ATTACHMENT E

EXHIBIT NO. NMPC-100

PREPARED DIRECT TESTIMONY OF BRIAN GEMMELL

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Niagara Mohawk Power Corporation	**)**	**Docket No. ER22-___-000**
d/b/a National Grid	**)**	

PREPARED DIRECT TESTIMONY OF BRIAN GEMMELL

I. BACKGROUND AND QUALIFICATIONS

Q. Please state your name and business address.

A. My name is Brian Gemmell. My business address is 40 Sylvan Road, Waltham, MA 02451.

Q. Please describe your current responsibilities.

A. I am employed by National Grid (defined below) as its Chief Clean Energy Development Officer. I am responsible for National Grid's pursuit of clean energy business opportunities for our customers and regulated energy networks in support of future New York and New England states' goals.

In both New York and New England, National Grid's home states have defined their clean energy and environmental ambitions to broadly achieve the renewable electric generation target of 70% by 2030, and 100% emissions-free electric system demand by 2040, or similar such timeframes. The purpose of my role is to drive strategic and proactive thought leadership to increase our clean energy profile, as well as to pursue emerging infrastructure opportunities and partnerships. These approaches will influence future rate cases and grow rate base for our regulated utilities in New York and New England.

I lead and develop a team that is responsible for all business development and analytics, and commercial support and agreements for all new clean energy business opportunities. The specific portfolio includes but is not limited to infrastructure for renewable generation, infrastructure in support of electric vehicle ("EV") corridor charging and other transportation, utility-scale battery energy storage solutions, low-

carbon gas, and electrification of heat in the New York and New England states, as well as the Sandy Pond high-voltage direct current ("HVDC") transmission in New England.

Q. Please describe your educational background and work experience.

A. I graduated from the University of Strathclyde in Glasgow, United Kingdom with a Masters of Engineering (MEng) Degree in Electrical and Electronic Engineering in 1990, and a Doctor of Philosophy (PhD) Degree in Electrical and Electronic Engineering in 1995. During 1992, I spent six months as a Visiting Engineer at the Massachusetts Institute of Technology in Cambridge, Massachusetts.

My career began at ScottishPower in the United Kingdom, where I held positions in Substation Engineering, Asset Management, and Transmission Planning. Later I became Vice President of Transmission Solutions at Siemens, enabling the adoption of new, complete turnkey technologies to improve the reliability and efficiency of transmission systems across the United States. I also was General Manager of Siemens' U.S.-based Power Technologies International, as well as Business Development Manager in Flexible Alternating Current Transmission Systems ("FACTS") and HVDC Solutions for Siemens and ALSTOM (acquired by General Electric).

I joined National Grid in 2017 as Vice President of Strategy and Performance for National Grid's businesses regulated by the Federal Energy Regulatory Commission ("FERC" or "Commission"), and later was named Vice President of Transmission Asset Management & Planning and Capital Delivery Electric across New England and New York. In that role, I led the development, prioritization, and management of 10-year transmission capital expenditure ("CAPEX") plans totaling $10 billion, execution of an

annual complex electrical project portfolio totaling $800 million, and operation and maintenance of National Grid's 2-gigawatt ("GW") HVDC facility.

I am a past President and currently on the Board of Directors of WIRES, an international non-profit trade association that promotes investment in electric transmission and progressive state and federal policies that advance development of electric power infrastructure. I have been a member of the Institute of Electrical and Electronics Engineers ("IEEE") since 2000.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony?

A. My testimony addresses the legislative origins and features of the Smart Path Connect Project ("Project"). My testimony also summarizes the requests for Commission approval of the Project that Niagara Mohawk Power Corporation d/b/a National Grid ("NMPC") is making in the filing for which my testimony is an exhibit ("NMPC Filing"). Furthermore, I explain how the Project satisfies the needs for expanded transmission capability in northern New York and provides numerous economic and environmental benefits to New York customers, including unlocking significant renewable capacity in northern New York, providing substantial cost savings, and reducing greenhouse gas emissions.

Q. Are you sponsoring any exhibits to support your testimony?

A. Yes. In addition to this testimony, I am sponsoring the following exhibits:

- **Exhibit No. NMPC-101** – Documentation of Project financial benefits from the NYPA's simulation study performed by the New York Power Authority ("NYPA");
- **Exhibit No. NMPC-102** – Customer payment savings for delivered energy related to the Project; and
- **Exhibit No. NMPC-103** – Capacity cost savings related to the Project.

Q. What is the Smart Path Connect Project?

A. The Smart Path Connect Project is a transmission upgrade project that NMPC is jointly developing with NYPA. The Smart Path Connect Project will be sited in northern New York and consists of rebuilding approximately 100 miles of existing transmission lines and associated equipment, upgrading approximately ten substations, and converting most of the Project facilities from 230 kilovolts ("kV") to 345 kV. I provide more details regarding the Smart Path Connect Project later in my testimony.

Q. Please provide an overview of NMPC.

A. NMPC is a Commission-regulated public utility company organized and operated under the laws of the State of New York. It provides electric service to over 1.5 million customers and natural gas service to over 540,000 customers in upstate New York. NMPC owns and operates transmission facilities in New York, all of which are subject to the operational control of the New York Independent System Operator, Inc. ("NYISO"). NMPC recovers its transmission revenue requirements pursuant to formula rates under Attachment H to the NYISO Open Access Transmission Tariff ("OATT").

The outstanding common shares of NMPC are wholly owned by National Grid USA. National Grid USA is an indirect, wholly-owned subsidiary of National Grid plc, a company incorporated in England and Wales. NMPC is the only National Grid subsidiary that owns or operates transmission facilities in New York.

Although NMPC does business under the name of "National Grid," for purposes of avoiding confusion, I will refer to the filing party and New York service company affiliate here as "NMPC," while references to "National Grid" will refer to one of NMPC's corporate parents.

Q. Please describe the other testimonies that are being submitted in support of this filing.

A. In addition to my testimony, witnesses for NMPC are submitting the following testimonies in support of the NMPC Filing:

- Mr. Andrew Byrne, Commercial Development Director, Clean Energy Development at National Grid, is submitting testimony in Exhibit No. NMPC-200 supporting the incentive rate treatment requests for the Smart Path Connect Project, including detailing the significant financial, regulatory, and other risks and challenges that the Smart Path Connect Project will impose on National Grid. Mr. Byrne also addresses the "80/20" risk sharing and cost containment mechanism that National Grid proposes to apply to its portion of the Project

- Mr. Adrien M. McKenzie, President of FINCAP, Inc., is submitting testimony in Exhibit No. NMPC-300 regarding the return on equity ("ROE") and capital

structure for the Smart Path Connect Project. Mr. McKenzie provides an analysis demonstrating that a base ROE for the Project of 10.50% is just and reasonable. Mr. McKenzie also provides an analysis demonstrating that ROE incentives requested for the Project are within the zone of reasonableness and are necessary to attract investors.

- Mr. Bart Franey, Director of Transmission Business Development at National Grid, is submitting testimony in Exhibit No. NMPC-400 that describes and supports the New York statewide load ratio share cost allocation and cost recovery mechanisms proposed for the Smart Path Connect Project.
- Ms. Tiffany Escalona, Director, New England Regulation, is submitting testimony in Exhibit No. NMPC-500 regarding the rate mechanisms that will apply to NMPC's portion of the Smart Path Connect Project.

III. STATE LEGISLATION AND NYPSC PROCEEDINGS THAT RESULTED IN THE IDENTIFICATION AND DEVELOPMENT OF THE SMART PATH CONNECT PROJECT

Q. Please describe the New York State legislation that led to the development of the Smart Path Connect Project.

A. The Smart Path Connect Project has its origins in the Climate Leadership and Community Protection Act ("CLCPA"), which the New York legislature enacted as Chapter 106 of the New York State laws of 2019. CLCPA requires a 40% statewide reduction in greenhouse gas emissions from 1990 levels by 2030, and an 85% reduction by 2050. Further, CLCPA requires that (1) a minimum of 70% of statewide electric generation be produced by renewable energy by 2030 (the "70 x 30 Target"); (2) the

electric demand system be 100% emissions-free by 2040; and (3) the State meet the following procurement targets: 9 GW of offshore wind by 2035, 6 GW of photovoltaic solar generation by 2025, and 3 GW of energy storage resources by 2030.

Q. Did any subsequent New York State legislation also lead to the development of the Smart Path Connect Project?

A. Yes. In recognition of the significant changes that must be made to the New York power grid to meet the CLCPA requirements, the State legislature enacted the Accelerated Renewable Energy Growth and Community Benefit Act ("AREGCBA") as Chapter 58 (Part JJJ) of the New York State laws of 2020. AREGCBA requires the State to provide for the construction of expanded transmission and distribution infrastructure sufficient to ensure the cost-effective and timely development of the renewable energy generation projects needed to meet the CLCPA requirements (which AREGCBA refers to as the "CLCPA Targets"). In furtherance of this goal, Section 3 of AREGCBA calls for the NYPSC "to make a comprehensive study of the state's power grid to identify distribution and transmission infrastructure needed to enable the [S]tate to meet the CLCPA [Requirements]" and to establish a bulk transmission investment program to be submitted to the NYISO for incorporation into its transmission studies and planning processes.

Q. What does AREGCBA require with respect to implementation of the bulk transmission investment program?

A. To implement the bulk transmission investment program, Section 7 of AREGCBA prescribes two alternative pathways for project selection. First, for projects necessary to

implement the plan, AREGCBA generally requires the NYPSC to "utilize the state grid operator's public policy transmission planning process" – *i.e.*, the Public Policy Transmission Planning Process found at Section 31.4 of Attachment Y to the NYISO OATT – for project selection.

The second pathway specified in AREGCBA requires the NYPSC to identify projects that are needed on an "expeditious" basis to meet the CLCPA Requirements. AREGCBA refers to such identified projects as Priority Transmission Projects ("PTPs"). In recognition of the State's specific need for the timely development of bulk transmission, AREGCBA directs that PTPs be developed by NYPA, subject to the concurrence of NYPA's Board of Trustees ("Trustees"). Once a project has been designated as a PTP by the NYPSC and the NYPA Trustees have concurred, AREGCBA requires NYPA to undertake a public solicitation process to assess whether joint development of the PTP would provide significant additional benefits in achieving the CLCPA Requirements.

Q. Did the NYPSC identify the Smart Path Connect Project as being needed on an expeditious basis pursuant to the second pathway specified in AREGCBA?

A. Yes. On July 2, 2020, New York State Department of Public Service Staff ("Staff") and NYPA filed a petition in which Staff proposed the adoption of criteria for identifying and designating a PTP, while NYPA proposed a set of transmission investments in northern New York ("NNY") for designation as a PTP. NYPA referred to those transmission investments collectively as the Northern New York Project or NNY Project. The NNY Project was subsequently renamed the Smart Path Connect Project.

On October 15, 2020, pursuant to its authority under AREGCBA, the NYPSC issued an *Order on Priority Transmission Projects* in Case 20-E-0197 ("Priority Project Order") to address the petition filed on July 2, 2020. The Priority Project Order established criteria by which it would determine whether a project qualifies as a PTP. The Priority Project Order, applying these criteria to the NNY Project (*i.e.*, the Smart Path Connect Project), determined that it qualified as a PTP, the construction of which is needed expeditiously to meet the CLCPA Requirements.

Q. What criteria did the NYPSC establish in the Priority Project Order to determine whether a project qualifies as a PTP?

A. In the Priority Project Order, the NYPSC established two general criteria by which it would determine whether a project qualifies as a PTP. First, the NYPSC determined that "a key and perhaps determinative factor" for the analysis of whether a transmission project qualifies as a PTP is whether the project addresses the deliverability of existing generation.[1] The fact that operating generators "are not able to offer their full capacity due to transmission constraints is a strong indicator of whether traditional planning processes have kept pace with State policy."[2] Additionally, the NYPSC noted that the presence of generation in the planning queue that will benefit from solving a transmission constraint affecting existing generation should be given weight.[3] The NYPSC

[1] Priority Project Order at 16. The Priority Project Order is available at https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=20-E-0197&CaseSearch=Search.

[2] *Id.*

[3] *Id.* at 17.

encapsulated these considerations into the following first general criterion it will consider for designating a PTP: "The transmission investment's potential for unbottling existing renewable generation, as well as projects that are in the NYISO interconnection process, for delivery to load centers in the State, thereby reducing the amount of new generation that must be constructed to meet the CLCPA [Requirements]."[4]

The NYPSC separately noted that, where solving a transmission problem outside of the NYISO Public Policy Transmission Planning Process "will increase the likelihood of meeting the CLCPA deadlines, the proposed transmission project may qualify as a PTP."[5] Accordingly, the NYPSC established a second general criterion for selection of a PTP as follows:

> Whether an early in-service date for the transmission investment would: (a) increase the likelihood that the State will meet the CLCPA [Requirements]; and/or (b) enhance the value of recent, ongoing or anticipated distribution, local transmission, and/or bulk transmission investments, and/or help the State realize benefits from such investments because it can be placed in-service sooner than the NYISO process would allow.[6]

Q. Please explain why and how the NYSPC determined in the Priority Project Order that Smart Path Connect Project meets the PTP criteria.

A. With respect to the first criterion, concerning the unbottling of generation, the NYPSC found that "the State's investments in renewable generation in the northern region are not being fully realized due to transmission limitations."[7] The NYPSC noted an analysis

[4] *Id.*

[5] *Id.* at 18.

[6] *Id.* The final language of this criterion resulted from the NYPSC accepting the criterion proposed by Staff, with the addition of the language stipulating that the project could be placed in-service sooner than the NYISO process would allow. *Id.*

[7] *Id.* at 25.

provided by NYPA indicating that with respect to existing generation, the Project will avoid 7.5 terawatt-hours ("TWh") of renewable generation curtailments annually, and found that "the presence of a significant amount of existing renewable generation that is currently not served by the transmission system indicates that a project to unbottle that generation is 'needed expeditiously.'"[8] With respect to planned generation, the NYPSC noted NYPA's identification of approximately 2,400 MW of planned generation that would not be deliverable to downstate load without additional transmission capacity in northern New York, and then found "that the number of interconnection applications that are being studied by the NYISO suggests there is strong developer interest in this area of the State, and that advancing the [Smart Path Connect] Project would help capture the investment these applications represent, increasing the overall benefits of the project."[9]

With respect to the second general criterion, the NYPSC found that given that the NYISO 2020 public policy planning cycle had only recently been initiated, the Smart Path Connect Project would likely be placed in service earlier than a comparable project selected via the NYISO public policy transmission planning process.[10] The NYPSC accordingly found that "the NYISO process cannot meet the same goals in the same time frame that NYPA may achieve" and determined that the Project is "needed expeditiously."[11]

[8] *Id.* at 20-21.

[9] *Id.* at 21.

[10] *Id.* at 22-23.

[11] *Id.* at 25.

The NYPSC concluded its analysis by stating that NYPA had shown a sufficient basis for identifying the Project as a PTP based on the NYPSC's established criteria.[12]

Q. Has the NYPSC performed a comprehensive power grid study as required by AREGCBA?

A. Yes. The NYPSC, through the New York State Department of Public Service, initiated a set of system studies that constituted the comprehensive power grid study required by AREGCBA in 2020. The NYPSC issued an initial report on the comprehensive power grid study in January 2021 ("Initial Power Grid Study Report").[13]

Q. What did the Initial Power Grid Study Report find with regard to the Smart Path Connect Project?

A. Following the designation of the Smart Path Connect Project as a PTP, the Initial Power Grid Study Report assumed as a predicate for purposes of its local transmission planning assessment that the Project will be constructed.[14]

[12] *Id.*

[13] Initial Report on the New York Power Grid Study, NYPSC, (Jan. 19, 2021), available at https://www.nyserda.ny.gov/-/media/Files/Publications/NY-Power-Grid/full-report-NY-power-grid.pdf.

[14] Initial Power Grid Study Report at 2 n.2, 79 n.76, and Appendix E at E-4, E-38.

IV. FEATURES AND LOCATION OF THE SMART PATH CONNECT PROJECT

Q. Please provide an overview of what the Smart Path Connect Project consists of and where it will be located.

A. The Smart Path Connect Project consists of rebuilding approximately 100 miles of existing 230 kV transmission lines along with associated equipment, converting 90 percent of these facilities to 345 kV, and upgrading approximately 10 substations in northern New York.[15] The Project includes rebuilding all or parts of the following transmission lines: NMPC's Adirondack to Porter (Chases Lake-Porter Line 11, Adirondack-Porter Line 12, and Adirondack-Chases Lake Line 13) and NYPA's Moses-Willis 1&2, Willis-Patnode and Willis-Ryan. The Project also includes a connection to NYPA's Moses-Adirondack 1&2 (also known as "MA 1&2" or "Smart Path") transmission facilities.[16]

To minimize costs and environmental impacts, NMPC and NYPA have proposed to develop the majority of the Project within their existing rights-of-way.[17] However, in addition to the existing rights of way, NMPC and NYPA will need to engage in good-faith negotiations with third-party property owners to obtain certain property rights necessary to construct the Project as proposed.

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[15] Application of New York Power Authority and Niagara Mohawk Power Corporation d/b/a National Grid for a Certificate of Environmental Compatibility and Public Need for the Rebuild of Approximately 100 Linear Miles of Existing 230 kV to Either 230 kV or 345 kV along with Associated Substation Construction and Upgrades Along the Existing NYPA Moses-Willis 1&2, Willis-Patnode, Willis-Ryan, a portion of Ryan-Plattsburgh and National Grid's Adirondack-Porter 11, 12, and 13 Lines in Clinton, Franklin, St. Lawrence, Lewis, and Oneida Counties, New York, NYPSC Case No. 21-T-0340 (June 15, 2021) ("Article VII Application") at 4, available at https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=21-T-0340.

[16] *Id.*

[17] *Id.*

Q. What is the difference between the Smart Path Connect Project and the Smart Path project?

A. The Smart Path Connect Project is being undertaken jointly by NYPA and NMPC as described in my testimony. The Smart Path project is being undertaken by NYPA alone and will be connected at each end to a component of the Smart Path Connect Project. Although the Smart Path Connect Project and the Smart Path project have similar names, they should not be confused with one another. The maps I provide later in my testimony should be helpful in distinguishing between the two.

Q. What components comprise the Smart Path Connect Project?

A. The Smart Path Connect Project consists of two components: the Adirondack-Porter component and the Moses-Willis-Patnode ("MW-Patnode") component.[18] The costs of the Project will also include any required interconnection costs identified by the NYISO.

Q. Please describe the Adirondack-Porter component of the Project.

A. The Adirondack-Porter component is the southern section of the Project and involves the rebuild of approximately 55 miles of transmission from Croghan to Marcy. This component is comprised of the following Project facilities: (1) the rebuild and upgrade of NMPC's Adirondack-Porter 230 kV lines (Chases Lake-Porter Line 11, Adirondack-Porter Line 12, and Adirondack-Chases Line 13); (2) the construction of the proposed Adirondack Substation; (3) the interface connection of the proposed Adirondack Substation to NYPA's Smart Path project (the Moses-Adirondack 1 and 2 transmission

[18] *Id.*

facilities, also known as "MA1&2"); (4) the construction of a new Austin Road Substation; (5) the extension of the existing 230 kV Rector Road to Chases Lake Line 10; (6) the expansion of the Edic Substation; (7) removal of the existing 230kV Edic to Porter Line 17 and equipment at the Porter and Chases Lakes Substations; and (8) extension of the existing 345 kV Marcy Substation. NYPA will own listed components (2), (3), and (8), and NMPC will own the balance of the components.[19]

Q. Please describe the MW-Patnode component of the Project.

A. The MW-Patnode component is the northern section of the Project and covers approximately 46 miles running from Massena to the Town of Clinton in Clinton County, New York. The MW-Patnode component involves the following projects: (1) the rebuild of NYPA's Moses-Willis 1&2 to convert 230 kV circuits to 345 kV (about 37 miles); (2) the rebuild of Willis-Patnode and Willis-Ryan 230 kV lines and a short portion of the Ryan-Plattsburgh 230 kV line, resulting in single circuit 230 kV line upgrades to double circuit 230 kV lines (together, about nine linear miles); (3) the construction of a new proposed Haverstock Substation; (4) the interface connection of the proposed Haverstock Substation to the MA 1&2 right-of-way; (5) the expansion of the Willis Substation; (6) the modification of the Ryan, Patnode, and Massena Substations within the existing fence lines; and (7) a right-of-way expansion at the Ryan Substation. NYPA will own all of those components.[20]

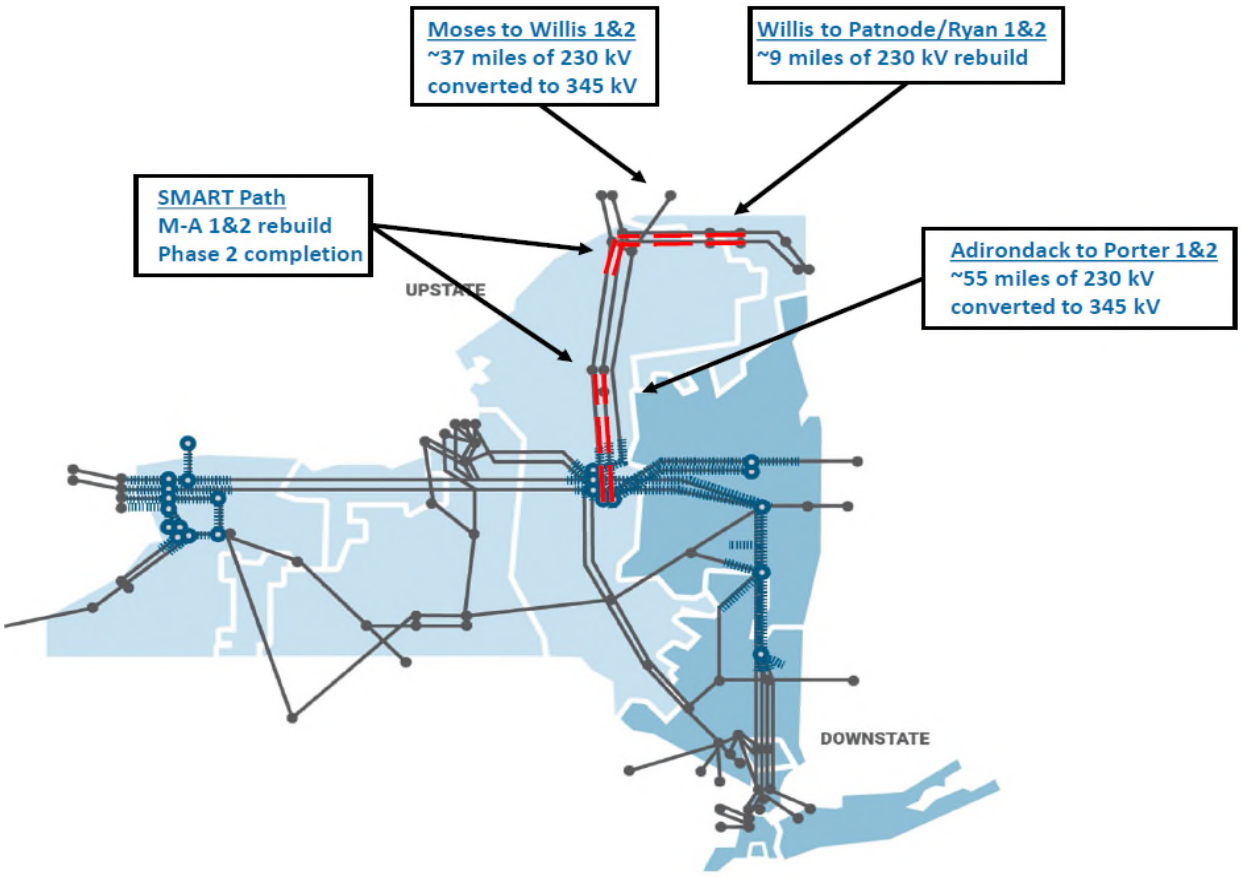
[19] *Id.* at 4-5.

[20] *Id.*

Q. Can you provide maps depicting the two components of the Project and their geographic relation to other projects in New York?

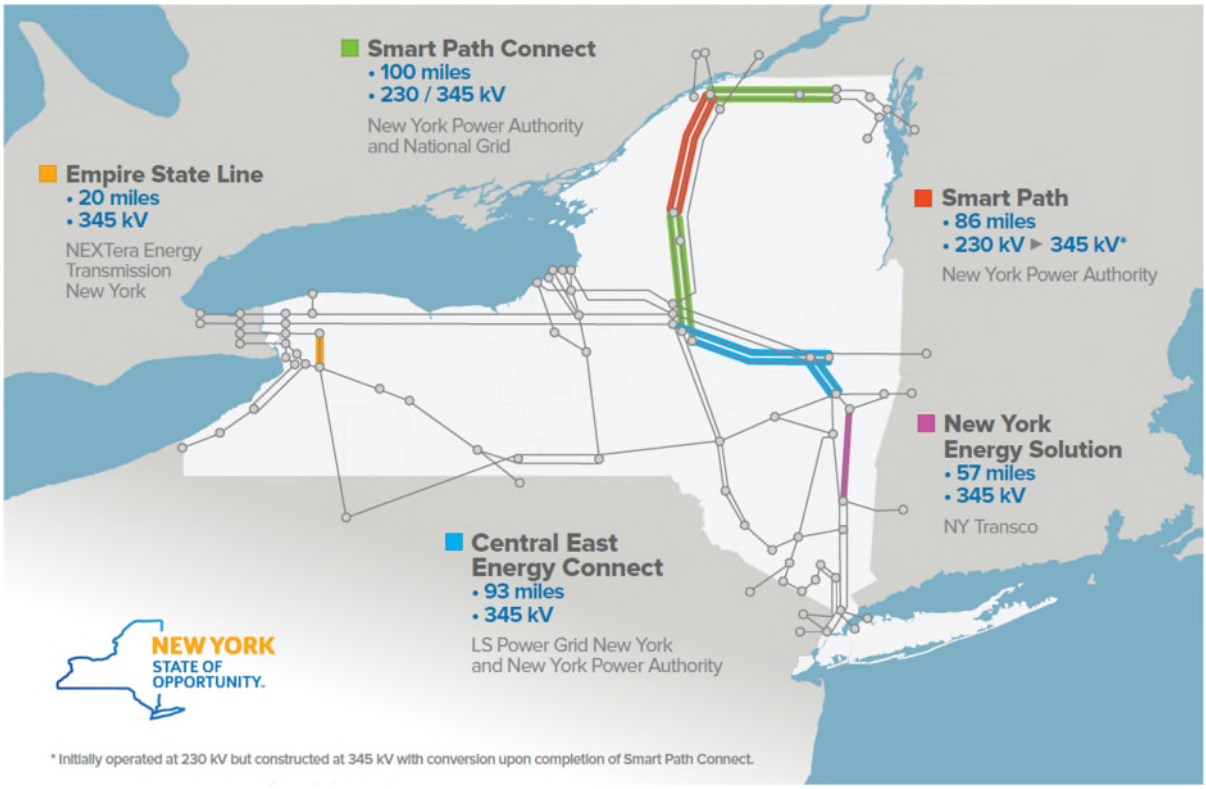
A. Certainly. Figure 1 below highlights in red the components of the Project.

Figure 1 – Components of Smart Path Connect Project



As shown in Figure 2 below, together with other projects under construction, the Project will create a continuous 345 kV path from the northern border of the State to the downstate region.

Figure 2 –Major Transmission Projects Under Construction in New York State



Q. What are the total estimated capital cost of the Project and its estimated timeline for construction?

A. The total capital cost to place the Project in service is currently estimated at $1.2 billion, with approximately $535 million of that total amount relating to NMPC's portions of the Project ($495 million excluding financing costs). Construction is anticipated to begin in 2022, subject to approval pursuant to Article VII of the New York Public Service Law ("Article VII"), and the anticipated in-service date for the Project is December 2025.[21]

[21] Application for Certificate of Environmental Compatibility and Public Need, NYPSC Case 21-T-0340, Exhibit E-4: Engineering Justification at page E-4-11 ("Article VII Application Engineering Justification"); National Grid 2021/22 Half Year Results Statement at 18, available at National Grid Q2 6K 2021.

Q. How did NMPC come to be a participant in the Smart Path Connect Project?

A. As I have explained, once a project has been designated as a PTP by the NYPSC and the NYPA Trustees have concurred, AREGCBA requires NYPA to undertake a public solicitation process to assess whether joint development would provide for significant additional benefits in achieving the CLCPA Requirements. In accordance with that AREGCBA requirement, NMPC was selected as a participant in the Project pursuant to a NYPA public solicitation process.

Q. Please describe the public solicitation process that NYPA undertook for the Project.

A. NYPA's public solicitation process for the Project began with its issuance of a press release on October 30, 2020 to announce that it was issuing a written Solicitation of Interest to "invite[] expressions of interest by interested parties who wish to be considered as co-participants in the development of" the Project ("Solicitation Press Release").[22] The Solicitation Press Release stated that:

> [e]ntities who believe they can bring tangible benefits to the Project and facilitate its expeditious development and completion are encouraged to respond, including without limitation:
>
> - Entities who possess ownership or control of real property and/or transmission facilities that can be used to advance the Project.
>
> - Entities who have a demonstrable track record relating to development, maintenance and operation of major transmission projects.

[22] "NYPA Invites Interested Parties to Propose Co-Participant Roles for the Development of the Northern New York Priority Transmission Project," NYPA Press Release (Oct. 30, 2020), available at https://www.nypa.gov/news/press-releases/2020/20201030-nny.

- Entities who have access to innovative technologies that can support the Project.[23]

Q. Did NMPC submit a written response to the Solicitation of Interest?

A. Yes. On December 21, 2020, NMPC timely submitted a written response that included all the information required by the Solicitation of Interest.

Q. What happened after NMPC submitted its written response?

A. NYPA conducted its public solicitation process for a five-month period following issuance of the Solicitation Press Release and the Solicitation of Interest. On March 30, 2021, after the process was completed, NYPA issued a press release to announce that the NYPA Trustees had given authorization to "accept, develop and operate" the Project and had approved NMPC as a co-participant with NYPA in the development of the Project ("Approval Press Release").[24]

Q. Why did NYPA select NMPC as a co-participant in the development of the Project?

A. The reasons why NYPA selected NMPC were explained in the Approval Press Release:

> In selecting National Grid [*i.e.*, NMPC] as a co-participant on the project, NYPA cited among other things, National Grid's extensive experience planning, developing, constructing, managing and operating transmission projects similar in type and scale to the NNYPTP [*i.e.*, the Project] as well as ownership and familiarity of property and transmission facilities that can be used to support the expeditious development of the project. National Grid also has a longstanding relationship with communities in the North Country, working with them to meet their needs. Project costs will

[23] *Id.*

[24] "NYPA Board of Trustees Approves Northern New York Priority Transmission Project Plan," NYPA Press Release (Mar. 30, 2021), available at https://www.nypa.gov/news/press-releases/2021/20210330-nny.

> be estimated as the project's design and scope are finalized and will be shared between NYPA and National Grid. The selection of National Grid as a co-developer for the NNYPTP is subject to the Authority [*i.e.*, NYPA] and National Grid reaching agreement on proposed terms and conditions for development of the project.[25]

On May 25, 2021, NYPA issued a press release to announce that the NYPA Trustees had approved a Joint Development Agreement between NYPA and NMPC to set forth terms and conditions for developing the Project.[26]

Q. Please describe the relationship between NYPA and NMPC with regard to the development of this Project.

A. In May of 2021, NYPA and NMPC executed a Joint Development Agreement that provides the terms for development of the Project as between the two entities. The Joint Development Agreement stipulates that NYPA is the lead developer and, as such, bears the responsibility for the overall delivery of the Project. All governmental approval applications will be developed jointly and require the approval of both parties prior to submittal. Finally, NYPA is responsible for the operations and maintenance of all NYPA-owned Project facilities, while NMPC is responsible for operations and maintenance for the Project facilities it owns.

[25] *Id.*

[26] "NYPA Board of Trustees Approve Joint Development Agreement with National Grid, Co-Participant in 110-Mile Transmission Line Rebuild Project in New York's North Country and Mohawk Valley," NYPA Press Release (May 25, 2021), available at https://www.nypa.gov/news/press-releases/2021/20210525-jointtransmission.

Q. Have NYPA and NMPC submitted an application to the NYPSC for siting approval of the Project?

A. Yes. Under Article VII, the Project qualifies as a "major utility transmission facility,"[27] and as a result requires a Certificate of Environmental Compatibility and Public Need ("Certificate") and an approved Environmental Management and Construction Plan from the NYPSC before Project construction may begin.[28] On June 15, 2021, NYPA and NMPC filed the Article VII Application for a Certificate in NYPSC Case 21-T-0340. Some of the discussion I provide in this testimony is also available in the Article VII Application, for which proceedings are ongoing before the NYPSC.

Q. What other state and federal regulatory approvals will the Project require?

A. In addition to obtaining a Certificate, the applicants must prepare an Environmental Management and Construction Plan ("EM&CP") consistent with the Certificate. The EM&CP must also be approved by the NYPSC. The EM&CP consists of a detailed narrative and design drawings of the Project's design and construction plan. It includes a description of the Project's environmental impacts and the applicant's proposed impact mitigations. The EM&CP must be approved before construction may begin.

Before beginning construction, an application for the Project will also need to be made to the U.S. Army Corps of Engineers ("USACE") for permits for wetlands and

[27] "Major electric transmission facilities are lines with a design capacity of 100 kV^2 or more extending for at least 10 miles, or 125 kV and over, extending a distance of one mile or more." *See, e.g.*, The Certification Review Process For Major Electric and Fuel Gas Transmission Facilities: A Guide from the New York State Public Service Commission at 3 (Nov. 2017), available at http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/a021e67e05b99ead85257687006f393b/$FILE/19336071.pdf/Article%20VII%20Guide%20Web%2011-17%20Final.pdf.

[28] *See id.*

waterbody crossings as well as several other stand-alone permits. These requirements are discussed in more detail in Mr. Byrne's testimony, Exhibit No. NMPC-200.

Q. Who will have operational control of the Project after it is commissioned?

A. Once the Project is commissioned, operational control will be turned over to the NYISO.

Q. How does the Project fit into the NYISO planning process?

A. Projects selected via the Priority Project designation pathway do not directly participate in the NYISO public policy transmission planning process. However, as the NYISO pointed out in comments filed in the NYPSC PTP proceeding, and as reflected in the NYPSC's PTP designation criteria, the process for designating priority transmission projects can operate "in tandem" with the NYISO public policy transmission planning process.

The NYISO was an active party in the NYPSC PTP proceeding, and the NYPSC specifically took into account the status of the NYISO's 2020 public policy planning cycle, the number of interconnection applications being studied by the NYISO, and whether the NYISO's current and planned transmission projects have enough capacity to deliver the NYISO's planned generation. Additionally, my understanding is that the Project will be added to the NYISO's "baseline" for planning purposes once the NYISO completes its facilities study, which NMPC anticipates will occur in May or June of this year. The Project's system impact study was completed in July 2021, and was approved by the NYISO Operating Committee on October 14, 2021, which signifies that the

NYISO has determined that the Project meets the NYISO minimum interconnection standard.

V. THE NEEDS THAT THE SMART PATH CONNECT PROJECT WILL ADDRESS AND THE BENEFITS IT WILL PROVIDE

Q. Why is the Smart Path Connect Project needed?

A. The Project is a key element in the infrastructure upgrades necessary to "unlock" renewable generation that currently exists, as well as renewable generation under development, in northern New York, in order to allow that generation to be transported to load centers, which are predominantly located in the downstate area of New York.

In northern New York, the bulk transmission system is constrained into east-west and north-south orientations due to the physical boundaries of Adirondack State Park and historical limitations on construction of transmission projects within its boundaries. Both the east-west and north-south elements of the bulk transmission system in the northern New York region currently consist of 230 kV infrastructure, with the exception of a NYPA 765 kV transmission line that runs from Chateauguay to Massena to Utica paralleling the north-south 230 kV circuits.

As currently configured, this transmission system does not provide sufficient transfer capability to deliver all of the available renewable generation in northern New York to load. Existing renewable generation in the upstate region is currently vulnerable to periodic, and increasing, curtailment. NYISO data shows that wind curtailments alone are significant in nature, averaging approximately 66 gigawatt-hours ("GWh") annually

over the period 2018-2020.[29] On the basis of these constraints of existing renewable generation, the NYISO recently explained that additional transmission is needed in northern New York: "*[a]dditional transmission capability is necessary to alleviate constraints and maximize the potential contribution of these [existing] renewable resources to meet electric demand and achieve public policy goals*."[30]

Q. Has the NYISO previously explained that northern New York needs additional transmission capacity?

A. Yes. The NYISO has called for the construction of additional transmission in northern New York for several years. In 2019 – even before the enactment of CLCPA and its ambitious climate requirements – the NYISO noted that "additional transmission capability is needed [in upstate and northern New York] to deliver energy from renewable resources to New York consumers in order to achieve New York's environmental and energy policies."[31] In the same comments, the NYISO highlighted that "bottling of renewable resources is already occurring on the Moses South transfer path and will only be exacerbated by future growth of renewables in the northern New York region."[32]

[29] NYISO Power Trends 2021 at 16 (Figure 9), available at https://www.nyiso.com/documents/20142/2223020/2021-Power-Trends-Report.pdf/471a65f8-4f3a-59f9-4f8c-3d9f2754d7de ("Power Trends 2021 Report").

[30] *Id.* at 16 (emphasis in original).

[31] NYISO Comments, NYPSC Case No. 18-E-0623, at 6 (Jan. 22, 2019), available at https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=18-E-0623&submit=Search ("NYISO Jan. 22, 2019 Comments").

[32] *Id.* at 6-7.

Q. What impact do the CLCPA Requirements have on the need for the Smart Path Connect Project?

A. The need for additional transmission such as provided by the Project is even clearer when considering the significant amount of additional renewable generation that will be needed in northern New York to meet the CLCPA Requirements. The NYISO has studied renewable generation pockets within which curtailments would occur if renewable generation sufficient to meet the 70 x 30 Target is added to the grid, and those generation pockets include key transmission lines that would be upgraded as a part of the Project.[33] As a part of that study, the NYISO found that between 975 and 1,050 MW of increased transmission capability would be needed on the northern New York 230 kV and 115 kV systems to unbottle potentially curtailed renewable generation.[34]

The amount of renewable generation projected to come online in northern New York is significant. The NYPSC projects that to meet the 70 x 30 Target, approximately 6,500 MW of renewable generation capacity in NYISO Zones D and E, which are located primarily in northern New York, will come online.[35]

Q. What types of benefits will the Smart Path Connect Project provide?

A. The Smart Path Connect Project will provide a number of economic and environmental benefits, as well as benefits for the reliability of the bulk power system in northern New York. Also, by unbottling renewable generation in northern New York, the Project will

[33] *See* Power Trends 2021 Report at 39-40 (Figure 16: Renewable Generation Pockets).

[34] NYISO Jan. 22, 2019 Comments at 10.

[35] Initial Power Grid Study Report at 15-16 (Figure 2).

increase the diversity of fuel supply as well as help promote job growth and economic opportunities in an area of the state that has seen significant economic hardships over the past decades.

Q. How will the Smart Path Connect Project provide economic and environmental benefits?

A. As discussed above, congestion in northern New York has been well-documented, and the NYISO and numerous other parties have noted the importance of expanding transmission facilities to enable the delivery of renewable resources from the constrained upstate and northern New York regions to customers statewide.[36] Placing the Project into service will address this congestion and provide a series of related economic and environmental benefits.

Q. Please describe how the Smart Path Connect will facilitate the delivery of renewable resources from constrained areas.

A. The Smart Path Connect Project will facilitate the deliverability of both existing renewable generators as well as those that are expected to come online in the near future by avoiding potential congestion that could impede their delivery. In addition to the significant curtailments already imposed on existing renewable generation in northern New York, the NYISO interconnection queue[37] contains more than 2,460 MW of planned

[36] *See, e.g.*, NYISO Jan. 22, 2019 Comments at 6; Priority Project Order at 6-13 (summarizing a number of parties' comments in addition to those of the NYISO).

[37] *See* NYISO, Interconnection Process (select Prior Interconnection Queues, NYISO Interconnection Queue 5/31/2020 (published June 10, 2020)), available at https://www.nyiso.com/interconnections.

renewable generation in the northern New York region that will not be deliverable on a firm basis without significant expansion of the transmission network in northern New York. To meet the CLCPA Requirements, these proposed renewable generation projects will need to be brought online without delay, and a significant portion of their output will need to be delivered to load centers.

By expanding key portions of the 230kV system in northern New York in those corridors that the NYISO has identified as existing generation pockets, Smart Path Connect Project will provide a critical link between the transmission system in northern New York and the existing "backbone" transmission network in New York. The Project will interconnect directly to the existing transmission backbone system of the New York Control Area ("NYCA").[38] The Project will complement and expand upon NYPA's rebuild of the MA 1&2 circuits (*i.e.*, the Smart Path project), which is located in between the northern and southern components of the Project, and the Central East Energy Connect and New York Energy Solutions Transmission Projects, which will introduce transmission improvements at the southern end of the Project.[39] Collectively, these projects and the Smart Path Connect Project will establish a continuous 345 kV path that greatly expands the energy and capacity deliverability of renewable generation from northern and western New York to load centers.[40] The Project will also enable an increase in power transfer limits across the Moses-South NYCA interface.[41]

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[38] Article VII Application at 17.

[39] *Id.*; Article VII Application Engineering Justification at page E-4-3. Central East Energy Connect was previously known as Segment A of the AC Transmission Project and New York Energy Solutions was previously known as Segment B of the AC Transmission Project.

[40] Article VII Application at 17.

[41] *See* Article VII Application Engineering Justification at page E-4-11.

Transmission planning studies performed by NYPA have found that the Smart Path Connect Project will accommodate an additional 1,000 MW of firm transfer capability for renewable energy generation in the northern New York region. This compares with the between 975 and 1,050 MW of increased transmission capability that the NYISO has estimated would be necessary on the northern New York system in order to eliminate potential curtailments of the renewable generation that will be built in this region in order to meet New York's CLCPA Requirements. Indeed, analysis performed by NYPA, which I discuss below, shows that the Smart Path Connect Project would eliminate curtailments from existing generators in upstate New York, resulting in 7.5 TWh of avoided renewable generation curtailments annually.

Q. Has there been any attempt to quantify the economic and environmental benefits that will be provided by the Smart Path Connect Project?

A. Yes. NYPA, as part of its PTP petition to the NYPSC, produced a detailed simulation of the impact of the Project, in a manner similar to the NYISO's public policy planning process benefit analyses. NYPA's modeling assumptions included existing generation capacities from the NYISO's 2020 "Gold Book," the NYISO 2019 Congestion Assessment and Resource Integration Study, awarded generation from the New York State Energy Research and Development Authority's large scale renewables and off-shore wind solicitations, NYISO interconnection queue data for new renewable generation, the build-out of new transmission projects, as well as assumptions concerning fuel and emissions forecasts and peak usage data, all modeled consistently with the

NYISO's methodology. This simulation study is included with my testimony as Exhibit No. NMPC-101 ("NYPA Simulation Study").

In addition to the NYPA Simulation Study, NYPA and its consultants performed additional analyses of savings provided by the Project relating to energy costs paid by load as well as capacity market benefits, using the same data sets utilized in the NYPA Simulation Study. These analyses are included with my testimony as Exhibit Nos. NMPC-102 and NMPC-103, respectively. NYPA also analyzed savings relating to the reduction in future cost of refurbishing or replacing aging infrastructure in northern New York, where certain elements of the transmission system are approaching end of life.

Q. What do these analyses show in terms of financial and environmental benefits?

A. These analyses show that Smart Path Connect Project is expected to provide substantial cost savings to the citizens of New York totaling approximately $4.6 billion on a 20-year net present value ("NPV") basis, resulting in a benefit-to-cost ratio for the Project of 3.9.

Figure 3
Project Cost and Benefits ($ millions)

Project Cost	$1,176
Project Benefits (20 year NPV)	
1. Lower customer energy payments	2,853
2. Value of lower CO_2 and NO_X emissions	981
3. Lower customer capacity costs	500
4. Avoid aging infrastructure replacement	270
5. Total Project Benefits	$4,604
Benefit to Cost Ratio (Project Cost/Line 5)	3.9

As reflected in Figure 3, the primary Project benefits include:

- Delivered energy cost savings (costs paid by load) of $214 million per year ($2,853 million 20-year NPV;[42]
- Emission reductions of 1.16 million tons of carbon dioxide ("CO2") and 160 tons of nitrogen oxides ("NOx") annually (value of $981 million 20-year NPV);[43]
- Capacity market benefits of $25 million – $50 million annually (utilizing the midpoint ($37.5 million) results in a 20-year NPV of $500 million);[44] and
- Avoiding the replacement of aging infrastructure, reducing the future costs of refurbishing or replacing aging transmission infrastructure (value of $270 million 20-year NPV).

In addition to the benefits calculated and included as part of the benefit-to-cost ratio discussed above, there are additional ways to quantify certain discrete benefits that are not included in the Project benefit-to-cost ratio in Table A to avoid the risk of double counting. These benefit measurements, typically used by the NYISO in its public policy transmission planning process analyses, include:

- Congestion cost savings are projected to be $450 million annually and result from increased power transfer limits across the Moses-South NYCA interface, resulting from the elimination of approximately 7.5 TWh of renewable curtailments per year;[45] and

[42] *See* Exhibit No. NMPC-102.

[43] Exhibit No. NMPC-101 at 1, 6 ("Project Production Cost Results" table).

[44] *See* Exhibit No. NMPC-103 (containing an analysis of the estimated capacity cost savings derived from the same data set utilized in the NYPA Simulation Study). The annual benefit is the source for the 20-year NPV.

[45] *See* Exhibit No. NMPC-101 at 1, 6.

- Production cost savings of up to $99 million per year.[46]

Q. Did any of this analysis factor into the NYPSC's decision to approve the Smart Path Connect Project as a PTP?

A. Yes, the NYPA Simulation Study was provided to the NYPSC as part of the petition that led to the Priority Project Order. In the Priority Project Order, the NYPSC specifically noted the analyses provided by NYPA showing these anticipated cost savings and emissions reductions, and indicated that the engineering and economic analyses provided by NYPA were sufficient in evaluating that Project.

Q. How will the Project enhance the reliability and resiliency of the bulk power system in northern New York?

A. The Project will create a more resilient, and thus more reliable, transmission system in northern New York. First, the Project will reduce the thermal overloads that are contributing to the curtailments of existing resources in the region. As a result, future curtailments of existing and planned generation resources will decline and deliverability of generation resources in northern New York to other parts of the State will improve. Although improvements in the deliverability of generation are typically considered a resource adequacy issue, such improvements inevitably improve the reliability of the bulk power system by increasing the number of generation resources capable of serving load during abnormal system operating conditions.

[46] *Id.*

Also, the Project involves replacement of 63-year-old wooden H-frame structures with steel monopole structures. The steel structures will be more durable than the aged wooden structures and better equipped to handle the vertical, longitudinal, and transverse loads expected under the icy and windy winters common in northern New York. Additionally, the Project includes the installation of Optical Ground Wires, which shield the high-voltage conductor from lightning strikes.

Q. Does this conclude your testimony?

A. Yes, it does.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Niagara Mohawk Power Corporation d/b/a National Grid	**)** **)**	**Docket No. ER22-___-000**

DECLARATION OF BRIAN GEMMELL

I depose and state under penalty of perjury that the foregoing testimony was prepared or assembled by me or under my direction, and that I have read the questions and answers labeled as my testimony: that if asked the same questions my answers in response would be as shown; and that the facts contained in my answers are true to the best of my knowledge, information, and belief.

Executed on March 2, 2022

*/s/ Brian Gemmell*_____
Brian Gemmell

EXHIBIT NO. NMPC-101

Exhibit No. NMPC-101

Northern New York Priority Transmission Project Evaluation of Project Viability

Resource Planning Group

Energy Resource Management

New York Power Authority

June 29, 2020

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EXECUTIVE SUMMARY

The Resource Planning Group from Energy Resource Management (ERM) at the New York Power Authority (NYPA) modeled the impacts of the proposed Northern New York (NNY) Project (Project) on the New York state electric power system.

The Project consists of rebuilding NYPA's Moses-Willis-Plattsburgh 230 kV corridor and National Grid's Adirondack to Porter 230 kV corridor to 345 kV to unbottle existing renewable generation and increase transfer capability by an additional 1,000 MW in firm, round-the-clock renewable capacity for future growth in support of the Climate Leadership and Community Protection Act (CLCPA) targets.

NYPA's Resource Planning Group calculated the Project's production cost savings expected in year 2025 by using the General Electric Multi Area Production Simulation (GE-MAPS) software. The savings are calculated as the difference between the pre-Project (i.e. without the Project) and post-Project (i.e., with the Project) results over the duration of the study period. NYPA conducted a single year study in 2025. The assumptions for the 2025 system are defined in the modelling assumptions on page 3 of this report, which consist of the system with existing renewables, incremental renewables in Zones D and E as filed in the NYISO interconnection queue, previous New York State Energy Research and Development Authority (NYSERDA) Large Scale Renewable Solicitation awards (I, II, and III), NYSERDA offshore wind awards (1,618 MW) split between Zones J and K, and an additional 1,000 MW renewable injection (modelled according to historical Hydro-Québec (HQ) schedules at 70% capacity factor) in the NNY region. NYPA's findings suggest that the system with renewable injections as defined above is severely constrained and results in curtailment and dispatch problems for the generation. There is significant congestion while renewable generators compete against each other for the limited transmission capacity existing today on the Moses-South interface and the Moses-Willis-Plattsburgh corridor.

The Project offers many benefits in terms of production cost savings, emission reductions, allowing renewables to be sited without curtailment, and decreasing congestion in the NNY area. Under the modelled scenario, with the addition of the Project, the transmission system would be robust enough to accommodate all known existing and proposed renewable generation projects plus an additional 1,000 MW in firm renewable capacity. NYPA's analysis yields a single year production cost savings of $99 million in 2025. Assuming the savings remain consistent, the 20-year present value of the Project is estimated to be $1.05 billion. With a preliminary Project cost estimate of $905 million and adding the appropriate capital recovery factor, the Benefit-to-Cost (B/C) ratio is calculated to be 1. However, this B/C ratio takes into consideration only production cost savings. It would be much higher if the other Project benefits described below were reflected.

In addition to the production cost savings, the Project eliminates significant renewable curtailment in the NNY regions (~7.5 TWh) and makes renewable energy deliverable to areas where fossil generation can be displaced while eliminating significant amounts of congestion (~$450 million) in NNY. There are also significant emission benefits as a result of fossil generation being displaced statewide. NYPA's analysis suggests, on annual basis, CO_2 reduction of 1.16 million tons statewide and 160 tons of NO_x reduction in the downstate region. NO_x has long been recognized as playing a key role in the number of chronic lung disorders resulting in asthma and other lung diseases.

STUDY APPROACH

The Resource Planning Group studied the impact of the Project consisting of system upgrades in the NNY region by performing detailed simulations of the New York future energy system with the following Year 2025 assumptions:

- Approximately 3,000 MW of incremental renewables in the NYISO interconnection queue in NNY region
- NYSERDA Large Scale Renewable Solicitations I, II, & III
- Two awarded NYSERDA offshore wind projects
- An additional 1,000 MW renewable injection utilizing the historical HQ schedules at 70% capacity factor at the Moses Substation
- Local transmission line ratings utilizing the summer rate A and rate B values provided by the NYPA Transmission Planning Group.

The analysis was performed using GE-MAPS production cost market modeling software, which incorporates extensive details regarding generating unit operating characteristics, transmission grid topology and constraints, and market system operations to support economic transmission planning.

The Resource Planning Group's study approach included the following steps:

1. Assumptions development: Expected electric power system parameters for the 2025 study year were established based on appropriate public sources, including the 2020 Load & Capacity Data "Gold Book" (Gold Book) published by the New York Independent System Operator (NYISO) and the 2019 Congestion Assessment and Resource Integration Study (CARIS) also published by NYISO.
2. Two Case simulations: Base case without the Project (i.e., without Transmission solutions) and Solution case with the Project (i.e., with Transmission solutions) for the 2025 study year, each using the assumptions identified herein.
3. Impact Analysis: Compared the results from the base case and solution case under each scenario to determine the economic benefits that the Project (Transmission solutions) will bring.

The GE-MAPS simulation results provided key metrics that were used to assess the impact of the Project. These metrics included:

1. New York Control Area (NYCA) wide production cost savings and the calculations of the 20-year present value
2. Benefit to Cost ratio
3. NYCA wide carbon emission reduction
4. Downstate NO_x emission reduction
5. Renewable curtailment
6. Congestion cost in NNY region

MODELING ASSUMPTIONS

The Resource Planning Group derived modeling assumptions from public sources, including the 2020 Gold Book and CARIS 2019 assumption documents. A summary of the key modeling assumptions is provided below.

New York Electric System Modeling Assumptions

Generation

1. Existing generation capacities based upon 2020 Gold Book

2. New / future generation based on CARIS 2019 and NYSERDA I, II and III solicitation awards, NYSERDA Offshore wind awards in Zones J & K, and renewable generation projects proposed in the NYISO Interconnection Queue for Zones D & E.

    a. NYSERDA Solicitations (*see Appendix: Table 1*) - proposed in-service dates and capacity:

        i. Solicitation I: 2019 to 2021; 734 MW Wind and 605 MW Solar

        ii. Solicitation II: 2019 to 2021; 668 MW Wind and 1,025 MW Solar

        iii. Solicitation III: 2020 to 2024; 165 MW Wind and 1,050 MW Solar

    b. Offshore Wind Awards: 816 MW in Zone J and 880 MW in Zone K

        i. Zone J interconnected at 345 kV

        ii. Zone K interconnected at 138 kV

    c. NYISO Interconnection Queue Projects (*see Appendix: Table 2*)

        i. Additional 2,373 MW of Renewables in Zone D & E

1. Roaring Brook Wind (80 MW) is included in NYSERDA Solicitation II

        ii. Additional 594 MW of Renewables in Watertown area (located in Zone E)

3. Interconnection of new/future units based on NYSERDA and/or NYISO Interconnection Queue data (*see Appendix: Table 3*)

4. All upstate nuclear units are online for the study period.

5. Indian Point nuclear plant 2 retired April 30th, 2020.

6. Indian Point nuclear plant 3 retired April 30th, 2021.

7. Units affected by DEC No_x rule retired in the downstate region; compensatory MW (simple cycle) added in areas where duration reliability is a concern (assumption developed by NYISO).

8. External generation in PJM, ISO-NE and IESO (Ontario) is based upon continued economic generation/transmission modeling work in those regions using public ISO sources and S&P Market Intelligence platform

9. NYISO Import/Exports based on economic transactions clearing the hurdle rates across the NYISO interfaces.

10. 1,000 MW injection at Moses is modeled using historical HQ import schedules at 70% capacity factor.

Transmission

1. Nextera's Empire State Line in Western New York in-service by 2025.

2. AC Transmission Project Segment A and B both in service by 2025.

Fuel & Emissions

1. Fuel forecasts based on Platt's (curve date May 15th, 2020). Natural gas forecasts are monthly except for winter months (Dec-Mar), for which weekly volatility is based on 5 year historical values. Actual delivery to the generator is based on the CARIS methodology of blending fuel hubs and a small burner tip cost is added for delivery of the fuel to the plant.

2. Emissions price forecasts are based upon CARIS 2019 methodology.

3. RGGI price at $8.25/ton.

Other Assumptions

1. Peak load & Energy based on 2020 NYISO Gold Book (2019 Actual data); neighboring ISO data from respective ISO reports.

2. Generating unit capacities based on 2020 NYISO Gold Book (2019 Actual data) with updated winter and summer DMNC values. Neighboring ISO capacities gathered from S&P Global data.

3. Wind/Solar Resource modeling based on GE, NREL, and/or developer data (if available). Units and Resources modeled consistent with 2020 NYISO Gold Book (2019 Actual data).

Market Modeling

The power systems adjacent to NYISO are represented as operating systems committing and dispatching generation to meet demand. The amount of power imported to and exported from NYISO

and these adjacent systems is based on economic dispatch within their control area in 2025. The import and export amounts are not a fixed input assumption and are based on economic transmission clearing the hurdle rates.

RESULTS AND CONCLUSIONS

The study results shown in the table below indicate that the B/C ratio for the Project is 1. The proposed transmission solution offers many benefits in terms of production cost savings, emission reductions, avoided renewable curtailments, and decreasing congestion in the NNY area.

The Project Production Cost Results

Production Cost Results (Year 2025)	Case with Incremental Renewables in NYISO Queue + 1000 MW firm Renewable		
	Transmission		
	Base Case	Case	Delta
Production Costs Savings ($m) *	-	-	$ 99
20 yr Present Value ($m)	-	-	$ 1,050
Project Cost ($m)	-	$ 905	
B/C Ratio **	-	-	1.00
NYCA CO_2 Emissions (tons)	27,058,93	25,898,42	(1,160,514)
Downstate NOx Emissions (tons)	4,450	4,290	(160)
Renewables Curtailed (GWh)	8,339	932	(7,407)
Congestion Cost with NNY contingencies ($k)	$ 494,356	$ 47,283	(447,073)

* According to NYISO's methodology, the total production costs for NYCA consist of internal NYCA generation costs and the net cost of transactions with New York's neighbors. Internal generation costs are comprised of fuel, variable operation and maintenance, start-up and emission allowance costs for SOx, NOx, and CO_2.

** B/C Ratio = 20-yr Present Value of Production Cost Savings/(Overnight Project Cost x CRF). According to NYISO, the capital recovery factor (CRF) is calculated based on generic figures for a return on investment, federal and state income taxes, property taxes, insurance, fixed O&M, and depreciation (assuming a straight-line 30-year method). The calculation of the appropriate CRF, and, hence, the benefit/cost ratio, is based on the first ten years of the 30-year period, using a discount rate of 7.08%, and the 16% carrying charge rate. These assumptions yield a CRF of 1.16.

Appendix

Table 1: NYSERDA Solicitations I, II & III

Zone	Resource Type	NYSERDA Solicitation I Capacity (MW)	II Capacity (MW)	III Capacity (MW)
A	Land-Based Wind	340	-	
	Utility Scale Solar	-	300	290
	Offshore Wind	-	-	
B	Land-Based Wind	-	200	
	Utility Scale Solar	-	180	200
	Offshore Wind	-	-	
C	Land-Based Wind	272	290	165
	Utility Scale Solar	40	367	
	Offshore Wind	-	-	
D	Land-Based Wind	-	-	
	Utility Scale Solar	-	-	180
	Offshore Wind	-	-	
E	Land-Based Wind	122	178	
	Utility Scale Solar	20	60	200
	Offshore Wind	-	-	
F	Land-Based Wind	-		
	Utility Scale Solar	460	118	180
	Offshore Wind	-	-	
G	Land-Based Wind	-	-	
	Utility Scale Solar	85		
	Offshore Wind	-	-	
H	Land-Based Wind	-	-	
	Utility Scale Solar	-	-	
	Offshore Wind	-	-	
K	Land-Based Wind	-	-	
	Utility Scale Solar	-	-	
	Offshore Wind	-	-	
Total	Land-Based Wind	734	668	165
	Utility Scale Solar	605	1,025	1,050
	Offshore Wind	-	-	

Table 2: NYISO Interconnection Projects

NYISO Interconnection Units: Zone D & E		
Zone	**Resource Type**	**Capacity (MW)**
D	Land-Based Wind	1047
	Utility Scale Solar	600
E	Land-Based Wind	106
	Utility Scale Solar	620
Watertown area (E)	Land-Based Wind	100
	Utility Scale Solar	494

Table 3: Interconnection lines for new/future generation

NYSERDA I	Zone	Capacity (MW)	Bus Number	Interconnection Point	Voltage Level (kV)
Alle-Catt	NYZAA	340	130756	STOLE345	345
Columbia PV	NYZFA	60	130793	CRARY115	115
Darby PV	NYZFA	20	137895	MULTP-10	115
Flint Mine PV	NYZFA	100	125043	PL.VAL 1	115
Greene County PV	NYZFA	20	125116	N.CAT 6	69
Pattersonville PV	NYZFA	20	137532	RTRDM1	115
Janis Solar PV	NYZCA	20	131096	WILLET34	34.5
Sky High PV	NYZCA	20	136246	TILDEN	115
Java Solar A	NYZAA	2	131381	SPERRY34	34.5
Blue Stone PV	NYZGA	20	125126	SAUGERT	69
Daybreak PV	NYZGA	25	125126	SAUGERT	69
Little Pond PV	NYZGA	20	146804	SHOEM69	69
Magruder PV	NYZGA	20	125024	E.WALD 1	115
Double Lock PV	NYZFA	20	137905	ST JOHNS	115
East Point PV	NYZFA	50	137944	MARSH 69	69
Grissom PV	NYZFA	20	137944	MARSH 69	69
Rock District PV	NYZFA	20	137944	MARSH 69	69
Sunny Knoll PV	NYZFA	20	137944	MARSH 69	69
Tayandenega PV	NYZFA	20	137905	ST JOHNS	115
Branscomb PV	NYZCA	20	136539	OSWEGO S	34.5
Puckett Solar PV	NYZEA	20	131685	E.NORW46	34.5
Regan Solar PV	NYZEA	20	130796	E.NOR115	115
NYSERDA II	**Zone**	**Capacity (MW)**	**Bus Number**	**Interconnection Point**	**Voltage Level (kV)**
Hannacroix PV	NYZGA	5	137905	ST JOHNS	115
Stillwater PV	NYZFA	20	137893	MOHICAN	115
Clay Solar PV	NYZCA	20	136181	CLAY	115
Dog Corners PV	NYZCA	20	130919	STATES34	34.5
Excelsior Energy	NYZAA	280	149000	ROCH 345	345
Heritage Wind	NYZAA	200	135452	LOCKPORT	115
Horseshoe PV	NYZAA	180	135858	GOLAH115	115
Manchester Solar	NYZBA	20	136167	HOOKRD	115
Morris Ridge PV	NYZCA	152	130764	MEYER230	230
North Light PV	NYZCA	80	130776	BORDR115	115
Silver Lake PV	NYZBA	25	131381	SPERRY34	34.5
Mohawk PV	NYZFA	98	137905	ST JOHNS	115
Hills Solar PV	NYZEA	20	137886	INGHAM-E	115
Skyline Solar PV	NYZEA	20	137233	ONEIDA	115
Watkins Road PV	NYZEA	20	136786	MOSH-SUN	115
Roaring Brook	NYZEA	78	137928	CHASES L	230
High Bridge Wind	NYZEA	100	130796	E.NOR115	115
Bakerstand Solar I	NYZAA	20	135381	H.HILL	34.5

NYSERDA III	Zone	Capacity (MW)	Bus Number	Point	Interconnection Voltage Level (kV)
BldMountainPV	NYZFA	20	137905	ST JOHNS	115
WRiverPV	NYZFA	20	137481	JMC1+7TP	115
SEHilltopPV	NYZFA	20	137490	BLUECIRC	115
GarnetECPV	NYZCA	200	130751	CNDGUA_T	230
HighviewPV	NYZAA	20	135300	BETH-149	115
SEFlatHill PV	NYZEA	20	136778	LOWVILLE	115
SEGrassyKnollPV	NYZEA	20	136755	BLACK RV	115
LimestonePV	NYZFA	20	130793	CRARY115	115
SETabletopPV	NYZFA	80	137877	CLINTON	115
ELPTiconderogaPV	NYZFA	20	137865	BATKILL	115
NSideEC PV	NYZEA	180	136755	BLACK RV	115
SandyCreek PV	NYZEA	20	130796	E.NOR115	115
GreensCorners PV	NYZEA	120	137200	EDIC	345
SEFairway PV	NYZEA	20	136758	BREMEN	115
Prattsburg wind	NYZCA	145	130761	AVOCA230	230
SEValleyPV	NYZCA	20	130819	KATEL115	115
MartinRd PV	NYZAA	20	130766	ROBIN230	230
SRipley PV	NYZAA	270	135251	S RIPLEY	230
Off-Shore Wind	**Zone**	**Capacity (MW)**	**Bus Number**	**Point**	**Interconnection Voltage Level (kV)**
Off-Shore Wind Zn J	NYZJA	800	126304	W 49 ST	345
Off-Shore Wind Zn K	NYZKA	800	126434	GRENWOOD	138
Interconnection Units	**Zone**	**Capacity (MW)**	**Bus Number**	**Point**	**Interconnection Voltage Level (kV)**
PV ZONE D	NYZDA	100	130783	CHATG115	115
WIND ZONE D	NYZDA	598	136783	MOSES W	230
PV ZN E 1	NYZEA	620	137928	CHASES L	230
WIND ZN E 1	NYZEA	106	147881	BOONVLE	115
North Side Energy	NYZEA	180	147840	MOSES W	230
Bull Run Wind	NYZDA	449	147843	PLAT T#1	230
Bull Run Solar	NYZDA	169	147843	PLAT T#1	230
Franklin PV	NYZEA	150	136783	MALONE	115

Interconnection Units - Watertown	Capacity			Interconnection Voltage	
Watertown PV ZN E 2	NYZEA	494	136763	COFFEEN	115
Watertown WIND ZN	NYZEA	100	136755	BLACK RV	115

EXHIBIT NO. NMPC-102

Customer Payment Savings for Delivered Energy Calculated from
Data Set Used in NYPA Simulation Study for Priority Project (June 2020)

In the table below, NYPA performed the calculations in the "Delta ($)" column under "*Weighted total cost ($)*," with the assistance of General Electric Energy Consulting which measures the change in total delivered energy costs paid by load between pre- and post-SPC Project. The delta represents a statewide load payment reduction for energy in 2025 of approximately $214 million.

Total payments by load include the Locational Based Marginal Pricing (LBMP) payments (i.e., energy, congestion and losses) paid by electricity demand but not capacity costs.

Area Names	NYISO Area	Weighted total cost ($)		
		Pre Case	Solution Case	Delta ($)
NYZAA	Zone A	$ 315,970,784	$ 288,494,400	$ (27,476,384)
NYZBA	Zone B	$ 194,879,984	$ 166,233,504	$ (28,646,480)
NYZCA	Zone C	$ 358,200,768	$ 302,189,728	$ (56,011,040)
NYZDA	Zone D	$ 41,218,268	$ 94,415,248	$ 53,196,980
NYZEA	Zone E	$ 163,136,560	$ 151,221,760	$ (11,914,800)
NYZFA	Zone F	$ 386,110,912	$ 376,165,440	$ (9,945,472)
NYZGA	Zone G	$ 293,381,216	$ 275,345,824	$ (18,035,392)
NYZHA	Zone H	$ 93,794,576	$ 89,384,168	$ (4,410,408)
NYZIA	Zone I	$ 173,814,016	$ 165,065,584	$ (8,748,432)
NYZJA	Zone J	$ 1,542,980,608	$ 1,464,055,808	$ (78,924,800)
NYZKA	Zone K	$ 656,844,032	$ 634,096,832	$ (22,747,200)
Total		**$ 4,220,331,724**	**$ 4,006,668,296**	**$(213,663,428)**

EXHIBIT NO. NMPC-103

ICAP Savings Calculated from Data Set Used
in NYPA Simulation Study for SPC Project
June 2020

Additional generation resources added in the currently transmission-constrained northern region would not be eligible to provide capacity due to their inability to satisfy New York Independent System Operator, Inc.'s ("NYISO") capacity deliverability requirements. The increased transmission capability of the Smart Path Connect Project ("SPC Project") will enable incremental resources to qualify to supply capacity in the NYISO capacity market, and these additional megawatts ("MW") of capacity clearing against the NYISO Installed Capacity ("ICAP") Demand Curve will reduce the clearing prices applicable for all capacity procured in the New York Control Area ("NYCA"), thus reducing capacity costs incurred by consumers relative to the costs they would have incurred without the Project.

For ICAP savings, General Electric Energy Consulting ("GE Consulting") developed a simplified model calculating the savings as the results of the shift of the supply curve produced by the additional capacity available when unbottling renewables in northern New York via the SPC Project.

The methodology involved using the current administratively approved demand curves (see Table 1 below) and escalating the reference point and the slope of the demand curve in the future years by 2% per year. The study also assumed that the locational capacity requirement remains constant. Finally, GE Consulting calculated the ICAP savings by the change in price and volume cleared before the SPC Project and after. The volume cleared before the SPC Project reflects the curtailed MWs between the peak hours of 12:00 – 19:00 in the six summer months, and the volume cleared after the SPC Project reflects the reduction in curtailed MW during these same hours (additional capacity resources). For demand curve purposes, NYISO expresses the ICAP obligation as unforced capacity or UCAP, which accounts for the system-wide generator-forced outage rate.

Table 1: NYISO Demand Curve Characteristics

	UCAP Requirement (MW @ 100% Req.)	Demand Curve Zero Crossing %	UCAP at $0 (MW @ Col. B %)	Demand Curve Slope (in UCAP) ($/kW-Month) per **100 MW**
	Col. A	Col. B	Col. C = (Col. A) x (Col. B)	Col. D = $\frac{\text{-100 * Ref. Point}}{\text{Col. C - Col. A}}$
NYCA	35,603.5	112%	39,875.9	**-$0.2004**

The ICAP savings analysis below uses the change in the ICAP price for the NYCA from Table 1 above and applies that change to the Rest of State ("ROS") portion of the NYCA market (i.e., excluding NYISO downstate Zones G through K) where the significant capacity savings will be realized due to the SPC Project. The curtailment impact, in fact, is in the northern New York

region because of significant renewable buildout (additional 3,000 MW from the NYISO interconnection queue) and an additional 1,000 MW Hydro Quebec injection, and the SPC Project will relieve those curtailments.

GE Consulting calculated the ICAP savings as follows:

1) Calculated the demand curve slope using the NYISO published data for 2021. Every 100 MW of new capacity will result in $0.2004 savings for NYCA capacity payments (see demand curve data in Table 1 above). This is assuming the supply curve is a perfectly vertical slope (zero price elasticity).
2) By looking at the GWh of uncurtailed renewable energy in the six-month summer capability period between hours 12:00 – 19:00 (per NYISO rules) after the SPC Project, based on the "GE-MAPS" simulation study, there is an additional 278 MW of capacity for summer capability in the ROS market.
3) Shifted the demand curve by 278 MW ~ $0.2004*278/100 ~ $0.56 /kW-month decrease in capacity price.
4) Calculated the price of capacity in 2025 by inflating the 2021 summer price of capacity by 2% per year (~ $4.43/kW-six months).
5) Calculated the greater volume that would clear in the capacity market with the SPC Project (278 MW) and the capacity price ($4.43/kW-month - $0.56/kW-month = $3.87/kW-month).
6) By multiplying the price and quantity for ROS for before the SPC Project and after, GE Consulting determined the savings ~ $50 million – see Table 2 below. These calculations consider only changes in the ROS market, where the more-significant changes will occur.
7) As the slope of the supply curve may not be infinite (zero elasticity assumptions) and there may be capacity market changes in the future, GE Consulting derated the total savings by 50% ($50 million * 50% ~ $25 million).
8) **Total annual savings estimated at ~ $25 - $50 M.**

See Table 2 for a summary of these calculations.

Table 2: ICAP Cost Impacts Pre- and Post-SPC Project

Estimated NYCA ICAP Price in 2025 Before SPC Project	$	4.43	per MW
Estimated NYCA ICAP Price in 2025 After SPC Project	$	3.87	per MW
UCAP Quantity in 2025		16,695	MW
UCAP Quantity Plus Additional Renewable Enabled by SPC Project in 2025		16,973	MW
Total ICAP Costs Before SPC Project (Summer)	$	444	million
Total ICAP Costs (Summer) After SPC Project	$	394	
Savings (assuming inelastic slope)	$	50	
Savings @ 50%	$	25	
Estimated ICAP Cost Savings	$25 - $50 million		