Attachment D

Exhibit Nos. NYP-100 – NYP-104
Prepared Direct Testimony and accompanying Exhibits of the
NYPA Transmission Development Panel

Exhibit No. NYP-100

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Power Authority **Docket No. ER22-___-000**

PREPARED DIRECT TESTIMONY OF THE NYPA TRANSMISSION DEVELOPMENT PANEL ON BEHALF OF THE NEW YORK POWER AUTHORITY

February 10, 2022

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I. INTRODUCTION

Q. Would the members of the NYPA Transmission Development Panel ("NYPA Panel") please state their names and business addresses?

A. Our names are Girish Behal, Frank D'Eufemia, and Ana Stachowiak. Our business address is 123 Main Street, White Plains, NY 10601.

Q. By whom are you employed?

A. We are all employed by the New York Power Authority ("NYPA").

Q. Please explain your job responsibilities, work experience, and educational backgrounds.

A. (Behal):

I am the Vice President of Projects and Business Development for NYPA, where I am responsible for the development of new transmission, generation (including renewable generation) and energy storage projects, including project permitting and licensing. Prior to joining NYPA, from June 2011 to February 2020, I was Director of Strategic Initiatives and Development for SNC-Lavalin, where I was responsible for leading and managing project and customer development in onshore and offshore renewables and for portfolio management of key projects in interregional transmission planning and strategic due

diligence. I provided project-specific oversight to the engineering teams that performed interconnection and congestion analyses, plus studies and engineering to support projects in the power sector. Prior to my tenure at SNC-Lavalin, I served as a project lead/project manager and associate engineer for transmission and distribution construction projects for Northeast Utilities, as a project engineer for Curtis Partition Private Ltd., and as a project engineer for Larsen and Toubro Ltd. I have more than 19 years of experience in the energy industry with 17 years in the arena of onshore and offshore renewables, energy storage and transmission, and distribution projects for voltage levels from 11 kV to 345 kilovolts ("kV") Alternating Current ("AC") and up to 500 kV Direct Current ("DC"), involving substation, overhead and underground transmission lines.

I received a Bachelor of Civil Engineering degree from Maharaja Sayajirao University, Baroda, Gujarat, India. I also received a Graduate Certificate in Power Systems and a Master of Science degree in Electrical and Computer Engineering (Power Systems) from Worchester Polytechnic Institute. In 2017, I received a Master of Business Administration from the Simon Business School, University of Rochester. Additionally, I received my certification as a Project Management Professional in 2007.

(D'Eufemia):

Since August 2019, I have served as the Director, and now Senior Director (2021), of Business Development for NYPA. My duties include oversight of a team focused on origination and development of bulk electric transmission, generation, including offshore wind projects. For the Smart Path Connect Project ("SPC Project" or "Project"), I participated in drafting the Petition Requesting Adoption of Criteria for Guiding Evaluation of Whether a Bulk Transmission Investment Should be Designated as a Priority

Transmission Project, and for Designation of Certain Transmission Investments in Northern New York as a Priority Transmission Project, dated July 2, 2020 and submitted by NYPA and New York State Department of Public Service ("NYDPS") to the New York Public Service Commission ("NYPSC") ("Priority Project Petition"). I was personally involved in the development of the SPC Project through transmission planning, detailed design, drafting and submittal of the NYPSC Article VII filing. Prior to this position, I worked as the Director – Civil/Structural Engineering and Dam Safety, which includes the structural transmission and substation team, while also participating with NYPA in various roles (Secretary, Vice Chairman, Chairman and Previous Chairman) of NYPA's internal Transmission Maintenance Committee. My responsibilities within previous roles included leading initiatives primarily supporting substation and transmission line projects. Prior to joining NYPA in 2015, I worked at an investor-owned utility in New York State (since 2006), specializing in substation and transmission project design and construction.

I hold a Bachelor of Science in Civil Engineering (2005) from Polytechnic University (now known as the NYU Tandon School of Engineering) and a Master of Science in Civil Engineering (2018) from Manhattan College. I am registered as a Professional Engineer in the State of New York.

(Stachowiak):

I am the Senior Program Director for Projects Development for NYPA, where I am responsible for providing project management analyses during project initiation phase, including constructability reviews, outage constraints, scheduling and cost estimating. I have worked in this position since March 2021. Prior to this, I worked as a Project Manager/Senior Program Director in NYPA's project management organization since June

2017, where I managed large strategic project initiatives including project funding/budgeting, scheduling, outage planning and procurement efforts. Prior to joining NYPA, I served as a staff engineer for Public Service Electric & Gas Corporation (New Jersey) where I worked on large strategic transmission projects including analyzing the need for upgrades in existing transmission corridors and related system-wide impacts.

I received my Bachelor of Science in Bioengineering (2006) from Syracuse University. I am registered as a professional engineer in the State of New York. I am the assistant secretary/treasurer on the New York State Society of Professional Engineers, Westchester Putnam chapter and have served on its board since 2017.

Q. What is the scope of the NYPA Panel's testimony in this proceeding?

A. In support of NYPA's accompanying petition for incentive transmission rate treatment for the SPC Project, the rebuild, upgrade, and expansion of over 100 miles of high-voltage transmission lines in northern New York, we summarize the relevant New York legislation and the process pursuant to which the NYPSC designated the SPC Project as a "priority transmission project" or "Priority Project." The Project was initially known as the "Northern New York Project" before being renamed "Smart Path Connect" by NYPA. The NYPSC gave the Project its Priority Project designation because it found the Project must be implemented on an expedited basis to enable clean energy produced in the northern part of the State to reach the load centers to satisfy the State's climate mandates. In support of NYPA's request for a 50-basis point ROE Risk Adder, our testimony also addresses the substantial risks and challenges associated with developing the Project.

Q. Is the NYPA Panel sponsoring any exhibits?

A. Yes, we are sponsoring Exhibit No. NYP-101 (list of approvals and permits required for

the Project separate from the New York State Article VII certification process), Exhibit No. NYP-102 (documenting a number of Project benefits from NYPA's electric power system simulation study), Exhibit No. NYP-103 (customer payment savings for delivered energy from data set used in simulation study), and Exhibit No. NYP-104 (capacity cost savings from data set used in simulation study).

Q. Please briefly describe the incentive rate treatments that NYPA is requesting for the Project.

A. NYPA filed for an abandonment incentive on November 16, 2021 (supplemented on November 23, 2021) in Docket No. EL22-15-000. NYPA is further requesting herein a 50-basis point return on equity ("ROE") adder to reflect the significant risks and challenges associated with the development of the Project ("ROE Risk Adder"). Mr. Scott Tetenman, NYPA's Senior Vice President of Finance, discusses the financial risks related to the SPC Project in Exhibit No. NYP-200. These financial risks, together with the project development risks discussed herein, justify the Commission granting NYPA's request for the ROE Risk Adder.

Q. Is Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid"), NYPA's joint developer on the Project, also seeking authorization for incentive rates?

A. Yes. National Grid filed for an abandonment incentive on November 19, 2021 in Docket No. EL22-17-000. In a filing expected later this year, we anticipate that National Grid will seek certain additional transmission rate incentives to account for the risks and challenges of the Project.

II. OVERVIEW OF THE PROJECT

Q. Please describe the Smart Path Connect Project.

A. The Project is the outgrowth of the Climate Leadership and Community Protection Act

("CLCPA"), enacted by the New York legislature in 2019.[1] CLCPA sets clean energy requirements that include statewide greenhouse gas emission reduction and statewide renewable electric generation production goals. Then, in 2020, the New York legislature enacted the Accelerated Renewable Energy Growth and Community Benefit Act ("AREGCBA")[2] to facilitate needed changes to the New York power grid to meet those state-law climate requirements. In accordance with AREGCBA, the SPC Project was designed to expand transmission infrastructure in northern New York to allow for existing and new renewable energy generation projects that meet the CLCPA requirements to be timely and cost-effectively delivered to load. On October 15, 2020, the NYPSC, acting through its authority under AREGCBA, designated the Project as a Priority Project.

The SPC Project, which is also depicted below in Figure 1, consists of rebuilding approximately 100 linear miles of existing 230 kV transmission lines and converting 90% of these facilities to 345 kV with the remainder being rebuilt to higher capability 230 kV, in addition to associated substation construction and upgrades. The Project consists of two components: east to west—the Moses-Willis-Patnode ("MW-Patnode") component and north to south—the Adirondack-Porter component.

The MW-Patnode component, owned by NYPA, is the northern section of the Project and covers approximately 46 miles running from the Town of Massena in the west to the Town of Clinton in Clinton County, New York in the east. The MW-Patnode component of the Project includes the following:

(1) rebuild of NYPA's Moses-Willis 1&2 to convert 230 kV circuits to 345 kV (about 37 linear miles);

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[1] 2019 N.Y. Laws, ch. 106.
[2] 2020 N.Y. Laws, ch. 58, Part JJJ.

(2) rebuild of Willis-Patnode and Willis-Ryan 230 kV lines and a short portion of the Ryan-Plattsburgh 230 kV line resulting in existing single circuit 230 kV lines upgraded to double circuit 230 kV lines (together, about nine linear miles);

(3) construction of a new proposed Haverstock Substation;

(4) interface connection of the new proposed Haverstock Substation to NYPA's Moses-Adirondack 1&2 (also known as "MA1 & MA2" or "Smart Path") transmission facilities. The interface consists of an upgrade of approximately six linear miles of 230 kV circuits to 345 kV lines;

(5) expansion of the Willis Substation;

(6) modifications of the Ryan, Patnode, Massena, and Moses Substations within the existing fence lines; and

(7) right-of-way ("ROW") expansion at the Ryan Substation.

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. Specifically, the Project includes rebuilding all or part of National Grid's Adirondack-Porter 230 kV lines (Chases Lake-Porter Line 11, Adirondack-Porter Line 12, and Adirondack-Chases Lake Line 13), and connecting to NYPA's MA1 & MA2 transmission facilities. The Adirondack-Porter component includes the following:

(1) rebuild and upgrade of National Grid's Adirondack-Porter 230 kV lines (Chases Lake-Porter Line 11, Adirondack-Porter Line 12, and Adirondack-Chases Lake Line 13) to 345 kV;

(2) construction of a new Adirondack Substation by NYPA;

(3) construction of NYPA's interface connection of the new Adirondack Substation

to the MA1 & MA2 transmission facilities;

(4) construction of a new Austin Road Substation by National Grid;

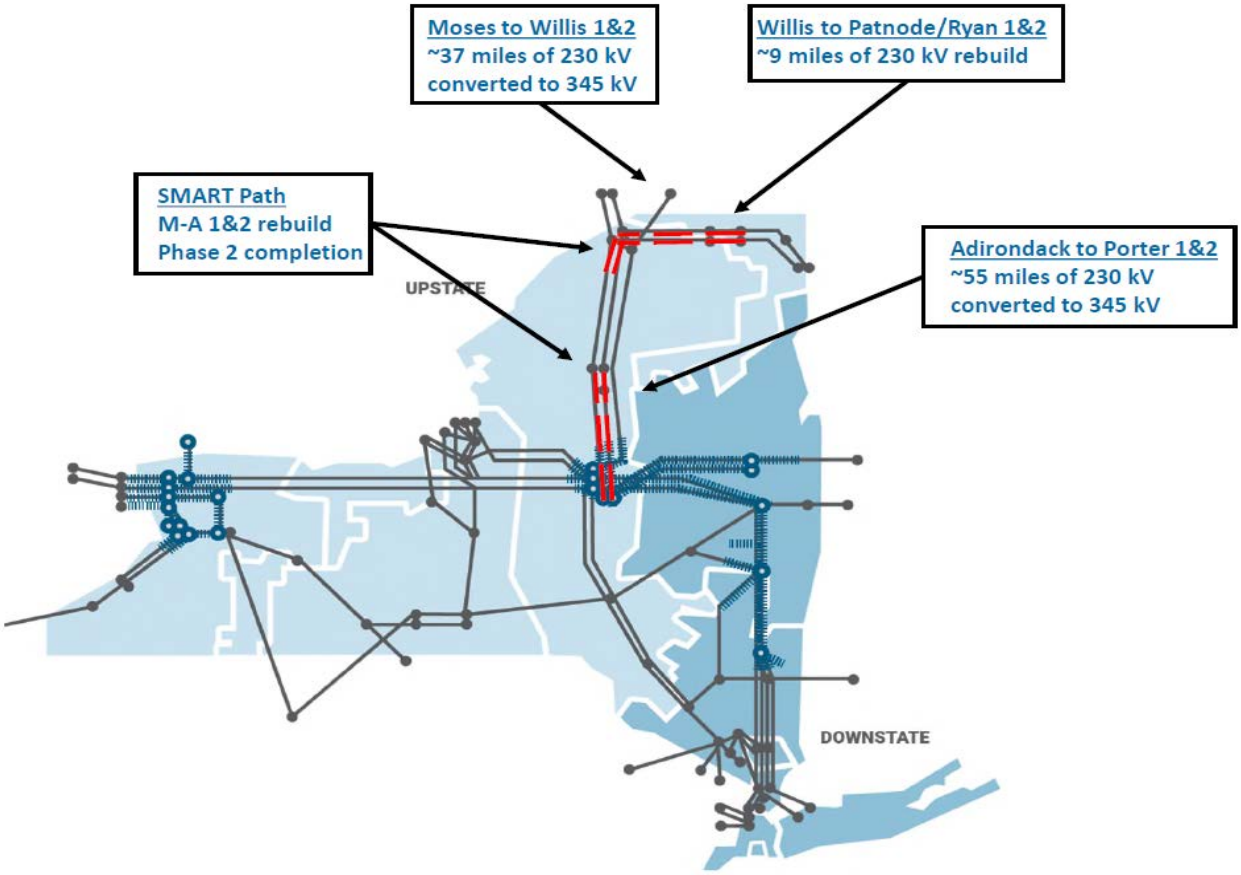
(5) extension of the existing 230 kV Rector Road to Chases Lake Line 10 by National Grid;

(6) expansion of National Grid's Edic Substation;

(7) construction by National Grid of an interface connection of one circuit to NYPA's Marcy Substation; and

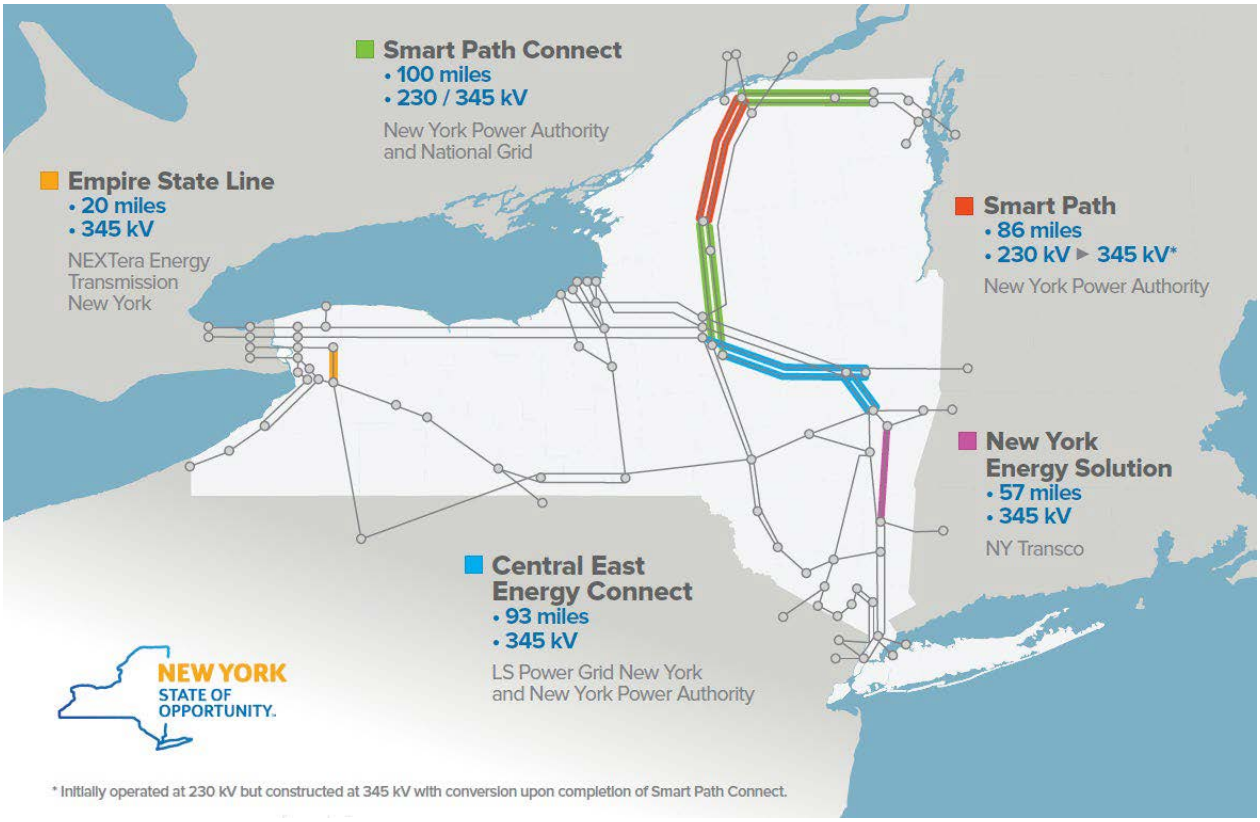
(8) extension of the existing 345 kV Marcy Substation by NYPA.

Figure 1 – Components of Smart Path Connect Project



Together with other projects under construction by NYPA and other developers, the SPC Project will create a continuous 345 kV path from the northern border of the State to the downstate region, as shown below in Figure 2.

Figure 2 – Transmission Projects Under Construction in the State of New York



Q. Please describe the transmission constraints in northern New York?

A. In northern New York, the bulk transmission system is constrained into east-west and north-south orientations due to the physical boundaries of the 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. The north-south elements were originally built in the 1940s while the east-west elements date from the 1950s and 1970s. The only exception to the 230 kV infrastructure in this region is NYPA's 765 kV transmission line that runs from Chateauguay to Massena to Utica paralleling the north-south 230 kV circuits.

Q. Please explain the significance of these transmission interface constraints.

A. As currently configured, the bulk transmission system in northern New York is unable to provide sufficient transfer capability to deliver all the available generation located in northern New York today—including substantial levels of renewable generation and noncarbon-emitting hydroelectric generation—to load. Existing renewable generation in the upstate region is currently vulnerable to periodic, and increasing, curtailment. New York Independent System Operator, Inc. ("NYISO") data show that wind curtailments alone are significant in nature, averaging more than 62 GWh per year in each of 2018-2020.[3] Due to these constraints, NYISO has recently concluded that, to meet electric demand and achieve public policy goals, additional transmission capability is necessary to alleviate constraints and maximize the contribution of existing renewable resources.[4]

Q. How much additional transmission capability is needed to satisfy the CLCPA requirements?

A. NYISO has studied renewable generation pockets within which curtailments would occur if renewable generation sufficient to meet CLCPA's minimum of 70% statewide renewable electric generation by 2030 target is added to the grid.[5] The northern New York generation pocket would be reached and served by key transmission lines that would be upgraded as a part of the SPC Project.

NYISO found that between 975 and 1,050 MW of increased transmission capability would be needed on the existing northern New York 230 kV and 115 kV systems to unbottle potentially curtailed renewable generation. This increased transmission capability

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[3] NYISO, *Power Trends 2021: New York's Clean Energy Grid of the Future*, at 16 (fig. 9), https://www.nyiso.com/documents/20142/2223020/2021-Power-Trends-Report.pdf.

[4] *Id.*

[5] *See id.* at 39 (fig. 16: Renewable Generation Pockets).

will enable transfer of additional renewable generation, which studies have projected to be approximately 6,500 MW of renewable generation capacity in NYISO Zones D and E[6] that is needed to meet CLCPA's minimum of 70% statewide renewable electric generation by 2030. Based on NYPA's transmission planning studies, the SPC Project is designed to increase transfer capability on the northern, New York system by 1,000 MW.

Q. What is a priority transmission project?

A. As noted earlier, in recognition of the fact that significant changes to the New York power grid are required to meet the CLCPA requirements, in 2020 the Legislature enacted the AREGCBA. AREGCBA directs the NYPSC to establish a bulk transmission investment program to be submitted to the NYISO for incorporation into its transmission studies and planning processes. To implement the bulk transmission investment program, AREGCBA prescribes two pathways for project selection. One of these pathways charges the NYPSC with identifying projects that are needed on an "expeditious" basis to meet the CLCPA requirements. These projects are referred to in AREGCBA as Priority Projects. The other pathway, which is not at issue in this petition, is the NYISO Public Policy Transmission Planning Process ("PPTPP") found at Section 31.4 of Attachment Y to the NYISO Open Access Transmission Tariff.

Q. What are the Priority Project selection criteria?

A. The NYPSC established two general criteria by which it would determine whether a project qualifies as a Priority Project: (1) "[t]he transmission investment's potential for unbottling existing renewable generation, as well as projects that are in the NYISO interconnection

[6] NYISO Zones D & E are upstate Zones. NYPSC, *Initial Report on the New York Power Grid Study*, at 15-16 (fig. 2) (Jan. 2021), https://www.nyserda.ny.gov/-/media/Files/Publications/NY-Power-Grid/full-report-NY-power-grid.pdf.

process, for delivery to load centers in the State, thereby reducing the amount of new generation that must be constructed to meet the CLCPA Targets;" and (2) whether an early in-service date for the transmission investment would: (a) "increase the likelihood that the State will meet the CLCPA deadlines"; 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[.]"[7]

Q. Did the NYPSC emphasize any criteria?

A. Yes. The NYPSC stated that whether the project addresses the "deliverability of existing generation is a key and perhaps determinative factor" for whether a transmission project qualifies as a Priority Project.[8] The NYPSC remarked that the fact that operating generators cannot offer their full capacity due to transmission constraints strongly indicates whether traditional planning processes have kept pace with State policy.

Q. Does the SPC Project satisfy these criteria?

A. Yes, the SPC Project, proposed jointly by NYDPS and NYPA, satisfies these criteria. The NYPSC found that the Project satisfied both criteria and designated it a Priority Project on October 15, 2020, as follows:

- With respect to the first criterion, the NYPSC found that due to transmission limitations, the benefits of the State's investments in renewable generation in the northern region are not being fully realized. The NYPSC stated the presence of a significant amount of existing renewable generation not currently served by the

[7] Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act, NYPSC Case 20-E-0197, Order on Priority Transmission Projects at 17-18 (Oct. 15, 2020) ("Priority Project Order") (internal quotations omitted) (emphasis in original).
[8] *Id.* at 16.

transmission system indicates that a project to unbottle that generation is needed expeditiously. The NYPSC noted that the Project is predicted to avoid 7.5 terawatt-hours ("TWh") of renewable generation curtailments annually. The NYPSC further stated that with respect to planned generation, the number of interconnection applications that are being studied by NYISO suggests there is strong developer interest in the northern area of the State. The NYPSC noted NYPA's identification of approximately 2,400 MW of planned generation that would not be deliverable to load centers without additional transmission capacity in northern New York and found that advancing the Project would help capture the benefits of the investment represented by the applications, increasing the overall benefits of the Project.[9]

- With respect to the second general criterion, the NYPSC found that because the NYISO 2020 public policy planning cycle had only recently been initiated, it was likely that the Project, if designated a Priority Project, would be placed into service earlier than a comparable project selected via the NYISO PPTPP. The NYPSC accordingly found that the NYISO process cannot meet the State goals in the same time frame that NYPA may achieve through the Priority Project designation process and concluded that the Project is needed expeditiously.[10]

Q. What studies did NYPA provide that support the NYPSC's findings regarding the benefits of the Project?

A. To aid the NYPSC in its evaluation of the SPC Project's benefits, NYPA, as part of its Priority Project Petition, produced a detailed electric power system simulation of the impact of the Project, in a manner like NYISO's public policy planning process benefit

[9] *Id.* at 20-21.
[10] *Id.* at 22-23, 25.

analyses, using the General Electric Multi Area Production Simulation software, with the assistance of General Electric's consultants. 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. NYPA's electric power system simulation study, which informed the NYPSC's Priority Project designation, is included as Exhibit No. NYP-102 ("NYPA Simulation Study"). The Project benefits set forth in the NYPA Simulation Study, along with other benefits, are discussed later in our testimony. We further note that the NYPSC, as the entity charged with ensuring reliable electric service at just and reasonable rates, has broad expertise in evaluating the benefits that would accrue from transmission expansion. Moreover, as required by AREGCBA, when NYPA and the NYDPS made their filing, the NYPSC was in the midst of a comprehensive evaluation of the transmission enhancements needed to facilitate achieving the CLCPA requirements.

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

A. Projects selected via the Priority Project designation pathway do not participate in the NYISO PPTPP, but as noted by NYISO and reflected in the NYPSC Priority Project designation criteria, the process for designating priority transmission projects can operate "in tandem" with the NYISO PPTPP.[11]

[11] *Id.* at 11-12 (citation omitted).

NYISO participated as an active party in the NYPSC Priority Project designation proceeding for the SPC Project. As part of the designation proceeding, the NYPSC specifically took into account the status of the NYISO 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 NYISO's planned generation.[12] Following the NYPSC's issuance of the Priority Project Order, NYISO staff requested a meeting with NYPA to discuss the SPC Project. Following the meeting, at the request of NYISO staff, NYPA attended the December 11, 2020, NYISO Electric System Planning Working Group ("ESPWG") during which NYPA presented a Project overview to NYISO stakeholders, addressed questions from market participants and agreed to present an annual update detailing Project progress in tandem with the annual updates given to ESPWG by developers of projects selected via NYISO's PPTPP. NYPA presented the second annual update of the SPC Project at the December 17, 2021 ESPWG meeting.

In addition, NYPA has engaged extensively with NYISO and stakeholders concerning the Project, pursuant to NYISO's interconnection process. NYPA filed an interconnection request on December 22, 2020 and attended an initial scoping meeting on January 22, 2021. The scope of the System Impact Study was recommended for approval by NYISO's Transmission Planning Advisory Subcommittee ("TPAS") and thereafter approved by its Operating Committee at meetings in February 2021. Thereafter, NYPA began work on the actual study. Initial System Impact Study results were shared with NYISO and other relevant transmission owners in August 2021 and updated study results

[12] *Id.* at 17, 21.

were presented to TPAS on October 1, 2021. On October 14, 2021, the Operating Committee gave final approval of the SPC Project System Impact Study which signifies that NYISO deems that the Project meets the NYISO minimum interconnection standard. It is our understanding that the Project will be added to the NYISO's "baseline" for planning purposes once the NYISO completes its Facilities Study (initiated on October 22, 2021), which NYPA expects to be completed in May or June of this year.

III. PROJECT COST

Q. What was the preliminary Project cost estimate?

A. NYPA, as part of its Priority Project Petition, performed a preliminary cost estimate for the SPC Project based on a preliminary project design. The Project cost estimate at that time was $905 million in 2019 dollars.[13]

Q. What is the current cost estimate of the Project?

A. NYPA's current cost estimate for the Project is $1.2 billion (including Allowance for Funds Used During Construction ("AFUDC")). This is consistent with the estimate that NYPA and National Grid included in their Article VII application to the NYPSC.[14] NYPA's share is estimated to be $641.3 million, inclusive of AFUDC. NYPA's cost estimate was developed based on the Project execution plan and escalated out through Project completion in 2025.

[13] This preliminary estimate was NYPA's "Class 4" Project cost estimate done in accordance with Association for Advancement of Cost Engineering principles and subject to change, which did not reflect cost escalation or sales taxes.
[14] A portion of the SPC Project costs described in this petition were included in the 2020 Article VII certificate awarded to NYPA's for its MA1 &MA 2 upgrade.

IV. DEVELOPMENT OF THE PROJECT

Q. As noted above, NYPA and National Grid will be developing the Project jointly. How did NYPA and National Grid become joint developers?

A. AREGCBA requires NYPA to undertake a public solicitation process to assess whether joint development would provide for significant benefits in achieving the CLCPA requirements. Following designation of the Project as a Priority Project, on October 30, 2020, NYPA initiated a comprehensive public process soliciting interest from potential co-participants. On March 30, 2021, after completing its public solicitation process, NYPA determined that it would develop the Project with National Grid as a co-participant. NYPA recognized that National Grid would be an ideal co-participant due to National Grid's ownership of existing facilities that complement NYPA's portion of the Project and the significant engineering and design work that National Grid conducted to determine the optimal method for upgrading its existing facilities in northern New York.

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

A. NYPA and National Grid executed a Participation Agreement that provided the terms for development of the Project. The Participation Agreement stipulates that NYPA is the lead developer and, as such, bears the responsibility for the overall delivery of the Project. Accordingly, to mitigate the risk of non-performance by National Grid with respect to its portion of the Project, NYPA has appropriate step-in rights to direct Project completion. 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 National Grid is responsible for operations and maintenance for the Project facilities it owns.

Q. To date, what, if any, costs have NYPA incurred in its role as a joint developer of the Project?

A. NYPA has incurred approximately $22.6 million in project development costs through December 31, 2021. This includes costs incurred from the inception of the Project.

Q. What is the Project's anticipated in-service date?

A. The currently anticipated in-service date, as communicated to the NYISO, is December 2025.

Q. Will NYPA turn operational control of its share of the SPC Project over to NYISO?

A. Yes. Once it is commissioned, NYPA will turn operational control of its share of the Project over to NYISO, and it is NYPA's understanding that National Grid intends to do the same with respect to its share.

V. PROJECT BENEFITS

Q. Is there an estimated benefit to cost ratio for the Project?

A. Yes. As shown in Table A below, NYPA calculated a benefit to cost (or "B/C") ratio for the Project of 3.9. NYPA expects the Project to result in significant benefits for the citizens of New York State.

Table A
Project Cost and Benefits ($ millions)

Project Cost	$1,176
Project Benefits (20 year NPV)	
1. Lower customer energy payment costs	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

Q. What are the Project benefits?

A. As reflected in Table A above, the primary Project benefits are derived from the NYPA Simulation Study itself or from the same source data used in that study (with one exception).[15] They include:

- Delivered energy cost savings (costs paid by load) of $214 million per year ($2,853 million 20-year Net Present Value ("NPV"));[16]
- Emission reductions of 1.16 million tons of carbon dioxide ("CO_2") and 160 tons of nitrogen oxides ("NO_x") annually (value of $981 million 20-year NPV);[17]
- Capacity market benefits of $25 million – $50 million annually (utilizing the midpoint ($37.5 million) results in a 20 year NPV of $500 million);[18] and
- Avoid the replacement of aging infrastructure (some of the northern New York transmission system is approaching end of life). This reduces 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 B/C ratio discussed above, NYPA notes there are additional ways to quantify certain discrete benefits that it has not included in the Project B/C ratio in Table A to avoid the risk of double counting. These benefit measurements, typically used by NYISO in its PPTPP 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;[19] and
- Production cost savings of up to $99 million per year.[20]

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[15] Of these benefits, the avoidance of replacing aging infrastructure was not contained in the NYPA Simulation Study or the source data underlying that study.

[16] Exhibit No. NYP-103 shows the calculation of the annual customer load payment energy cost savings using the same data set from the NYPA Simulation Study. That annual benefit is the source for the 20-year NPV.

[17] Ex. No. NYP-102 at 1, 6 ("Project Production Cost Results" table).

[18] *See* Ex. No. NYP-104 (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.

[19] *See* Ex. No. NYP-102 at 1, 6. NYPA determined congestion benefits using transmission planning criteria, the same approach as that used by the NYISO in PPTPP evaluations.

[20] *Id.*

NYPA also expects the following additional benefits from the Project which it has not quantified and not included in the Project B/C ratio in Table A:

- Enhanced system reliability, efficiency and operational flexibility of the transmission grid;
- Enhanced resiliency/storm hardening;
- Improvement in market competition and liquidity;
- Increased diversity of fuel supply with the additional renewable resources made viable by the Project; and
- Promotion of job growth.

VI. PROJECT RISKS AND CHALLENGES

Q. What are the risks and challenges that NYPA, as well as National Grid, will face in developing the Project?

A. The SPC Project represents a uniquely large transmission build-out for NYPA in particular and for New York State generally and is the first project to be selected and built pursuant to the NYPSC's authority under AREGCBA. As a result, the risks and challenges are numerous both from a construction and financial[21] standpoint, but also as a result of regulatory hurdles. Some of the major risks include:

- **Execution Risks:**
  - System outages: NYPA and National Grid will require system outages which at times may not be granted by NYISO due to system operation constraints. These outages will need to be coordinated to ensure continued system reliability. Moreover, the existing transmission facilities provide a significant amount of power to downstate New York. Requested outages to

[21] NYPA's financial risks associated with the construction of the Project are specifically set forth in Mr. Tetenman's testimony. Ex. No. NYP-200 at 3-10.

perform the necessary facility work will likely be heavily scrutinized, i.e., shorter outage/construction durations or the need for temporary transmission lines may be required to mitigate reliability concerns, resulting in additional costs to the Project. As a result, the scale of the Project and the volume of additional transmission projects currently underway across New York raises the risk that required system outages may not be obtainable in the timeframe needed for Project completion. This could impact the Project schedule and impose additional costs.

- Material procurement issues: Risks include raw materials, particularly steel price volatility, which is heightened by the current market conditions related to the COVID-19 pandemic and political environment. Further, manufacturing availability, quality, and delivery logistics risks are significant for a project of this scale. Mr. Tetenman's testimony explains NYPA's proposal to mitigate the financial risks of unforeseen steel price increases as part of its cost containment proposal.[22]
- Labor and equipment shortages: These risks have been exacerbated by the COVID-19 pandemic and are anticipated to be a challenge. The large number of transmission projects undertaken in New York and nationally over the same time period as the SPC Project is expected to strain the availability of transmission line contractors and crews. This is likely to have an impact on cost and schedule. Mr. Tetenman addresses NYPA's proposal to mitigate partially the Project's financial risks associated with labor and

[22] *Id.* at 17-18.

equipment cost increases in his testimony as part of its cost containment proposal.[23]

- Unexpected Underground Risks: This includes the potential for unexpected geotechnical conditions during construction, such as rocks which would require rerouting or drilling related to linear miles of transmission lines, which would result in schedule delays, and an increase in cost.
- New or Expanded Substation Risks: The location of NYPA's proposed new or expanded substations entail unique execution risks because they are, among other things, sited on previously undeveloped land. This pertains to the proposed Haverstock Substation, the new Adirondack Substation (which will replace the existing substation of the same name), and the expanded Willis Substation. Such execution risks include developing appropriate grade, drainage plans and differing underground site conditions. The three substations require development in excess of 75 acres of land (Haverstock – 42 acres, Adirondack – 25 acres, and Willis – 17 acres).
- Property rights acquisition issues: Though the Project is largely within existing rights-of-way ("ROW") of either NYPA or National Grid, there are some portions of the Project that need to be built on parcels controlled by third parties. NYPA and National Grid will need to acquire the right to access some properties for studies and to acquire permanent rights for construction. There is a risk that NYPA and National Grid will face

[23] *Id.*

difficulty in obtaining these rights. For the Project to be in-service by its target in-service date, cooperation by the current landowners is necessary.

- **Regulatory Risks:**
  - Governmental and Regulatory Approvals: The process of obtaining the required governmental and regulatory approvals carries significant risk to the Project schedule which may also impact Project costs. Article VII of the New York Public Service Law establishes a public review process in which community residents, as well as state and local agencies, are invited to provide input into the siting, design, construction, and operation of a major transmission facility. We elaborate on the potential risks of delays caused by the Article VII certification process later in our testimony.
  - Siting Risk of New Haverstock Substation: The location of the proposed Haverstock Substation entails environmental and engineering siting risks. The Haverstock location was chosen to optimize the intersection points of three existing transmission ROWs thus reducing the rebuild needed to connect four transmission circuits (MA1 & MA2 and Moses-Willis 1&2) with NYPA's existing Saint Lawrence-FDR Hydroelectric Project ("STL"). Optimizing the location of Haverstock has reduced the construction costs by an estimated $25 million, minimized the need for additional ROW acquisition, and reduced the cost and expense associated with the Project's permit obligations related to the U.S. Army Corps of Engineers, the Federal Aviation Administration ("FAA") and FERC (pertaining to NYPA's FERC hydroelectric license for STL). Because the approximate two-mile line

segments between the proposed Haverstock Substation and the existing Moses Substation at STL are comprised of significant wetlands and long water crossings, there is a risk that the Army Corps permits could be delayed or denied due to new regulatory compliance burdens imposed in 2021. If denied, NYPA will need to pursue a more complex rebuild of the electrical connections at STL which will add approximately $25 million to the cost of the Project, plus the cost of an enhanced FAA permit for the transmission tower height needed over alternative terrain.

- **Other Risks:**
  - There are numerous additional risks that could cause delays and increase the risk of additional costs being incurred to complete the Project. This includes inclement weather, including the possibility of unusual wet conditions. A related concern for such weather conditions would be the increased need for additional environmental mitigation measures.

Q. Please explain the NYPSC's Article VII certification process.

A. New York's Article VII process requires a full public review of the need for and the environmental impact of major transmission facilities in New York. The process begins with the pre-application phase ("PAP") in which the applicants consult with stakeholders. These stakeholders include the various regulatory agencies such as the NYDPS and the New York State Department of Environmental Conservation. PAP may also include outreach to the public to explain the project proposal and collect input. Following the PAP phase, the applicant submits the Article VII application ("Application") that incorporates input and information gathered in the PAP. The Application is an extensive document that

often takes a year or more to compile. It contains a detailed description of the project and its location. The Application includes natural resources studies such as wetland delineations, visual impact analysis, endangered species studies, and others. It also includes archeological studies. The applicant must submit intervenor funding with the Application. This allows the full participation in the review process by municipalities and certain other parties by supplying funds to pay for hiring expert witnesses, consultants, and legal representation.

NYPA and National Grid jointly submitted their application on June 15, 2021. After application submission, the Secretary to the NYPSC determines whether the Application complies with the Article VII requirements. If the Application complies, it will be deemed "complete." On December 24, 2021, the NYPSC issued the Project a completeness determination.

Now deemed complete, the Application moves into the hearing/negotiation and decision phase. An Administrative Law Judge has been assigned to conduct public statement and evidentiary hearings. The Application is comprehensively reviewed by NYDPS Staff and other regulatory agencies. NYPA and National Grid issued a notice of impending settlement negotiations on December 27, 2021, and settlement discussions commenced on January 10, 2022. At the conclusion of this hearing and settlement phase, based on the record evidence, the NYPSC will determine whether it will grant the Certificate of Environmental Compatibility and Public Need ("Certificate"). NYPA and National Grid considered requesting expedited review of the Project pursuant to

AREGCBA,[24] but it was determined that the Project did not satisfy the expedited process criteria because NYPA and National Grid need to acquire some new property rights for certain Project facilities. In addition to not receiving expedited review, the size and complexity of the Project, regulator resources, and the participation level of the local stakeholders could contribute to a longer timeframe for the Article VII approval. Thus, it could take longer than originally anticipated to obtain a Certificate, potentially as long as 12 months from the completeness determination.

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 intent of the EM&CP is to minimize environmental impacts during construction and operation of the transmission facility. Once the EM&CP is approved, construction may begin. Predicting a timeframe for EM&CP approval is difficult. For less complex projects, EM&CPs may be filed concurrently with the Article VII application. However, most often, the project EM&CP is filed during the evidentiary/negotiation phase of the approval process or after the Certificate is granted, once conditions and restrictions are known.

For this Project, NYPA expects to submit an EM&CP for the facilities it will own, which may result in the submission of multiple EM&CPs, reflecting the various phases of

[24] AREGCBA instructs that the commission establish an expedited process for proceedings on applications for major utility transmission facility, including a final decision by the Commission, within nine months from the date of the completeness determination for certain projects, including those that would be constructed within existing ROWs. N.Y. Laws, ch. 58, § 123.

construction of the Project. We understand that National Grid will file an EM&CP for its facilities, which also may take a phased approach. The decision about whether to submit a single or multiple EM&CPs is heavily influenced by the applicant's construction schedule and conditions or restrictions in the Certificate conditions or parties' settlement agreements. In general, EM&CPs that are smaller in scope require less review and are approved more quickly. Multiple EM&CPs for a project can often keep construction on schedule. Approval for a single EM&CP for longer or more complicated projects can take a year or more.

In the Certificate, the NYPSC may impose conditions and restrictions on an applicant. Often the total number of conditions exceed 100. The conditions may include affirmative requirements or proscriptions on issues such as facility location requirements, parking restrictions, construction hour restrictions, construction sign requirements, complaint notification process, required training for contractors, required monthly reporting requirements to the NYDPS, specifications on locations contractor equipment may be used, required inspectors including an environmental monitor and agricultural monitor, herbicide use conditions, and facility retirement requirements. Any conditions that require significant modification may cause delays to the Project schedule and increased costs.

Q. What federal, state, and local authorizations are required to be obtained in order to construct or place in service the Project?

A. In addition to the Article VII certificate, the SPC Project will require a U.S. Army Corps of Engineers approval for sections 10 and 404 permits for wetlands and waterbody crossings which, because of increased compliance burdens applicable to Army Corps

permits required in 2021 as we have described, will pose increased risks to the Project in light of the planned siting for the Haverstock Substation. The Project will also require a New York State Department of Environmental Conservation State Pollution Discharge Elimination System General Permit for Stormwater Discharge During Construction Activities; Utility Work Permit from the New York State Department of Transportation; Coastal Consistency Certificate from the New York State Department of State; and historic and archaeological clearances from the New York State Historic Preservation Office/New York Office of Parks, Recreation and Historic Preservation. These authorizations are set forth in more detail in Exhibit No. NYP-101.

Q. What land rights will be needed to construct the Project?

A. NYPA has proposed to develop the vast majority of the Project within existing ROWs owned by NYPA and its co-developer, National Grid. However, NYPA and National Grid will need to engage in good faith negotiations with some third parties to obtain certain new property rights necessary to construct the Project as proposed. NYPA and National Grid's efforts to obtain these ROWs may result in disputes or challenges that could jeopardize the Project's in-service date or require a material modification to the Project as proposed. To the extent the Project must be modified, the Project could be significantly delayed, with an increase in costs, or could be jeopardized entirely.

Q. How will NYPA mitigate the costs and risks in completing the SPC Project?

A. NYPA has substantial experience developing electric transmission projects and will fully leverage this experience in support of the Project development. The Project will be led by a Project Manager experienced in delivering transmission projects and identifying and mitigating risks. NYPA will assemble a team of engineering, permitting, and construction

experts ("the NYPA team") reporting to the Project Manager who will collaborate with the National Grid project team by providing input, review, and guidance necessary to successfully execute the Project. The NYPA team will provide its expertise to ensure the Project permit applications are developed fully to the requirements of the law and rules. The NYPA team will review the design drawings and provide design standards informed by design and operating experience in New York. The NYPA team will review all studies produced in the Article VII proceeding, including, for example, those related to wetlands delineation, cultural resource designations and visual impacts, among others, to ensure they meet the NYPSC's expectations. NYPA will also support the construction plan development, will coordinate system outage requirements, and provide construction inspectors to monitor the Project execution and overall quality. The NYPA team's active engagement in the Project execution will mitigate project risks and associated costs.

In addition to its above-described expertise, NYPA has taken explicit steps in order to mitigate the risks of the Project.

First, NYPA, in a separate docket (Docket No. EL22-15-000), has requested that the Commission authorize an Abandoned Plant Incentive for the Project. The Abandonment Incentive mitigates the risks of Project cancellation for reasons beyond the control of NYPA.

Second, NYPA determined that it was advantageous to develop the Project jointly and selected National Grid as a co-participant. National Grid's participation in the Project directly mitigates risk to NYPA.[25] Also, National Grid's ownership and control of large portions of the Adirondack-Porter component of the Project and NYPA's close

[25] *See* Ex. No. NYP-200 at 10.

collaboration with the company will help mitigate costs and risk and ensure that construction will be completed.

Third, National Grid and NYPA have and will continue to utilize best-in-class project management practices. This includes the development of a detailed schedule identifying all Project tasks, resources, and the sequences for such tasks. The schedule will serve to ensure that the entire project team knows what needs to be completed, by when, and by whom. Additionally, standard procurement processes will be utilized to secure the materials and labor resources at competitive prices, which may include the use of a competitive bid process for needed materials. Further, best-in-class practices will be utilized to the maximum extent possible to assist in incorporating lessons learned on previous projects and avoiding new risks.

Q. Given the scope and complexity of the Project, will those mitigation measures be sufficient to eliminate the Project's risks and challenges?

A. No. Despite best efforts, many risks cannot be fully mitigated for a project of this size and scope, and it is for this reason that NYPA has requested from FERC the incentive rate treatments enumerated above.[26]

Q. Does this conclude the NYPA Panel's testimony?

A. Yes, it does.

[26] *See id.* at 11-12.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Power Authority) **Docket No. ER22-___-000**

AFFIDAVIT OF GIRISH BEHAL

State of New York)

County of Westchester)

I, Girish Behal, affirm that the statements contained in the Prepared Direct Testimony of the NYPA Transmission Development Panel served on behalf of the New York Power Authority in these proceedings are true and correct to the best of my knowledge, information and belief, and I hereby adopt said testimony as if given by me in formal hearing, under oath.

_____

Girish Behal

Dated: February 7th , 2022

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Power Authority) **Docket No. ER22-___-000**

AFFIDAVIT OF FRANK D'EUFEMIA

State of New York)

County of Westchester)

I, Frank D'Eufemia, affirm that the statements contained in the Prepared Direct Testimony of the NYPA Transmission Development Panel served on behalf of the New York Power Authority in these proceedings are true and correct to the best of my knowledge, information and belief, and I hereby adopt said testimony as if given by me in formal hearing, under oath.

Frank D'Eufemia

Dated: February 7, 2022

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Power Authority) **Docket No. ER22-___-000**

AFFIDAVIT OF ANA STACHOWIAK

State of New York)

County of Westchester)

I, Ana Stachowiak, affirm that the statements contained in the Prepared Direct Testimony of the NYPA Transmission Development Panel served on behalf of the New York Power Authority in these proceedings are true and correct to the best of my knowledge, information and belief, and I hereby adopt said testimony as if given by me in formal hearing, under oath.

Ana Stachowiak

Dated: February 07, 2022

Exhibit No. NYP-101

Additional Required Permits Separate from Article VII Permits for Smart Path Connect Project

DESCRIPTION OF ADDITIONAL REQUIRED PERMITS

FOR SPC PROJECT SEPARATE FROM ARTICLE VII[1]

1. New York State Department of Environmental Conservation – SPDES General Permit for Stormwater Discharges from Construction Activities

Project construction activities will result in soil disturbances greater than one acre. Accordingly, the Project will require coverage under a State Pollutant Discharge Elimination System ("SPDES") General Permit issued in accordance with New York State Environmental Conservation Law. Applicant required to develop a Stormwater Pollution Prevention Plan ("SWPPP") in accordance with the requirements of the SPDES General Permit. One or more SWPPPs is anticipated by Applicant.

2. New York State Department of Transportation – Utility Work Permit

The New York State Department of Transportation ("NYSDOT") requires that a Utility Work Permit application be submitted to install utilities within or adjacent to a state highway right-of-way ("ROW"). Various parts of the Project would cross or be adjacent to New York State highways. Following New York State Public Service Commission ("NYPSC") approval of the final design as part of the Environmental Management and Construction Plan, the Applicant would work to obtain highway work permits from NYSDOT, pursuant to 17 NYCRR § 131, for the construction and operation of the Project within or adjacent to New York State highway ROWs, subject to the NYPSC's continuing jurisdiction.

3. New York State Department of State – Coastal Consistency Certificate

Under the federal Coastal Zone Management Act, the New York State Department of State ("NYSDOS") must issue a Coastal Consistency Certificate prior to any federal agency approval of any action for projects that will occur within and/or will directly affect a state's coastal area. The proposed Haverstock Substation and a portion of the Moses-Willis 1 & 2 lines north of New York State Route 37 are within the New York State Coastal Zone Boundary. As such, the Applicant will request this certification from NYSDOS in coordination with the federal permits it will be seeking as described below.

4. New York State Historic Preservation Office/New York Office of Parks, Recreation and Historic Preservation – Historic and Archaeological Clearance

In consultation with the New York State Historic Preservation Office, the Applicant will address the requirements of Section 106 of the National Historic Preservation Act and Section

[1] The permits described in this exhibit are the "Other Pending Filings" indicated by Applicant (collective term for the New York Power Authority ("NYPA") and Niagara Mohawk Power Corporation d/b/a National Grid) in Exhibit 8 of Applicant's Article VII application in Case 21-T-0340, *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 Upgrades Along the Existing NYPA Moses-Willis 1&2, Willis-Patnode, Willis-Ryan, and National Grid's Adirondack-Porter 11, 12 and 13 Lines in Clinton, Franklin, St. Lawrence, Lewis, and Oneida Counties, New York* (NYPSC June 15, 2021).

14.09 of the New York State Historic Preservation Act of 1980, including applicable consultation with Native American Nations. Through completion of archaeological and architectural investigations and appropriate mitigation, if any, the Applicant anticipates the applicable historic and archaeological resource requirements will be satisfied and agency-to-agency consultation requirements of Section 106 will be completed.

5. U.S. Army Corps of Engineers – Section 404 and Section 10 Permits

As described in the Applicant's Article VII exhibits, the Project would impact wetlands and streams that are regulated by the U.S. Army Corps of Engineers ("USACE"). Based on past experience, the temporary and permanent wetland and stream disturbance associated with construction activities of the Project could potentially be authorized by the USACE under Nationwide Permit ("NWP") No. 57 – Electric Utility Line and Telecommunications Activities. The Applicant is currently coordinating with the USACE regarding the applicability of NWP No. 57. Facility siting and the jurisdictional determination of specific wetlands will determine the ability to qualify for permitting under an NWP. If the Project does not qualify to use NWP No. 57, the Applicant will apply for an Individual Section 404 permit.

As required by Section 10 of the Rivers and Harbors Act (33 U.S.C. § 401), a Section 10 permit is required prior to conducting any work in or over navigable waters of the United States, or conducting work that affects the course, location, condition, or capacity of such waters, from the USACE. The Project crosses eight navigable waters: the Moses-Willis-Patnode component crosses the Grasse River, Raquette River, St. Lawrence River, and the St. Regis River; and the Adirondack-Porter component crosses the Black River, Independence River, Moose River, and Black River Feeder Canal. Further discussion regarding potential impacts to streams and rivers crossed by the Project is provided in Applicant's Article VII exhibits. The Applicant does not propose in-stream construction in any navigable water. However, as part of either the NWP No. 57 Pre-Construction Notification or the Individual Permit application, the Applicant would file a Section 10 application for the overhead wire crossing of the above navigable waters.

Before USACE's issuance of its permits, Applicant is required to obtain a Water Quality Certificate under Section 401 of the Clean Water Act from the designated state agency, in this case the NYPSC.

6. U.S. Army Corps of Engineers - Endangered Species Act, Section 7 Consultation

As part of the USACE permitting process, and in accordance with the Endangered Species Act and the Migratory Bird Treaty Act, as applicable, the Applicant will support a Section 7 consultation with respect to potential impacts to federally listed threatened, endangered and other protected species and habitats, in which the USACE, as the lead federal agency, will consult with the U.S. Fish and Wildlife Service.

7. Federal Aviation Administration – Notice of Proposed Construction or Alteration

The Applicant would be required to submit a Notice of Proposed Construction or Alteration to the Federal Aviation Administration prior to commencement of construction activities to identify location and heights of new pole structures.

8. Applicant Submissions to New York State Public Service Commission

In addition to the current Application for a Certificate of Environmental Compatibility and Public Need, Applicant will be submitting an application to the NYPSC to amend its Certificate of Environmental Compatibility and Public Need issued in Case 18-T-0207 for its Moses-Adirondack Smart Path Reliability Project (also referred to in the NYPA Panel Testimony as the "MA 1&2 upgrade" or "Smart Path").

Exhibit No. NYP-102

NYPA Simulation Study

Exhibit No. NYP-102

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	Point	Interconnection 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**	**Point**	**Interconnection 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. NYP-103

Estimated Customer Load Payment Savings

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. NYP-104

Capacity Cost Savings Calculations

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		