a fuel security element to retirement reliability reviews; and accelerated development of market mechanisms to address fuel security. Third, the emergence of economically competitive and state-mandated renewable and other low-carbon (nuclear) resources continues to put downward pressure on market energy prices, presenting financial challenges to the continued operation of older resources. Finally, there continues to be substantial opposition to the development of new natural gas infrastructure (e.g., new interstate pipeline capacity). In the context of all of these

pressing efficiency, reliability, and environmental challenges, it is difficult to overstate the relevance and importance of KEC's approach to fuel security and fuel management, including a firm delivered natural gas contract and dual fuel capability.

For these and other reasons discussed in my testimony, obtaining a capacity supply obligation ("CSO") in the ISO-NE FCM is only one - and not necessarily even the most important - indication of the reliability value of KEC to Connecticut and the ISO-NE region. Regardless of whether KEC obtains a CSO in the upcoming forward capacity auction ("FCA"), the reliability and competitive market attributes discussed herein (and in KEC's overall application) are sufficient for the Council to find that KEC is necessary for the reliability of electric supply, and contributes to the competitiveness and efficiency of wholesale electricity markets in Connecticut and the region. Nevertheless, KEC is also well positioned to succeed in obtaining CSOs in FCA 13 or subsequent FCM auctions.

II. WHY KEC IS NEEDED

Q. Have you reviewed the particular challenges the ISO-NE power system faces relative to the provision of reliable and efficient electric service?

A. Yes. I have participated in a continuous evaluation of the reliability challenges as a public utility commissioner and energy facilities siting board member, as an employee of energy and environmental regulatory agencies representing MA in regional policy deliberations, and as a consultant to ISO-NE, government agencies, foundations, and other electricity and natural gas market participants and stakeholders in the New England region.

Q. Could you please provide an overview of the particular challenges this region faces?

A. Yes. ISO-NE's unique reliability challenges have been recognized by the system operator,

by Connecticut (and other New England states), by the North American Electric Reliability Corporation ("NERC"), and by FERC.[4] Particular challenges for our states and region include (1) increasing dependence on natural gas without firm transportation rights, introducing operational challenges during cold winter conditions; (2) the ongoing attrition of aging and less-efficient generating capacity in the region (including fossil and nuclear resources); (3) an increasing penetration of variable renewable resources (primarily wind and solar photovoltaic ("PV") plants) at both the bulk power system ("BPS") and distribution system levels, a substantial portion of which results from state-sponsored RFPs for renewable hydro and wind resources; and (4) continued challenges in the siting and development of energy infrastructure needed to ensure power system reliability, and to preserve the cost-reduction benefits of competitive wholesale markets. These factors present risks and challenges to reliable BPS operations and the competitiveness and efficiency of wholesale markets in Connecticut and across the region that should be considered when evaluating the need for new generating resources.

Q. How would KEC help Connecticut and New England address these reliability challenges?

A. The KEC facility is precisely what is needed to meet the state's and the region's reliability needs now, and to help address the most pressing reliability, resilience, operating flexibility and environmental challenges that Connecticut and New England will face in the coming years. KEC is uniquely suited to these challenges because it can be configured in any mode

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[4] For example, see Connecticut Department of Energy and Environmental Protection ("DEEP"), *2018 Comprehensive Energy Strategy*, February 8th, 2018; NERC, 2018 *Long-Term Reliability Assessment*, December 2018; and FERC, *Winter 2018-19 Energy Market Assessment*, October 18, 2018.

- baseload, cycling, or peaking - and represents a dispatchable and flexible resource that (1) addresses the New England region's dependence on natural gas through a redundant and resilient approach to fuel security and management by including both a firm delivered gas contract and dual fuel capability; (2) adds an efficient, low-emitting, and local generating resource to help manage the attrition of aging generation in Southern New England; (3) possesses all of the various resource dispatchability and flexibility attributes needed to help the region reliably integrate an increasing quantity of variable renewable and demand resources at the grid-connected and distributed levels; and (4) will achieve all of the above while reducing emissions from higher-emitting fossil generating units on the system.

Q. Please describe in more detail how KEC can help address the challenge of the growing dependence on non-firm natural gas in New England.

A. KEC meets the fuel security challenge for the state and region with a comprehensive "**defense-in-depth**" approach to fuel supply - a level of fuel security almost certainly unmatched by most, if not all, existing or proposed natural gas-fired generating facilities in the New England region.[5] Specifically, NTE has obtained a contract for year-round firm natural gas transportation for KEC, beginning in 2020, to provide natural gas sufficient to support KEC's operations at maximum output.[6] Unlike most, if not all, natural gas-fired

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5 As explained by ISO-NE in its fuel security analysis: "[C]ontracting for firm pipeline capacity is costly and requires a long-term commitment. This has been a deterrent for natural gas power plant owners, who have short- to medium-term financial horizons and are a diverse group with diverse market interests." ISO NE, *Operational Fuel-Security Analysis*, January 17, 2018, p. 17. See also ISO-NE, *2017 Regional System Plan*, November 2, 2017, p. 98 ("[t]he lack of firm fuel contracts by natural gas generators has limited the availability of natural gas transport to generators and funding for natural gas infrastructure expansion.").

6 CSC Findings of Fact, Nos. 301-302.

generators in Connecticut, KEC would be able to always burn natural gas, given its long-term, firm natural gas transportation supply contract. Nonetheless, it could switch to ultra-low sulfur diesel oil ("ULSD") in the unlikely event that there should be emergency natural gas system conditions or disruptions under which the delivery of electricity and/or heating fuel to Connecticut would benefit from KEC moving to its alternate fuel supply. KEC's ULSD backup would thus provide additional and redundant fuel security to support reliable and resilient Connecticut and New England power system operations in the dead of winter, or at any other point in the year when the region faces natural gas system constraints (for example, the sudden or emergency loss of interstate natural gas pipeline capacity under summer peak conditions). It would also provide flexibility to support the delivery of natural gas for heating to critical public institutions (such as hospitals and schools) and residents/businesses under emergency conditions. NTE has included more than enough ULSD backup capability for this purpose. According to KEC project engineers, when full, the tank will have enough ULSD for at least 45.7 hours of operation at full load, or at partial load (or only during peak hours) for several days to a week. Further, KEC has the ability to replenish ULSD supplies while operating, if ever needed.[7] This contribution of KEC to the reliability, flexibility and resilience of the state's and region's power supply and other critical energy needs simply cannot be overstated in the current and expected future context for New England power system operations. In this sense, in addition to being an efficient and competitive source of low-cost power, KEC should be recognized as making a major contribution to key reliability needs and providing significant public interest benefits to

[7] CSC Findings of Fact, No. 314.

Connecticut and the region.

Q. How does the use of natural gas for electricity generation create constraints on natural gas delivery during winter months?

A. The use of natural gas for electricity generation in New England continues to be the dominant source of power supply. At the same time, natural gas is a critically important resource for heating homes, hospitals, schools and businesses during the winter. Consequently, the demand for natural gas, particularly during cold winter periods, has increased significantly in the New England region, while the ability to *transport* natural gas into New England has not kept pace with growth in demand, leading to periods of pipeline delivery constraints and associated power system economic and reliability challenges and risks in the region.

State-regulated local natural gas distribution companies ("LDCs") are required to forecast growth in demand for natural gas (for heating and process needs) in their service territories, and to ensure they have sufficient commodity and firm transportation capacity to meet customer demand at the time of winter peak (i.e., under the coldest winter conditions). This typically involves entering into fixed long-term contracts to support the development and construction of new interstate pipeline transportation capacity and local storage to meet growing peak demand, and/or contracting for the delivery of liquefied natural gas ("LNG"), coupled with firm pipeline transportation capacity from the source of the LNG. By entering into long-term contracts for pipeline capacity, the natural gas LDCs are *guaranteed* transportation of natural gas as needed to their systems on a year-round basis, and particularly under cold winter conditions. In effect, the LDCs purchase priority delivery rights on the interstate pipeline system.

Unlike most New England gas-fired plants, KEC has entered into the same type of firm, priority natural gas transportation contract as the LDCs to support its power plant operations. Most, if not nearly all, other natural gas-fired power plant owners in the New England region have chosen not to enter into such priority, long-term financial arrangements to guarantee the *transportation* of natural gas to their power plants.[8] Throughout much of the year this is not a reliability concern, because outside of cold weather conditions there is generally sufficient transportation capacity not being used by LDCs, allowing for continuous operation of more than enough of the region's natural gas-fired power plants to support reliable and economic power system operations.[9] Given these circumstances, power plant owners have typically chosen to purchase excess pipeline transportation only on an *as-available* basis for power plant operations, also known as "interruptible" or "non-firm" service.

Under these conditions, as we have become dependent on natural gas for electricity generation, the interstate pipeline system has become constrained - that is, filled to or near

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[8] As described by ISO-NE in its annual energy outlook: "gas utilities commit to long-term contracts required for incentivizing pipeline development" while "generators, on the other hand, typically forego these premium contracts, instead arranging for fuel only as needed and relying on unused pipeline capacity for delivery." ISO-NE, *2018 Regional Electricity Outlook, Natural Gas Constraints*, available at https://www.iso-ne.com/about/regional-electricity-outlook/grid-in-transition-opportunities-and-challenges/natural-gas-infrastructure-constraints. This trend is described in greater detail by Gordon Van Welie, President and CEO of ISO-NE, "Cost-of-service, state-regulated, Local Distribution Companies (LDCs) enter into firm, long-term contracts with pipelines to guarantee gas delivery for home heating; merchant generators do not make comparable long-term fuel arrangements because they cannot be assured of cost recovery" and "[m]erchant gas generators typically will not sign long-term contracts for firm gas transportation, since it is more economic for them to buy transportation in the secondary market (when it is available), or switch to oil when the pipelines are constrained." Van Welie, Gordon, *Challenges Facing the New England Power System*, ISO-NE Presentation, March 26, 2015, pp. 14, 21.

[9] For example, during summer months (when New England electricity demand is at its highest) the LDCs' demand is at its lowest, and absent pipeline closures or emergencies there is more than enough unused pipeline capacity to support full operation of the region's power plants.

capacity on days during winter months. Given the significant role that natural gas plays in meeting power system reliability needs, this creates risks to the reliable operation of the region's power system now and increasingly in the future, particularly under cold winter conditions.[10] In response, ISO-NE has (1) continuously raised concerns about the risks associated with power plants not contracting for firm natural gas transportation capacity; (2) developed market designs focused primarily on establishing incentives for reliable winter performance (such as the "pay-for-performance" component of the FCM); and (3) for six years administered an out-of-market "winter reliability program" to ensure reliable winter operations absent the development of new pipeline capacity into the region.[11] In just the past year alone, ISO-NE released a detailed study on fuel security challenges (with a focus on natural gas), rejected the retirement request of an existing generator based on a fuel security reliability assessment, initiated a new approach to reliability reviews focused on fuel security analyses, and began accelerated development of new interim and long-

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[10] To this point the lack of firm pipeline transportation arrangements has at times created high prices for natural gas delivered to power generators (including, e.g., during the 2017/2018 winter cold snap), but has not lead to specific power system outages in winter months. Instead, the region has managed to maintain reliability through the operation of oil- and coal-fired generating assets (many of which are among the resources that have retired or are at risk of doing so), the purchase of LNG on a spot basis, and the administration of ISO-NE's winter reliability program. ISO-NE continued to stress the expectation that these challenges will become more difficult going forward as existing non-gas generating assets seek to retire. ISO-NE, *Operation Fuel-Security Analysis*, January 17, 2018, pp. 8-9, 16-17.

[11] With respect to firm contracts, ISO-NE has emphasized that "The lack of firm fuel contracts by natural gas generators has limited the availability of natural gas transport to generators and funding for natural gas infrastructure expansion," See ISO-NE, *2017 Regional System Plan*, November 2, 2017, p. 98. With respect to its "pay-for-performance" programs, ISO-NE states "Beginning June 1, 2018, capacity payments will reward power resources that make investments to successfully boost performance during periods of system stress. Resources that don't perform will forfeit a portion of capacity payments." See ISO-NE, *2018 Regional Electricity Outlook*, February 2018, p. 18. With regard to its Winter Reliability Program, ISO-NE states that it has mitigated fuel risk security over the past six years by "Implementing Winter Reliability Programs that pay demand-response resources to be available and generators to boost winter fuel inventories of oil and LNG or to invest in dual-fuel technology," See ISO-NE, *2017 Regional Electricity Outlook*, January 2017, p. 30.

term wholesale market mechanisms to address fuel security concerns.[12] Many such ISO-NE actions have already been accepted by FERC or are or soon will be under FERC review.[13] In addition, the concerns raised by ISO-NE are shared by most other entities focused on or responsible for the reliability of power supply in the New England region.[14]

In short, given the dependence on natural gas for system operations, reliable power supply in New England is increasingly dependent on resources with reliable fuel supply, such as KEC's fuel assurance plan that includes a long-term firm fuel transportation contract and dual fuel capability with a commitment to have specific quantities of oil storage available. KEC's fuel assurance attributes will provide critical contributions to address the core regional cost and reliability concerns of (a) market fundamentals continuing to stress the economics of operating aging generating assets leading to timely or early retirements, and (b) the increasing difficulty of developing and siting new energy infrastructure in the region, causing older, higher-emitting, and less efficient units to be relied upon to meet reliability challenges. The combination of these factors suggests

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[12] For fuel security study see ISO-NE, *Operational Fuel-Security Analysis*, January 17, 2018; For rejected retirement request see ISO-NE, *Memo: Discussions of Near-Term Fuel Security Concerns*, April 3, 2018; For new reliability review approach and longer term market design efforts see ISO-NE, *Discussion of the ISO's Draft 2019 Annual Work Plan*, October 4, 2018.

[13] In August 2018, ISO-NE submitted proposed revisions to its Tariff to include fuel security as a criteria for out-of-market payments; FERC accepted this proposal, see 165 FERC ¶ 61,202, December 3, 2018; FERC also accepted the cost-of-service agreement for the continued operation of Mystic 8 and 9 generating units, see 164 FERC ¶ 61,022, July 13, 2018.

[14] For example, the Connecticut DEEP has stated that "The demand for natural gas is rising, yet gas pipeline are constrained during high demand periods, particularly during the winter months. These conditions create grid reliability concerns and price volatility during cold winter months." See Connecticut DEEP, *2018 Comprehensive Energy Strategy*, February 8, 2018, p. 108. Similarly, NERC reported that "New England has no storage facilities while relying on natural gas and liquefied natural gas supplies. It has limited infrastructure compared to the demand of natural gas in the area for electric generation. Disruption to any of the major trunk lines or deliveries would likely force generation out of service… Lack of firm transportation by electric generators in this area contribute to its risk profile." See NERC, *Potential Bulk Power System Impacts Due to Severe Disruptions on the Natural Gas System,* November 2017, p. 6.

placing a particular emphasis, when assessing need and public benefits, on the contributions of proposed resources that can address these fundamental challenges to Connecticut and the New England region.

Q. Since KEC is intended to be primarily run on natural gas, will it add to the over-reliance on natural gas electric generation in New England?

A. No; in fact, it helps to alleviate this reliability challenge. This is because KEC has *both* firm transportation of natural gas to the facility *and* back up ULSD-generation capability with a commitment to significant on-site ULSD storage capacity. In effect, the addition of KEC will increase the amount of fuel-secure resources available in Connecticut and New England, adding to the capacity unaffected by any potential natural gas constraints under cold winter conditions.

Q. Please describe how the cold snap last winter, from December 2017 into January 2018, affecting the Northeast U.S. sheds light on the reliability/market value of KEC's unique fuel security attributes.

A. From December 26, 2017 through January 8, 2018, the New England region faced one of the most severe periods of extended cold weather in recent history ("17/18 Cold Snap"). Throughout the 17/18 Cold Snap, natural gas pipelines entering the region were at or near

capacity;[15] demand for natural gas exceeded historical levels;[16] the price of delivered natural gas in short-term markets (that is, for those that did not have long-term firm delivery contracts) spiked to extremely high levels, driving similar increases in the prices offered by generators in the New England power market;[17] the region became heavily dependent on coal- and oil-fired generation;[18] and ISO-NE and state governments took specific actions to reduce the risks to power system reliability.[19]

In short, last winter (2017/2018), Connecticut and New England faced exactly the type of winter circumstances that KEC is designed to help address. This is because KEC's

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[15] See, e.g., EIA, *Northeast Winter Alert,* January 5, 2018: "Major pipelines delivering natural gas into New York and New England are constrained again on January 5, with average pipeline utilization ranging from 90%-100% on key segments." … "Many natural gas pipelines have issued operational flow orders and critical notices advising their customers to carefully manage the amount of natural gas transportation capacity they use relative to what they requested or scheduled per contractual rights, or they will be subject to possible penalties. Interruptible transportation service is highly restricted throughout the region."

[16] "Estimated U.S. natural gas demand on January 1, 2018 reached 150.7 billion cubic feet, surpassing the previous single-day record set in 2014…" EIA, *Cold weather, higher exports result in record natural gas demand*, January 5, 2018.

[17] "This past week, increases in demand led to higher prices in natural gas and electricity markets. Day-ahead natural gas price for delivery for January 1, 2018, neared $30 per million British thermal units at trading locations in the Mid-Atlantic region, New York, and Boston" … "Because the spot price of natural gas affects power prices in many parts of the United States, spot wholesale prices also rose, surpassing $200 per megawatt hour (MWh) in New York City and $185/MWh in New England." EIA, *Cold weather, higher exports result in record natural gas demand*, January 5, 2018.

[18] See, e.g., S&P Global Market Intelligence, *New England dual-fuel units burning through oil, emissions limits amid cold-snap,* January 2, 2018: "ISO New England spokesperson Marcia Blomberg said … the extreme cold weather is increasing demand for natural gas heating, creating pipeline constraints, driving up natural gas price and causing dual-fuel generators to switch fuels. As a consequence, oil- and coal-fired power plants are generating much more power than usual and wholesale power prices have soared," and "[a]s of 10:30 a.m. on Jan. 2, 34% of New England's electricity was being supplied by oil-fired generation (which over a given year supplies less than 1% of the region's generation), followed by natural gas at 25%, nuclear at 23%, renewables at 9%, coal at 6% and hydro at 4%."

[19] On January 3, 2018, ISO New England implemented Master/Local Control Center Procedure No. 2 (M/LCC 2). See ISO-NE, *January 7 Power Systems Update*, January 7, 2018. Actions were also taken by states to ensure fuel delivery. For example, see New Hampshire Declaration of Emergency Notice (Title 49 CFR 390.23), December 26, 2017; Massachusetts Declaration of Emergency Notice (Title 49 CFR § 390.23), December 28, 2017; and Vermont Declaration of Emergency Notice (Title 49 CFR 390.23), January 3, 2018.

firm natural gas delivery contract, at pre-established prices, will provide certainty of natural gas supply for power generation during critical cold periods on top of what otherwise would be delivered to New England power generators, and mitigation of regional electricity price impacts through generation of significant energy at fuel costs that do not spike with episodic cold weather conditions. In addition, the firm delivered natural gas contract will allow KEC to operate throughout such a cold snap period on natural gas, avoiding increased emissions associated with oil-fired generation and preserving oil stocks for use in the unlikely event that true emergency conditions emerge. In short, KEC represents precisely the type of generating facility that can reduce the reliability, emission and electricity cost risks and impacts that the New England region faces during cold snap events or other emergency system conditions at any point throughout the year.

Q. Please describe in more detail the ongoing attrition of aging and less-efficient generating capacity in the region, and its implications?

A. In New England, as in other regions, market conditions are causing the retirement of many aging and less-efficient coal and oil-fired generating units on the system. The combination of low-cost gas, decreasing costs (and increased efficiency) of new gas-fired capacity, and the emergence of economically competitive and state-mandated renewable resources is reducing prices, thereby placing financial pressure on the continued operation of older resources. These older resources are more expensive to operate and may require additional capital investment to upgrade power plant components. In New England, this primarily includes oil and coal-fired resources, but also less efficient natural gas-fired capacity and

some nuclear capacity; and most capacity at risk is located in southern New England.[20] The number of unit retirements that has occurred and is expected to occur is significant from a power system reliability perspective. While expectations around the specific level and timing of retirements will fluctuate from year to year as market conditions vary, the likely retirement of the vast majority of older, less efficient resources has been continuously recognized by ISO-NE, DEEP, and others as a potential reliability challenge.[21]

This context highlights the pressing need - for both reliability and market competitiveness reasons - for KEC's generating capacity - located in southern New England, with operating characteristics tailored to more seamless integration of variable resources, and with its defense-in-depth approach to fuel management that will help address the region's growing dependence on natural gas, and otherwise support continued reliable power system and efficient power market operations.

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[20] In New England, there are 84 operating generating units that can operate on coal or oil, including 27 with an operating capacity of more than 25 MW. 59 of these units are in Connecticut, Massachusetts, or Rhode Island (S&P Global Market Intelligence). A list of the largest of these coal and oil units is attached as Exhibit 2.

[21] See, e.g., Connecticut DEEP, *2018 Comprehensive Energy Strategy*, February 8, 2018, p. 151: "Between 2012 and 2020, more than 4,200 MWs of non-natural gas fired generation will retire. The bulk of those MWs were replaced in the FCAs by natural gas fired generation. The remaining coal, oil, and nuclear units are considered at risk of retirement. This presents a significant reliability concern for the region as the region becomes so heavily reliant upon natural gas generation without the necessary natural gas transportation infrastructure." See also, ISO-NE, *Resource Mix*, January 17, 2018, available at https://www.iso-ne.com/about/key-stats/resource-mix: "Several of the region's oldest generators - and some of its largest - have already ceased operations or plan to exit the markets. About 4,600 MW - an amount equal to about 16% of the region's current generating capacity - will have shut down between 2013 and 2021 and is likely being replaced primarily by natural-gas-fired plants and wind resources… Over 5,000 MW more of New England's oil and coal capacity is at risk of retirement due to age and infrequent operations in coming years, and uncertainty surrounds the future of 3,300 MW from the region's remaining nuclear plants." In addition to recently retired units, the following plants have requested retirement or are considered by ISO-NE to be at risk of retirement: Yarmouth, Merrimack, Newington, Schiller, Mystic, West Springfield, Canal, Middletown, Montville, and New Haven.

Q. Since the filing of NTE's original application, have there been developments that may increase the likelihood of additional generating asset retirements, or that highlight the importance of KEC's reliability attributes?

A. Yes. A number of recent events have made it more likely for there to be continued retirements of existing generating units, heightened reliability concerns, and further increases in the need for low-carbon and flexible generation resources. These events make the firm natural gas transportation and dual-fuel capability of the KEC facility even more important from reliability and market perspectives. For example:

- There has been continued resistance in New England to natural gas infrastructure expansion, and major pipeline applications in New England have been suspended in recent years. For example, in June 2017 the application for the Access Northeast pipeline, a 125 mile pipeline project to replace existing pipelines with larger ones in Massachusetts and Connecticut and expand the capacity of the Algonquin Gas Transmission Line was withdrawn and the project was suspended.[22] This is on top of other cancellations or adverse regulatory decisions that occurred prior to 2017.[23] These examples do not mean

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[22] See, for example, Jon Chesto, *Lacking financing, utilities put $3 billion natural gas pipeline on hold*, Boston Globe, June 29, 2017.

[23] For example, the application for the Northeast Energy Direct pipeline, a 188 mile pipeline extension to bring gas from Pennsylvania to New England, was withdrawn in May 2016 after lack of assurance that ratepayers would pay for the project, and in August 2016 the Massachusetts Supreme Judicial Court blocked a funding mechanism that would have allowed utilities to pass on the cost of natural gas pipeline expansion to their customers. Jon Chesto, *Kinder Morgan shelves $3 billion pipeline project*, Boston Globe, April 20, 2016; and *New England in Need of More Natural Gas Pipeline Capacity*, Institute for Energy Research, August 30, 2016.

that additional pipeline capacity will not be added, but they do highlight the elevated significance of NTE's defense-in-depth approach to fuel security.

- The Northeast states in the Regional Greenhouse Gas Initiative ("RGGI") recently established lower carbon caps for future years which - by increasing generator operating costs and further restricting total allowable emissions - may further exacerbate generating unit retirements and reliability concerns in the region. Specifically, in December 2017, RGGI initiated six changes to the RGGI Program, including a reduction in the RGGI cap resulting in an additional 30% cap reduction by 2030, relative to 2020 levels.[24]
- The increased stringency of the RGGI cap, in combination with state-specific policies such as the Global Warming Solutions Act ("GWSA") in Massachusetts,[25] increase generator operating costs and thus increase the likelihood of power plant retirements in the region,[26] and thus the need for

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[24] RGGI Press Release, *RGGI States Release Updated Model Rule, Concluding Regional Program Review Process*, December 19, 2017, available at https://www.rggi.org/sites/default/files/Uploads/Program-Review/12-19-2017/Announcement_Completed_Model_Rule.pdf.; RGGI, *Summary of RGGI Model Rule Updates*, December 19, 2017, available at https://www.rggi.org/sites/default/files/Uploads/Program-Review/12-19-2017/Summary_Model_Rule_Updates.pdf.

[25] The Massachusetts GWSA was signed in August 2008, creating a framework for reducing GHG emissions from all sectors of the Commonwealth's economy (M.G.L. c. 21n, §§ 3(c), 3(d) and 7). In May 2016, the requirements of the GWSA were further clarified by the Massachusetts Supreme Judicial Court in Kain v. Department of Environmental Protection. In August 2017, the Massachusetts Department of Environmental Protection promulgated a package of regulations designed to meet the requirements of the GWSA, including a cap on emissions of CO_2 from power plants in that state that is far more stringent than the RGGI emission reduction requirements. See Commonwealth of Massachusetts Department of Environmental Protection, *Background Document on Proposed New and Amended Regulations, 310 CMR 7.00 & 310 CMR 6.00 Air Pollution Control for Stationary and Mobile Sources*, December 16, 2016 (hereafter "Background Document"). See also Commonwealth of Massachusetts Department of Environmental Protection, *Fact Sheet: Electricity Sector Regulations, 310 CMR 7.75 and 310 CMR 7.74*, August 2017.

[26] Tightening caps on emissions of CO_2 increase the likelihood of retirements by (1) creating a binding constraint on the total CO_2 emissions from - and thus operation of - competing fossil-fueled power plants,

adding efficient and flexible generating resources in Southern New England over time.

- The significant level of activity related to regional market design and power system reliability reviews over the past year highlights the potential magnitude and pace of resource retirements. For example, on March 29, 2018 Exelon filed for the retirement of Mystic Generating Station, Units 7, 8, 9, and the Jet unit.[27] In response, ISO-NE rejected the retirement of Mystic units 8 and 9 on the basis of a new "fuel security" reliability review, and formally proposed the evaluation of unit retirement proposals using the same new fuel security reliability review method.[28] The most important element of this review is identification of natural gas-fired generating units that cannot be assumed to operate on peak winter days, due to a lack of firm natural gas delivery arrangements and/or dual-fuel capability (both of which KEC has). Ultimately, FERC accepted both the retention of the Mystic 8 and 9 units - subject to cost of service treatment (with

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and (2) increasing the costs of operation in particular for less-efficient and more carbon-intensive generating facilities.

[27] Business Wire, *Exelon Generation Files to Retire Mystic Generating Station in 2022, Absent any Regulatory Solution*, March 29, 2018.

[28] For Mystic retirement rejection see ISO-NE, *Memo: Discussions of Near-Term Fuel Security Concerns*, April 3, 2018; ISO-NE's proposed reliability review method tests the reliability impact of natural gas units without secure fuel arrangements by assessing "the operational impact created by the retirement of an existing generation resource with capacity market obligations from the forward capacity market" under 18 different scenarios which "consider varying levels of LNG injection and… varying levels of electricity imports and frequency of refilling dual-fuel oil tanks." S&P Global Market Intelligence, *ISO-NE proposes changes designed to retain resources needed for fuel security*, September 5, 2018. For ISO-NE's complete changes to its evaluation of unit retirement proposals see ISO-NE, *RE: ISO New England Inc. Compliance Filing to Establish a Fuel Security Reliability Standard, Short-Term Cost-of-Service Mechanism, and Related Cost Allocation for Out-of-Market Compensation in Docket No. EL18-182-000, and Docket No. ER18-___-000*, August 31, 2018.

such out of market costs collected from electric ratepayers in all New England states and paid to Exelon) through a reliability must run ("RMR") agreement - and ISO's new fuel security reliability assessment method.[29] Finally, pursuant to requirements included in FERC 164 ¶ 61,003, ISO is now developing on an expedited basis, and in concert with NEPOOL stakeholders, (1) long-term market design proposals aimed at helping ensure reliability during winter conditions over the long term,[30] and (2) an interim/short-term mechanism that recognizes the potential for a wave of resource retirement requests based on ISO-NE's new fuel security reliability review, and in light of Mystic units 8 and 9 obtaining substantial cost of service RMR revenues as a result of that review process.[31]

There may be some difference of opinions in the region about

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29 See 164 FERC ⁋ 61,022, July 13, 2018 and 165 FERC ⁋ 61,202, December 3, 2018.

30 ISO-NE has committed to filing their longer-term market solution with FERC by July 1, 2019 and "work towards implementing the solution as soon as feasible." See ISO-NE, *RE: ISO New England Inc. Compliance Filing to Establish a Fuel Security Reliability Standard, Short-Term Cost-of-Service Mechanism, and Related Cost Allocation for Out-of-Market Compensation in Docket No. EL18-182-000, and Docket No. ER18-___-000,* August 31, 2018. Two elements of the long-term market solution under development are the Multi-Day Ahead Market ("MDAM") construct - which produces the least-cost solution to meet demand over an extended market horizon (i.e. a multi-day period of cold weather) - and the Energy Inventory Reserve Constraint ("EIRC") - reserve constraint to create and preserve an energy margin against operational uncertainties. See ISO-NE, *Winter Energy Security Improvements: Market-Based Approaches,* December 11-12, 2018, pp. 6-7.

31 ISO-NE's short-term, "interim" changes are in effect for the 13th, 14th and 15th Forward Capacity Auctions and require reliability reviews when generators submit deactivation notices to determine reliability effects during the 90-day winter season (December, January, and February). If a generating resource meets certain "trigger criteria" - depletion of 10-minute reserves below 700 MW or rolling blackouts - then the unit is deemed necessary to retain for reliability purposes and is compensated through out-of-market payments, the costs of which are allocated regionally. For further description see S&P Global Market Intelligence, *ISO-NE proposes changes designed to retain resources needed for fuel security,* September 5, 2018 and ISO-NE, *RE: ISO New England Inc. Compliance Filing to Establish a Fuel Security Reliability Standard, Short-Term Cost-of-Service Mechanism, and Related Cost Allocation for Out-of-Market Compensation in Docket No. EL18-182-000, and Docket No. ER18-___-000,* August 31, 2018.

whether or not these extraordinary actions will prompt an accelerated wave of requests to retire units (and potentially earn RMR revenues), or whether ISO-NE's "stop gap" measures can stem this tide for a limited period of time.[32] Nevertheless, changing emission control requirements, the events of the past year, reactions by ISO-NE, and determinations of FERC reflect an inexorable march in the Northeast towards the retirement of our aging fossil and nuclear generating fleet, rapidly increasing reliance on variable renewable resources, and accelerating dependence on natural gas generating capacity, which (other than KEC) would be primarily fueled through non-firm, pipeline natural gas.

Q. Please describe in more detail the growth in grid-connected and distributed variable resources and demand management, and the likelihood of this growth continuing due to economic and policy factors?

A. The New England states have been at the forefront of the move towards lowering the carbon intensity of energy supply and consumption. State policies supporting the increased development of low-carbon resources include participation in RGGI, requirements for the purchase of renewable energy credits and long-term procurement of eligible renewable

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[32] For example, New England Power Generators Association, Inc. ("NEPGA") states in its comments on ISO-NE's winter reliability review proposal: "ISO-NE's proposal… would undermine the ability of the market to select the least-cost set of resources by forcing a resource - with costs higher than the market price and that would otherwise retire - to clear the FCA. Meanwhile, resources that would have cleared in an efficient market are displaced." NEPGA, *Motion to Intervene and Protest of the New England Power Generators Association, Inc.,* September 21, 2018, Docket No. EL18-182-000 and ER18-2364-000, p. 5. By contrast, Eversource states with regard to the same proposals: "The Eversource Companies fully support the ISO-NE proposal as a just and reasonable and rationale approach to determining whether and how to retain retiring resources needed for fuel security in the FCM. ISO-NE has demonstrated amply with substantial evidence in the filing why this is the case and the Commission should adopt the ISO-NE Proposal in its entirety." Eversource Companies, *Comments of the Eversource Companies*, September 21, 2018, Docket No. EL18-182-000 and ER18-2364-000, p. 4.

resources, mandated distribution utility investment in energy efficiency measures and programs, the establishment of net energy metering tariffs to support growth in distributed solar PV installations, initiatives to support demand-side management and other distributed resource incentives, as well as a host of state-specific measures to increase community and municipal efficiency and renewable investments. These policy preferences have been implemented coincident with a steep decline over the past decade in the cost to construct and/or install wind and solar PV resources, to the point that large variable renewable resources are becoming economic to develop and operate in competitive markets, in many cases without additional subsidies.[33]

The end result of this combination of economic and policy factors is a future of increasing integration of variable renewable resources in bulk power and distribution systems, and new challenges associated with managing the uncertain impact this will have on variations in net electrical demand and reliable power system operations.[34]

The integration of variable resources - at the grid-connected and distributed levels - will not be completed overnight, but expectations are high for growth in variable resource operations in the coming years.[35] Successfully navigating a system that is changing rapidly

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[33] Lazard, *Lazard's Levelized Cost of Energy Analysis - Version 12.0*, November 2018.

[34] See NERC, *2018 Long-Term Reliability Assessment*, December 2018, p. 24 ("Replacing coal and nuclear generation with natural-gas-fired and variable generation introduces new considerations for reliability planning, such as ensuring there is adequate inertia, ramping capability, frequency response, and fuel assurance on the system.").

[35] A recent analysis by Compass Lexecon found that: "based on current mandates and policies New England's clean energy resources will grow from meeting roughly 20% of New England's energy requirements today, to over 45% by 2023, and over 50% by 2027." This includes approx. 1,100 MW of hydro-electric power and 800 MW of offshore wind procurements by Massachusetts and 600 MW of offshore wind procurements by Rhode Island and Connecticut that have already occurred, in addition to future procurements and state RPS requirements. Cavicchi, Joseph A., *Promoting Competitive Power Markets and Growing Zero-Emission Resources in New England,* Compass Lexecon on behalf of NEPGA,

towards variable distributed resources and demand management will require the addition and operation of efficient and flexible generating resources over the same time period. This means that the New England power system must have a foundation of flexible, efficient, and fast-responding resources to manage greater levels of net load variability on the system.[36]

Finally, in support of CO_2 reduction goals, states have actively evaluated the procurement of distant renewable resources - whether large wind farms in Northern New England, New York, and/or Canada, or hydro generating resources in the Eastern Canadian Provinces. The ultimate level of development of these resources remains uncertain, since it requires the siting of major new transmission infrastructure across multiple states, and generally will not occur without state-approved, long-term, out-of-market contracts that put the risk of transmission (and power plant) investment on distribution company ratepayers. However, given the likely addition of a significant quantity of distant resources added to meet policy goals, the existence of competitively-sourced, local and flexible/dispatchable resources such as KEC will continue to be critical to support the

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November 7, 2018, pp. 5-6. As of January 2, 2019 there were 12,402 MW of grid-connected wind projects and 1,433 MW of grid-connected solar projects in the ISO-NE Interconnection Queue; this does not account for the growth in behind-the-meter distributed generation. See ISO-NE public queue data, available at https://irtt.iso-ne.com/reports/external. Growth in solar PV resources alone anywhere on the New England system is expected to increase by almost 400 MW by the end of 2019. See ISO-NE, *Final 2018 PV Forecast*, March 19, 2018, p. 10.

[36] As noted by ISO-NE, "New England's traditional power system is rapidly transforming into a more complex, less predictable hybrid grid where electricity needs are met with large generators and other power resources connected to the regional transmission system, in combination with thousands of small resources connected 'behind the meter' directly to retail customer sites or local distribution utilities. In addition to significant amounts of carbon-free renewable energy, the regional generation fleet will need to include fast, flexible power plants ready to jump in and balance the variable output from wind and solar resources." ISO-NE, *2017 Regional Electricity Outlook*, January 2017, p. 18.

continued competitiveness of wholesale electricity markets, meet local reliability needs, and minimize the impact on distribution company ratepayers of long-term contractual obligations to pay for long-distance high-voltage transmission and generation development projects.[37]

Q. Please describe in more detail how KEC can help reduce emissions from operating generating plants in New England.

A. KEC will help reduce the risks of climate change and contribute to regional air quality improvements through its normal operations in the competitive market context.[38] As traditional generating assets are asked to support increasing levels of variable renewable resources over time to meet state policy objectives, it will be important that they do so with the greatest level of efficiency and lowest emission rates possible. KEC will support these objectives by displacing the generation of electricity at older, less efficient, and higher-emitting plants in the region. As shown in Exhibit 3, KEC will operate at a CO_2 emission rate lower than virtually all of the fossil generating capacity in the New England region, and far lower than those that often operate on the margin. For example, as can be seen in Exhibit 3, KEC will have one of the lowest - if not the lowest - emission rates (in pounds of CO_2 per MWh generated) of all natural gas, oil and coal-fired generating resources in New England. Thus, in every hour that KEC operates and the marginal resource is a natural

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[37] For example, the 145-mile New England Clean Energy Connect, capable of bringing 1,200 MW from Quebec to lower New England, is estimated to cost $950 million and was only selected after a previous proposal, Eversource's Northern Pass project, was voted down by New Hampshire officials. See S&P Global Market Intelligence, *Mass. utilities contract with Avangrid, Hydro-Quebec for hydro-backed line*, June 14, 2018. Both proposals have faced significant challenges in state regulatory proceedings, ultimately leading to the demise of the Northern Pass line; the New England Clean Energy Connect approval process remains underway as of this filing.

[38] The Council has recognized the potential air quality benefits of KEC. See CSC Findings of Fact, No. 476.

gas, oil or coal resource, KEC will have the effect of reducing total emissions of CO_2 to meet the region's electricity demand. Thus, generation at KEC will more often than not generate emission reduction benefits while supporting reliable and competitive wholesale market operations.

This factor may be particularly important in the context of reliable winter operations. The ability to reliably dispatch KEC on natural gas during winter peaks could avoid significant additional emissions of CO_2, NO_x, SO_2, and/or Mercury from coal and oil units dispatched to meet winter reliability needs. In fact, ISO-NE estimates emissions during the 17/18 Cold Snap alone (December 26, 2017 to January 8, 2018) averaged over 220,000 short tons of CO_2 per day as compared to less than 100,000 short tons in the days leading up to the Cold Snap. This increase was driven almost entirely by the increased operation of oil and coal units.[39] If KEC were available as a generating resource during the 2017/2018 Cold Snap, its operation would have led to a decrease in approximately 117,857 short tons of CO_2 or approximately 6% of total emissions associated with New England generation over the course of this two-week period.[40]

III. DETERMINATION OF NEED AND PUBLIC BENEFIT IN THE CONNECTICUT AND REGIONAL CONTEXT

Q. How does the Council evaluate an application for an electric generating facility such

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[39] ISO-NE, *Winter 2017/2018 recap: Historic cold snap reinforces findings in Operational Fuel-Security Analysis*, April 25, 2018, available at http://isonewswire.com/updates/2018/4/25/winter-20172018-recap-historic-cold-snap-reinforces-findings.html.

[40] This assumes that KEC would have displaced generation from higher-emitting oil units which were operating at the time.

as KEC?

A. In evaluating proposed projects, the Council evaluates the public need for and benefits of each facility. If public need and benefit for the facility are found, the environmental impacts are evaluated and weighed against the public benefits.[41] If the public benefits outweigh or balance the environmental impacts, the facility is granted a Certificate of Environmental Compatibility and Public Need ("Certificate") by the Siting Council.

Q. How are public needs and benefits for electric generating facilities described in Connecticut statute?

A. Connecticut General Statute, Chapter 227a, §16-50p(c) (3), states "a public benefit exists when a facility is necessary for the reliability of the electric power supply of the state or for the development of a competitive market for electricity and a public need exists when a facility is necessary for the reliability of the electric power supply of the state."

Q. Does the statutory language in Connecticut set a specific threshold for the determination of need for new power plant construction in the State?

A. No. The Connecticut language links a determination of need to power system reliability in the State of Connecticut, and "…the development of a competitive market for electricity."[42] This construct requires careful case-specific consideration and interpretation by the Council, because there are complex linkages among power plant development in a given state, the reliability of power supply within the State and across the New England power

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41 Specifically, "[t]he Council's statutory charge is to balance the public need or benefit of a proposed facility with the effects of the proposed facility on the natural environment of the state at the lowest reasonable cost to consumers." Connecticut Siting Council, *Frequently Asked Questions*, available at http://www.ct.gov/csc/cwp/view.asp?a=3&q=484186&cscNav=|.

42 Connecticut General Statute, Chapter 227a, §16-50p(c) (3).

system, and the role of competitive markets in supporting reliable power system outcomes. In particular, reliability within Connecticut cannot be separated from reliability in the region as a whole, and depends on the existence and operation of energy infrastructure throughout New England. Similarly, power plants and other power system infrastructure (e.g., transmission, distribution, and distributed resources (such as solar, wind, hydro, and storage)) within Connecticut support not only the reliability of the state, but of the region as a whole.

Competitive markets, in turn, help meet state and regional reliability needs through competitive, least-cost market outcomes based on regional economics (including economic additions and economic retirement of generation and demand resources). The full range of regional system planning studies/analyses, real time system operations, and ISO-NE administration of wholesale markets at the regional level provides significant and specific benefits to Connecticut consumers through joint assurance of power system reliability, the removal from distribution company ratepayers of generating plant and transmission interconnection investment risk, and the operation of a wider geographic market to drive down the cost of reliable electric service. Thus, power system reliability and market economics, at both the state and regional level, are fully intertwined.

Q. Have you reviewed the Council's May 2017 Decision?

A. Yes.

Q. Please summarize the Council's discussion relevant to the questions of need and public benefit.

A. The Council recognized that Connecticut and the ISO-NE Region are "inextricably interconnected and rely on each other for a reliable electricity system" and that "[s]ystem

reliability is comprised of two aspects: transmission security and resource adequacy."[43] The Council also recognized that "…the KEC project is the type of project that competitive markets were developed to create. KEC would not be relying on contracts with electric utilities in order to get built. KEC relies on market signals primarily for capacity and energy, as well as ancillary services, and it is responding to those market signals and identifying a need to build the plant."[44] In short, the Council recognizes that (1) Connecticut cannot be separated from ISO-NE for reliability purposes, (2) reliability comprises multiple essential reliability services, (3) KEC is a competitive generating facility that is not reliant on guaranteed ratepayer funding and supports the operation and administration of competitive electricity markets, and (4) the financial incentive for constructing new generating capacity like the KEC facility does not derive solely from the capacity market, but from multiple market revenue streams (energy, capacity, ancillary services). Plant economic viability and financing rests on expectations of revenues from all such markets over the life of the facility; not a single year's revenue from a single market such as the FCM.

Q. What did the Council conclude and why?

A. In the end, the Council found that the public benefit for KEC had not been demonstrated, and denied the issuance of a certificate without prejudice.[45] The Council came to this finding based at least in part on its conclusion that ISO-NE "…effectively determined that

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[43] CSC Findings of Fact No. 76.

[44] CSC Findings of Fact No. 114.

[45] CSC Decision and Order, p. 1.

KEC is not required for resource adequacy… through … 2021," because the region met installed capacity requirements through the FCM without KEC.[46] The Council determined that since KEC did not clear the FCM, "…the proposed facility is not necessary for the reliability of the electric power supply of the state or for a competitive market for electricity at this time."[47]

Q. Do you agree with the Council's finding and, if not, please explain why?

A. No. I think a strict focus on FCM outcomes in Certificate determinations of "need" in Connecticut (or in other competitive market states) would unnecessarily constrain the Council's decision-making authority, and diminish the reliability and competitiveness of the New England power system.

I recognize that in the current context – a regionally integrated system from reliability, operational, and market perspectives – it is *at best* challenging to interpret statutory language around whether a facility is necessary for the reliability of the electric power supply or a competitive market, and to evaluate the public benefits of a resource. This is because "reliability" cannot be reduced to a single metric or single point in time, and the reliability contributions of a resource are inextricably linked to the unique contributions the resource makes to addressing the state's and region's various reliability challenges as the supply of and demand for electricity evolves over years, even decades. Further, the complicated links between power system reliability and competitive market outcomes increases the complexity of assessing "need" and "public benefit."

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[46] CSC Opinion, p. 5.

[47] CSC Opinion, p. 11.

Obtaining a CSO through the FCM is an important indicator of a resource's contribution to meeting the market's resource adequacy objective (peak summer demand) in a single year, but resting a decision on whether a resource is necessary for reliability (of the state/region), contributes to market competition, and/or provides public benefits requires a far more expansive review of a resource's role in the regional reliability and market context than pinning the decision only on the outcome of a single market for a single supply year.

The most clear and obvious evidence for this conclusion is the totality of ISO-NE's and FERC's recent initiatives, analyses, and decisions regarding fuel security. ISO-NE continuously references the region's most pressing reliability risk as being one of "winter energy inventory," not capacity.[48] And all of the region's reliability concerns related to fuel security arise on a system that annually demonstrates sufficient capacity (through the FCM) to meet *resource adequacy* needs. Yet ISO-NE has developed or is developing no fewer than *eight non-FCM market mechanisms* to address fuel security reliability needs,[49]

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[48] In a recent presentation, ISO-NE makes New England reliability challenge clear: "Winter energy issues are fundamentally an energy supply problem, not a capacity shortfall problem." ISO-NE, *Winter Energy Security Improvements: Market-Based Approaches*, October 10, 2018, p. 13. Similarly, in its fuel security study, ISO-NE concludes "For New England, the foremost risk to current and future power system reliability revolves around fuel security - the ability of power plants to get the fuel they need to run, when they need it." ISO-NE, *Operational Fuel-Security Analysis*, January 17, 2018, p. 50.

[49] A partial list would include, in the near-term, (1) a 21-day energy inventory forecast (revisions to OP-21) and (2) fuel use opportunity costs which can be included in energy market offers (see ISO-NE, *ISO-NE is implementing near-term changes in both operations and markets to help address the risk of winter energy shortages*, November 2, 2018, available at http://isonewswire.com/updates/2018/11/2/iso-ne-is-implementing-near-term-changes-in-both-operations.html). And over the longer-term, a market-based approach to fuel security which will include: (3) Multi-Day Ahead Markets (market design that provides least-cost solution to meet demand over an extended market horizon), (4) Energy Inventory Reserve Constraint (reserve constraint to create and preserve an energy margin against operational uncertainties), and (5) Forward Inventory Reserve Mechanism (seasonal auction for ancillary services) see ISO-NE, *Winter Energy Security Improvements: Market Based Approaches*, October 10, 2018, p. 18 and ISO-NE, *Winter Energy Security Improvements: Market Based Approaches*, December 11-12, 2018, p. 2. For a full

as well as several non-market programs and actions to ensure reliability on a system with sufficient capacity resources to meet FCM requirements.[50] In the current circumstance, if anything, the FCM appears to be *the least* of ISO-NE's worries when it comes to power system reliability, and KEC is a poster child for the generating resource attributes ISO-NE hopes will emerge in response to the actions it is taking to ensure power system reliability in Connecticut and across the region, in all hours of the year.

Q. In your view, is clearing the FCM the only indicator that a resource is a necessary and economic contributor to the state and region's reliability needs?

A. No it is not. The ultimate and explicit purpose of the design and administration of wholesale electricity markets is to procure resources that in total provide various reliability attributes - or "essential reliability services" - in sufficient quantities to maintain reliability at all times. Connecticut has recognized that it is often appropriate to view the question of "need" through this broader lens.[51] While clearing the FCM is an indicator that a resource

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list of ISO-NE's recent winter energy-security changes see ISO-NE, *Discussion of the ISO's Draft 2019 Annual Work Plan*, October 4, 2018. In addition to recent efforts, ISO-NE previously completed efforts to improve the consistency of timing between energy and natural gas markets, clarify generator obligations with respect to fuel supply, and consider asset operational reliability in setting operating reserve quantities.

50 For example, ISO-NE implemented a new fuel security criteria for reliability reviews see S&P Global Market Intelligence, *ISO-NE proposes changes designed to retain resources needed for fuel security*, September 5, 2018. Using this criteria ISO-NE also extended an RMR agreement to Mystic units 8 and 9 see S&P Global Market Intelligence, *ISO-NE asks for FERC permission to keep Exelon units online for fuel security*, May 3, 2018. FERC accepted both of these proposals see 164 FERC ¶ 61,022, July 13, 2018 and 165 FERC ¶ 61,202, December 3, 2018. For the past three winters, ISO-NE has also operated winter programs that compensate generators who have the ability to leverage oil inventories, LNG inventories, or demand response see ISO-NE, *Winter Program Payment Rate* available at https://www.iso-ne.com/markets-operations/markets/winter-program-payment-rate/. Note that these are no longer offered.

51 See, for example, the Connecticut Siting Council's opinion on the approval of an earlier Lake Road combined cycle generating facility in Killingly: "[…] the proposed facility has been located based on market conditions, not simply intended to provide benefit only to the local community. It would be integrated with other electric suppliers providing capacity to the region, and must be assessed as a regional facility..." Connecticut Siting Council, Opinion, Docket No. 189 – An application by Lake Road Generating Company L.P. for a Certificate of Environmental Compatibility and Public Need for the

provides an economic contribution to meeting system resource adequacy needs in summer peak conditions in a single year, there are other essential reliability services or resource attributes needed to maintain local, state, and regional system reliability that are not necessarily obtained through the FCM, and that are assured through other market mechanisms administered by ISO-NE on a day-to-day, month-to-month, and year-to-year basis.

Q. Please provide examples of the essential reliability services (other than resource adequacy) that are required to meet power system reliability needs.

A. As noted above, resource adequacy refers to having sufficient resources available to meet electricity demand in the peak demand hour of the year (normally in New England, a weekday afternoon in July or August). However, the system requires resources that can provide specific reliability attributes needed to maintain reliable system operations every moment of the year, on a second-by-second, minute-by-minute, hour-by-hour basis. Resources that clear the FCM may contribute to providing such services, but the operational characteristics of different FCM resources on the system vary widely in whether and to what extent they provide such reliability attributes.[52] It is thus useful to

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construction, maintenance, and operation of a proposed electric generating facility located off of Lake Road in Killingly, Connecticut, December 7, 1998, p. 1. See also a Connecticut Siting Council opinion approving a combined cycle generating facility in Middletown: "The project's benefits are that it would provide in-state generation of power to meet increasing demand; the likely replacement of more polluting and costly oil-fired units in the Independent Systems Operator New England (ISO-NE) system; and the diminished need to import power into Connecticut, given transmission import constraints." Connecticut Siting Council, Opinion, Docket No. 225 – Kleen Energy Systems, LLC application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance and operation of an Electric Generating Facility and Switchyard on River Road, Middletown, Connecticut, November 21, 2002, p.1.

[52] As a simple example, a variable wind resource with 100 MW of FCM capacity in Northern Maine cannot provide the same reserve, load-following, or ramping services as a gas-fired resource with 100 MW of

consider these various reliability attributes of proposed resources relative to system needs when evaluating the "need" for the facility, and its reliability and market benefits.

Examples of such reliability attributes - which are in part purchased through the various ISO-NE energy and ancillary services markets - include the following: voltage control; frequency response; automatic generation control; and various elements of unit responsiveness tailored to help respond to demand fluctuation and system contingencies on different time scales, such as "spinning" and "non-spinning" reserves (the capacity to come on line and/or increase output rapidly to help address sudden changes in system load/generation mix (due, e.g., to the loss of transmission or generating assets)); and "ramping" or "load-following" capability (the ability to help meet normal system fluctuations by quickly and efficiently increasing and decreasing generation output on time scales that range from seconds to hours). In addition, generating resource characteristics can in other ways increase the reliability value of the capacity relative to system needs, risks and dependencies, but may not be fully compensated for such value in wholesale markets. This would include, for example, the value of locating generation close to load to support local voltage requirements, and fuel security - or the ability to be available and perform in particular during times when the system is stressed or subject to common-mode failures (e.g., constraints on the capacity of the interstate natural gas pipeline system to move gas for power generation capacity into the region - discussed in more detail in Section II above).

FCM capacity located in Hartford, New Haven or Boston. See Hibbard, Paul, Tierney, Susan & Franklin, Katherine, *Electricity Markets, Reliability and the Evolving U.S. Power System*, Analysis Group, June 2017, p. 53-54. See also, NREL, *Integrating Variable Renewable Energy: Challenges and Solutions*, September 2013, pp. 8-9.

Q. In your opinion, how should the Council evaluate whether the KEC facility is "needed"?

A. In my view, the Council should consider the full set of attributes KEC brings to addressing the state's and the region's reliability challenges over at least the coming decade, and the role it will play in achieving consumer and reliability outcomes through participation in the region's wholesale markets.

Q. Why do you think it is important to understand and consider all of the reliability attributes of proposed resources when evaluating resource need?

A. When evaluating whether a facility is necessary for reliability in the context of a regional wholesale market, it is the full scope of a resource's reliability attributes, and its potential contributions to meeting specific state *and* regional system reliability requirements, that are important. This is particularly true in the current context, given how well the KEC project is suited to the unique reliability circumstances of Connecticut and New England at this time, as discussed in Section II, above.

Q. Do you have any additional concerns with tying the determination of need for resources in any New England state siting proceeding too narrowly, or exclusively to the outcome of the region's Forward Capacity Market?

A. Yes. First, it is important to consider the unique timing of the FCM auctions and associated capacity supply obligations relative to a proposed resource's development milestones. Specifically, limiting the review of "need" to whether or not a resource clears the FCM creates a fundamental structural discontinuity between the schedule for FCM auctions and the steps that must be taken by a developer to successfully develop and construct a power plant. While clearing the FCM is a clear indication of reliability benefits, *requiring* that a

proposed resource clear the FCM *prior to* receiving siting approval could preclude the development of a resource that is otherwise beneficial to the state from reliability and economic/market perspectives.

The time between when a resource clears the FCM and when the unit must achieve commercial operation to meet its CSO obligation is 39 months, which is very little time to take all the steps necessary to obtain project financing, enter into contractual commitments for plant components and engineering/construction services, and carry out the construction and testing of plant operation - most of which cannot begin in earnest prior to receiving siting approval. In reality, many of these steps must be carried out at tremendous expense and prior to the decision to offer into the FCM, in order to be able to finalize the pricing of an offer, and to be prepared to rapidly meet construction deadlines upon successful clearing of the market. It is very difficult for a developer to absorb the financial risk of failing to obtain a siting approval and meet its CSO obligation (or alternatively, price that risk into its capacity market offer), when offering into the FCM auction. This is because clearing the market comes with a specific obligation to be in operation three years hence - one that introduces the risk of significant financial penalties, and can only be discharged through subsequent "reconfiguration" auctions at significant expense.

In short, it is simply not necessary that a determination of need be based upon the outcome of a prior FCM auction, and many if not most new power plant construction in New England has not required this result and may not have been possible/constructed if

this were a requirement to their approval.[53]

IV. CONCLUSIONS

Q. Please summarize your conclusions.

A. KEC would be a reliable, local, and efficient generating resource, capable of providing the essential reliability services needed to effectively and efficiently maintain power system reliability in Connecticut and New England. Further, KEC is exactly what Connecticut and the region need to address the most pressing reliability risks, and to help meet public policy objectives: it would be close to load in the most densely populated portion of the New England region, connected to the state's and region's 345kV system; it would implement a defense-in-depth approach to fuel security, guaranteeing reliable operations through any system contingencies and even under the harshest of winter conditions, and add a unique level of resilience to energy system operations; it would provide highly flexible and controllable operations to support the vast integration of low-carbon, variable renewable resources; and it would do so while providing emission reduction benefits to Connecticut and the region.

Interpreting the question of need, public benefits, and contributions to competitive markets in a fully intertwined regional power system and market is complicated by the fact that the planning, procurement and operation of resources to ensure power system

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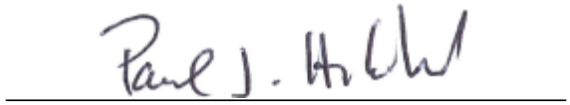
[53] In addition, it is worth noting that a variable wind resource or solar PV plant may not seek or obtain a CSO, yet still operate as an energy resource (and support system energy and ancillary services requirements). In this example, a literal reading of the Council's findings in its prior decision would mean that such renewable resources that will not clear the FCM auction by definition could not be granted a Certificate in the State of Connecticut - an outcome that is illogical and inconsistent with the State's competitive market structure, and energy and environmental policy goals and mandates.

reliability and efficient market outcomes are primarily regional in nature, and flow from federally-regulated reliability obligations and market designs. In this context, it is important for the Council to conduct a broader and more nuanced assessment of need, reflecting on reliability contributions to Connecticut and the New England region, and recognizing the complex nature of the interaction between wholesale electricity markets and power system reliability.

In short, in my view the Council should find that KEC is needed and necessary for the reliability of electric supply, and the competitiveness and efficiency of wholesale electricity markets.

Q. Does this conclude your testimony?

A. Yes.



Paul J. Hibbard

January 18, 2019

Exhibit 1
Curriculum Vitae & Testimony

Paul J. Hibbard
Principal

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EDUCATION

Ph.D. program (coursework), Nuclear Engineering, University of California, Berkeley

M.S. in Energy and Resources, University of California, Berkeley
Thesis: Safety and Environmental Hazards of Nuclear Reactor Designs

B.S. in Physics, University of Massachusetts, Amherst

PROFESSIONAL EXPERIENCE

2010 - Present Analysis Group, Inc., Boston, MA
Principal
Vice President

2007 - 2010 MA Department of Public Utilities, Boston, MA
Chairman
Member, Energy Facilities Siting Board
Manager, New England States Committee on Electricity
Treasurer, Executive Committee, Eastern Interconnect States' Planning Council
Representative, New England Governors' Conference Power Planning Committee
Member, NARUC Electricity Committee, Procurement Work Group

2003 - 2007 Analysis Group, Inc., Boston, MA
Vice President
Manager ('03 – '05)

2000 - 2003 Lexecon Inc., Cambridge, MA
Senior Consultant
Consultant ('00 – '02)

1998 - 2000 Massachusetts Department of Environmental Protection, Boston, MA
Environmental Analyst

1991 - 1998 Massachusetts Department of Public Utilities, Boston, MA
Senior Analyst, Electric Power Division

1988 - 1991 University of California, Berkeley, CA
Research Assistant, Safety/Environmental Factors in Nuclear Designs

TESTIMONY IN THE LAST FOUR YEARS

Post-Settlement Testimony of Paul J. Hibbard before the Maryland Public Service Commission on behalf of The Applicants, Case No. 9449, January 5, 2018.

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Exhibit 2

New England Coal and Oil Units

Name	Nameplate Capacity	State	Fuel
Bridgeport Harbor	400	CT	Coal
Devon	204	CT	Oil/Gas
GenComm Devon	242	CT	Oil/Gas
GenComm Middletown	242	CT	Oil/Gas
Middletown	415	CT	Oil
Montville	490	CT	Oil/Gas
New Haven Harbor	182	CT	Oil/Gas
Canal	1,165	MA	Oil/Gas
Cleary Flood	95	MA	Oil/Gas
M Street Jet	69	MA	Oil
Mystic	617	MA	Oil/Gas
Stony Brook	530	MA	Oil/Gas
Yarmouth (William Wyman)	846	ME	Oil
Merrimack	459	NH	Coal
Schiller	100	NH	Coal
Retiring or At-Risk Capacity	4,674		
Total Capacity	6,056		
as percent	77%		

Notes:

[1] Plants highlighted in gray indicate those that are recognized by ISO-NE as retiring or at risk of retiring.

[2] Includes all New England generating units greater than or equal to 50 MW that list oil or coal as their primary fuel type for some or all generating units at the station.

[3] While the table reflects information about the Mystic oil unit, the Mystic gas units were also filed for retirement, and other older and less efficient natural gas and dual-fuel units in the region may also be at risk of retirement.

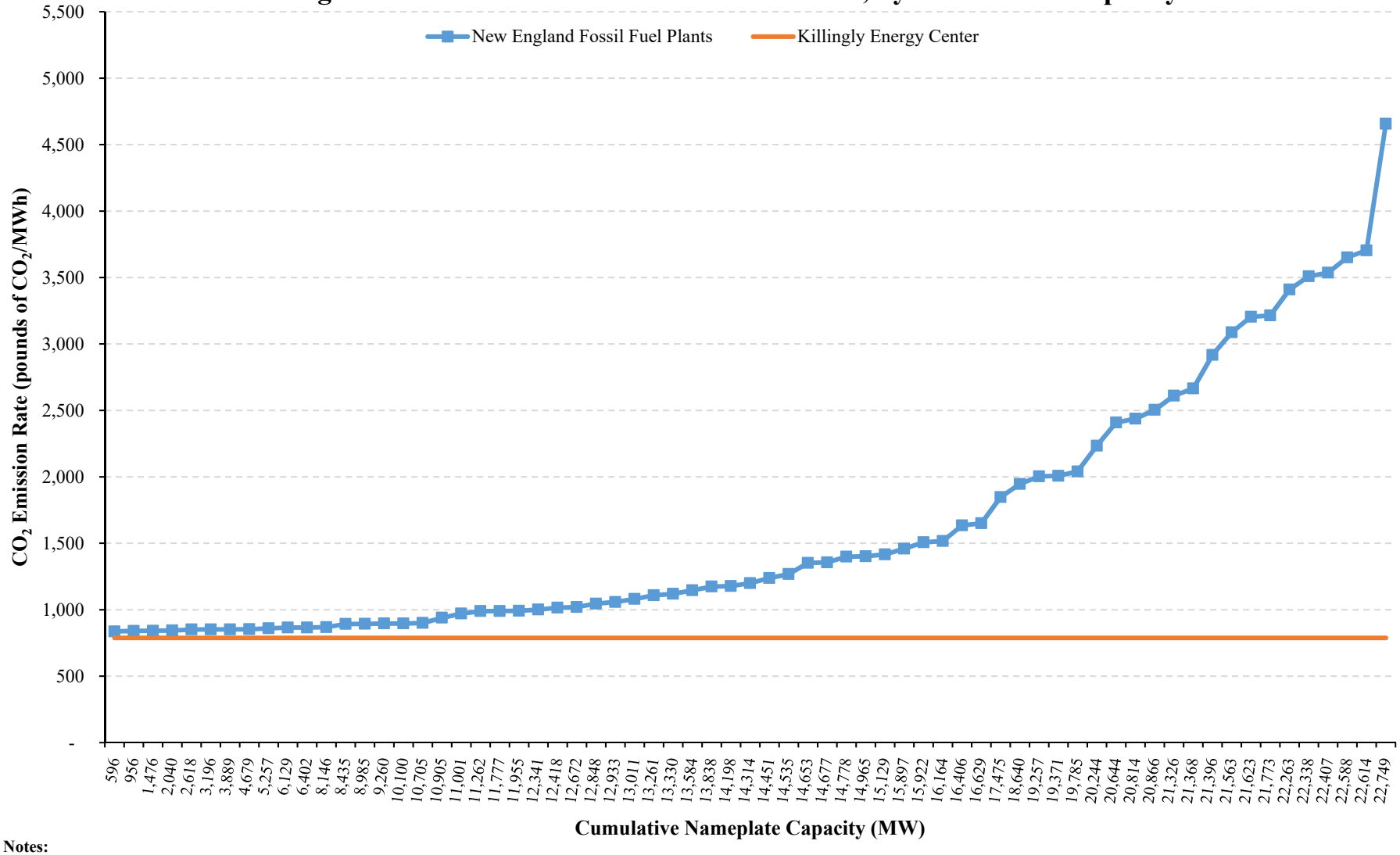
Sources:

[1] S&P Global Market Intelligence.

[2] ISO-NE, *Generation Mix* , available at https://www.iso-ne.com/about/key-stats/resource-mix/.

Exhibit 3

New England Fossil Fuel Generator Emission Rates, by Cumulative Capacity



Notes:

[1] The emission rate for Killingly Energy Center is the reported maximum tons of CO_2 equivalent emissions per year over the maximum annual generation of the plant.

[2] The emission rates for the rest of ISO-NE plants represent a three year (2015-2017) weighted average emission rate (annual CO_2 emissions over annual net generation), weighted by net generation for operating and operating & planned fossil plants where emissions data are available.

Sources:

[1] Killingly Energy Center, Bureau of Air Management New Source Review Permit to Construct and Operate a Stationary Source, Permit No. 089-0107, December 10, 2018.

[2] S&P Global Market Intelligence.