EXHIBIT E-4

ENGINEERING JUSTIFICATION FOR NEW SCOTLAND TO LEEDS TO PLEASANT VALLEY COMPONENT (§88.4)

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In accordance with 16 NYCRR § 88.4, as modified by the Procedural Order, this Exhibit E-4 provides the engineering justification for the proposed New Scotland-Leeds-Pleasant Valley facility.

1. ENGINEERING JUSTIFICATION: RELATIONSHIP TO THE EXISTING FACILITIES OF THE APPLICANT AND THE INTERCONNECTED NETWORK

NAT's proposed Project will meet the goal of incremental energy transfer across the upstate New York and southeast New York ("UPNY-SENY") regions outlined in the Blueprint. The combined Project will also provide significant incremental energy transfer capability to the Central East interface in New York. Collectively, the new lines will serve as a significant enhancement to the backbone transmission infrastructure in New York; relieve the most congested interface in New York Control Area ("NYCA"); and enable access to more efficient generation in upstate New York to load centers in downstate New York. The NAT proposed Project is also expected to increase liquidity in the New York Energy Markets by enabling increased power flows between high density load zones G, H, I, J, and K, and upstate NY generation.

New Scotland-Leeds-Pleasant Valley is proposed to consist of double bundled 1590 ACSR conductor connected between National Grid's New Scotland and Leeds Substations, and Consolidated Edison's Pleasant Valley Substation. All three substations operate at 345 kV. The interconnection at all the interconnecting substations will be achieved using applicable design criteria and good engineering judgments. Where possible and if required, NAT will design its facilities to provide the flexibility of future expansion for transmission or generation proposed to interconnect with NAT proposed Project. The New Scotland-Leeds-Pleasant Valley line is expected to be 65 miles in length and will be parallel to existing transmission ROWs for the majority of the proposed route.

The NYISO has initiated the Feasibility Study for the New Scotland-Leeds-Pleasant Valley line which will be followed by a System Reliability Impact Study (SRIS), and final specifications of the line and its interconnection will conform to the requirements of NYISO's SRIS process.

2. SPECIFIC BENEFITS

The proposed New Scotland-Leeds-Pleasant Valley line will bring specific benefits, both in terms of reliability and economy to the NAT and the interconnected network.

2.1. RELIABILITY BENEFITS

The New Scotland-Leeds-Pleasant Valley 345 KV line will interconnect directly to the existing transmission backbone system of New York Control Area (NYCA) and provide significant reliability benefits to New York State's existing transmission infrastructure. The Project will reinforce the New Scotland-Leeds-Pleasant Valley corridor, a transmission path critical to delivering bulk power to loads in downstate New York. The proposed line will provide an additional path for connecting more economic upstate New York generation with downstate loads during normal and contingency conditions as well as increase power transfer limits across critical NYCA interfaces, i.e., Upstate New York-Downstate New York (UPNY-SENY), Central East, and Total East.

NAT proposes to construct the New Scotland-Leeds-Pleasant Valley line utilizing steel or concrete structures which, when compared to wood structures, provides reliability due to resistance to fire damage and rot. NAT also proposes to construct the line utilizing structural loading criteria that meet or exceed all national and regional loading requirements, which will create an additional, robust path of power flow through the congested region.

2.2 ECONOMIC BENEFITS

The economic benefits of the proposed New Scotland-Leeds-Pleasant Valley line are described more fully in Section 2.5.7 in the Initial Application Materials for New Scotland-Leeds-Pleasant Valley pursuant to 16 NYCRR §85-2.8(f). Significant positive energy market, capacity market, and consumer cost benefits result from the NAT Project over a 10-year period after commencement of operation. These benefits are summarized as follows:

- The New Scotland-Leeds-Pleasant Valley line is expected to reduce Production Cost of generators in New York by $72 million from 2013 through 2022 based on the 2013 CARIS completed by NYISO.
- Demand$ Congestion reduction of approximately $998 million is expected for New York customers with New Scotland-Leeds-Pleasant Valley line in service based on the NYISO 23013 CARIS
- Other benefits due to the proposed NAT Project include expected reduction in air contaminant emission and increased imports of more economic energy from neighboring areas.

3. PROPOSED DATE FOR COMPLETION AND IMPACT OF DELAY

NAT expects to complete construction of the New Scotland-Leeds-Pleasant Valley line by November 2017, assuming timely regulatory approval. While the actual time required to complete construction depends on various factors, NAT expects the actual construction period for New Scotland-Leeds-Pleasant Valley to be approximately 18 months, once all the regulatory approvals and required permits have been secured. Delays in the in-service date would postpone the timing of the economic and reliability benefits that New Scotland-Leeds-Pleasant Valley will provide, i.e., in the absence of the proposed line, system congestion would be expected to continue and the goals of the Blueprint would not be achieved.

4. SYSTEM STUDIES

NAT has initiated the Feasibility Study phase for New Scotland-Leeds-Pleasant Valley with NYISO. The Project maintains queue position #414 in the NYISO Interconnection Queue. The System Reliability Impact Study ("SRIS") will follow after the Feasibility Study is complete.

Based on NYISO's Large Facilities Interconnection Procedure ("LFIP"), NAT signed a Feasibility Study Agreement with NYISO and the interconnection transmission operators. The study deposit has been furnished and the Feasibility Study is in progress. The results of the Feasibility Study may be available for initial review as soon as November 2013 and the SIS phase will then commence. The findings of the SRIS will be presented in the Part B submittal to fully satisfy the requirement to provide appropriate system studies, showing expected flows on the line under normal, peak and emergency conditions, including the system reliability impact study forwarded by the Transmission Planning Advisory Subcommittee for approval by the operating committee of the New York Independent System Operator, which shows effects on stability of the interconnected system.

5. COMPATIBILITY OF PROPOSED FACILITY WITH GOALS AND BENEFITS TO RATEPAYERS IDENTIFIED IN THE BLUEPRINT (PROCEDURAL ORDER, APPENDIX B AT 3)

The proposed Project is consistent with the goals set forth in the Blueprint and would bring significant benefits to ratepayers. This subsection details the compatibility of the proposed Project with the goals and benefits to ratepayers identified in the Blueprint.

5.1 CONGESTION RELIEF

NAT's New Scotland – Leeds – Pleasant Valley line will provide tremendous congestion relief benefit across the Leeds – Pleasant Valley and Central East transmission paths, identified by the NYISO as the most constrained in NYCA as part of the Congestion Assessment and Resource Integration Study ("CARIS"). An assessment of congestions

costs in the future years completed as part of 2013 CARIS Phase 1 Study, shows that the Central East transmission path will continue to be congested with the Demand$ Congestion increasing for each of the study years through 2022. Together, the Leeds Pleasant Valley and the Central East continue to be most congested transmission paths in NYCA in the future years as indicated by the latest 2013 CARIS. From 2008 through 2012, these two paths have shown a cumulative Demand$ Congestion[1] of $2.75 billion and $1.35 billion.[2]

The NYISO CARIS identified that a 345 kV transmission line between New Scotland and Pleasant Valley 345 kV substations will completely eliminate Demand$ Congestion along the highly congested Leeds Pleasant valley transmission path.[3] NAT's New Scotland – Leeds – Pleasant Valley will provide very similar results as the New Scotland – Pleasant Valley 345 kV line solution studied by the NYISO during 2013 CARIS. The NAT proposed line should completely eliminate congestion along the New Scotland – Pleasant Valley transmission path as well provide a significant reduction in the Demand$ Congestion along the Central East transmission path. Elimination of congestion along the New Scotland – Pleasant Valley transmission corridor will allow Downstate loads to better access the Upstate generation and economic imports of cheaper energy from outside the NYCA.

NAT's New Scotland – Leeds – Pleasant Valley 345 kV line will also provide incremental savings across additional cost metrics which will lead to direct cost savings for electric energy consumers on NYCA. These metrics include Load Payments, Export Payments, Transmission Congestion Cost Payments, and Losses Costs[4].

New Scotland-Pleasant Valley will provide greater benefits in conjunction with the Edic-Fraser transmission line. The cumulative impact of the Project, along with portfolios in combination with elements of other proposals (such as TOTS) should be evaluated in the comparative evaluation on the common record.

5.2 ENHANCED SYSTEM RELIABILITY

NAT's proposed Project is comprised of the New Scotland-Leeds-Pleasant Valley transmission line and the Edic-Fraser transmission line described separately in this Initial (Part A) Application. NAT's Project will integrate directly into the backbone 345 kV transmission system in New York State and significantly enhance the goal of long-term electric system reliability, a high-priority goal identified in the Blueprint. The NAT

[1] "Demand$ Congestion is the measure of the congestion component of Locational Based Marginal Price (LBMP) and its impact on NYCA load. It represents the cost of congestion to consumers." 2013 CARIS Phase 1 draft report, p. 14

[2] Ibid, p. 47.

[3] Ibid, p. 59.

[4] 2013 CARIS Phase 1 draft report, p. 64

Project will provide significant increases in the power transfer capability of at least three major interfaces in New York, namely UPNY-SENY, Central-East, and Total-East. UPNY-SENY and Central-East have been identified by the NYISO as the most congested interfaces in New York State. The NAT proposed Project will add a combination of new transmission lines totaling over 1,000 MW of transmission capacity under normal operating conditions. NAT's Project will provide the following additional reliability benefits to New York's electric transmission system:

(1) Mitigate any reliability based shortcoming which may prevent increased energy transfers to downstate New York loads due changes on transmission topology or generation profile in the state.

(2) An incremental transfer capability of at least 1 gigaWatt ("GW") on the UPNY-SENY interface and a significant increase in transfer capability of Central-East and Total-East interfaces. This increase in transfer limit of critical interfaces will lead to more reliable and flexible operation of the New York State electric transmission system during normal and contingency conditions. Electric system operators will be able to reliably operate the New York State electric system during extreme events such as unusual weather conditions, fuel shortages, or multiple generation and transmission outages. Increase in transmission capability will also provide economic benefit by reducing service curtailments and other possible high-cost outcomes during extreme system conditions.

(3) Increased transmission capacity, provided by NAT's Project, across major interfaces will reduce the need for local reserve margins in pockets of New York transmission system, thereby providing enhanced reliability in cases where energy imports are constrained and energy reserve margins are depleting due to changing system conditions.

(4) Increased transmission capacity will also provide electric transmission planners the ability to plan for generation retirements well in advance of such events and without opting for expensive contingency plans like Reliability Must Run ("RMR") contracts and other ancillary service payments.

The increased reliability of the New York electric system will provide economic development benefits by improving operations of existing commercial and industrial customers as well attracting new customers to New York.

5.3 FLEXIBILITY

NAT is proposing a 345 kV AC transmission Project to accomplish the goals of the Blueprint. NAT's Project will provide a robust transmission link between upstate New York, where clean and renewable energy has most potential, to downstate New York, where the largest demand for this energy resource lies. Since all the proposed lines will operate at 345 kV, the Project will seamlessly integrate with the backbone 345 kV

transmission network in New York State. Below are some of the benefits that NAT's Project will deliver to enhance the flexibility of the New York Control Area (NYCA) electric transmission system:

1. In addition to significant congestion relief, NAT's proposed Project of AC transmission lines will boost flexibility for New York State to plan for the entry and exit of generation and transmission.
2. The AC option will allow easier interconnection of renewable and conventional generation anywhere along the length of the proposed lines as well as more flexible dispatch of existing upstate generation.
3. NAT's proposed expansion of the AC transmission system in New York will allow New York State to better address future generation retirements.
4. Expansion of the AC transmission system will allow better flexibility to remove other older elements from operations for reconductoring or reconditioning.
5. Expansion of the AC system will also allow for the better management of the statewide electric grid during contingency conditions when other elements of the transmission grid may be out of service. Response time to emergencies is also expected to be lower in the case of AC transmission systems.
6. NAT's Project is proposed to be built on independent structures, providing New York electric grid operators maximum flexibility to operate these lines for maintenance during scheduled and unscheduled outage periods. The support structures used will be monopole steel structures, and if directed by the Commission, the lines will be designed and constructed for future double circuit capability. This will provide the opportunity to further increase transmission capacity between upstate and downstate New York at low cost with only minimal additional public or environmental impact.

During construction, NAT proposes to build its Project in a phased manner. To provide maximum flexibility for system-wide benefit, NAT will work with the NYISO and where possible, components of the NAT Project (including the Project) will be energized as they complete construction. This phased approach to construction and energization will enable the NAT Project to provide increased capacity and energy deliverability earlier in the program life-cycle, compared to energizing the components of the Project after the entire Project has been constructed.

5.4 EFFICIENCY

The proposed NAT Project will lead to significant production cost savings by replacing more expensive energy produced by generators located in downstate New York with more cost-effective, renewable, and more abundant sources of energy in upstate New York.

The NAT Project will enable reduced operation of less efficient, higher heat rate generation in the State in favor of higher efficiency generating units. This will also lead

to significant savings in the payments made by New York State customers for the electric energy they use due to the increased access to more efficient and cheaper sources of energy in Upstate New York. NAT's proposed transmission lines will also decrease the impedance on the critical New York transmission paths due to the addition of new transmission lines. This expected to reduce the overall system losses by over 66 MW, thereby reducing fuel consumption and associated air emissions, particularly oxides of nitrogen (NOX), particulate matter, and carbon dioxide (CO2).

5.5 REDUCED ENVIRONMENTAL IMPACT: GHG AND REGIONAL AIR POLLUTION AND EMISSION REDUCTIONS

One goal of the AC transmission upgrade initiative under the Blueprint is to reduce environmental impacts by relieving congestion and allowing a more efficient portfolio of generating resources, including renewables from upstate New York, to serve downstate areas. These principles are explained in the Blueprint as follows:

> "Congestion can have adverse environmental and economic consequences when older plants in urban areas run more frequently than they otherwise would if power from other sources of energy could reach these areas. The Energy Highway Blueprint addresses the challenges of a congested transmission system by calling for the upgrade of existing lines and the building of new lines following existing rights-of-way."[5]

> "These targeted upgrades of the AC transmission system can strengthen the statewide power grid and provide significant reductions in nitrogen oxide (NOX) and particulate matter emissions in the downstate region. The reduction of those emissions are particularly important because the downstate region is designated nonattainment for the federal air quality standard for ozone, and NOX emissions contribute to those elevated ozone levels."[6]

These goals are also reflected in the Procedural Order, where the Commission stated the following with regards to the expected environmental benefits of the AC transmission upgrades:

> "As we identified in undertaking this effort, upgrading this section of the transmission system has the potential to bring a number of benefits to New York's ratepayers. These include the near-term benefits of enhanced system

[5] New York Energy Highway Task Force, *New York Energy Highway Blueprint*, p. 38, October 22, 2012, http://www.nyenergyhighway.com/PDFs/BluePrint/EHBPPT/ (accessed August 20, 2013).

[6] Ibid., pp. 41-42.

reliability, flexibility, and efficiency, reduced environmental and health impacts through reduced downstate emissions…"[7]

The following subsections describe the greenhouse gas (GHG) and regional air pollution emission reductions expected to occur as a result of implementation of NAT's Project of AC transmission upgrades.

5.5.1 REDUCED ENVIRONMENTAL IMPACT: GHG AND REGIONAL AIR POLLUTION AND EMISSION REDUCTIONS

As described in the Blueprint and Procedural Order, it is expected that the congestion relief provided by NAT's Project of AC transmission upgrades will allow for reduced operation of older power plants in urban (e.g., downstate) areas, and reduced downstate emissions. The result would be lower overall emissions of GHG to the atmosphere.

These reductions in greenhouse gases would be expected due to the lower GHG emission rates associated with upstate generating resources, when compared with those in downstate areas. To illustrate this point, Table 5-1 and Figure 5-1 below compare the carbon dioxide ("CO2", the primary greenhouse gas) emission rates between upstate and downstate areas, based on information available from the U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID).

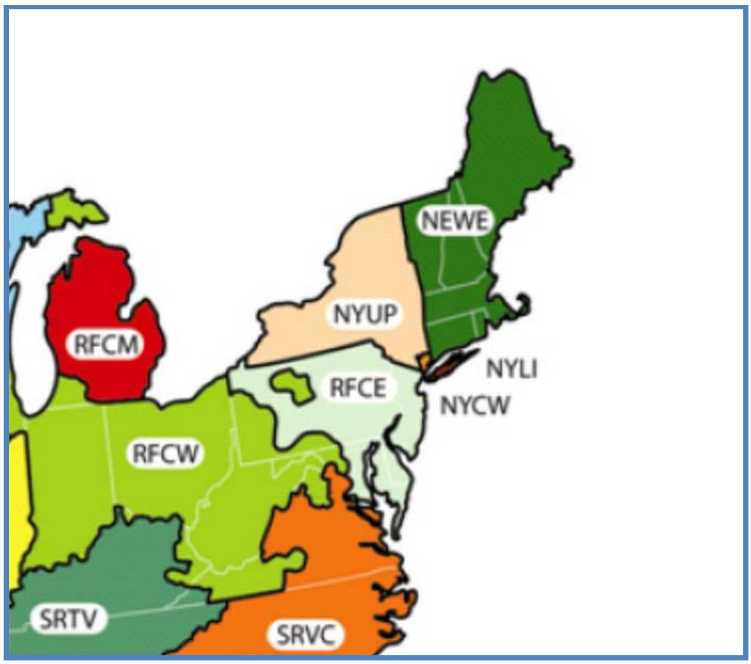
TABLE 5-1. CO2 EMISSION RATE COMPARISON FOR NEW YORK REGIONS

eGrid Sub-Region	Upstate/Downstate	CO2 Emission Rate (pounds/MW-hour)
NPUP Upstate NY	Upstate	721
NPCW NYC/Westchester	Downstate	815
NPLI Long Island	Downstate	1,537

Source: U.S. EPA, Emissions & Generation Resource Integrated Database (eGRID), http://cfpub.epa.gov/egridweb/ghg.cfm, accessed September 16, 2013.

[7] New York State Public Service Commission, Case 12-T-0502, Proceeding on Motion of the Commission to Examine Alternating Current Transmission Upgrades, *Order Establishing Procedures for Joint Review Under Article VII of the Public Service Law and Approving Rule Changes*, pp. 1-2, April 22, 2013.

FIGURE 5-1. EPA EGRID MAP – NORTHEAST UNITES STATES



Source: U.S. EPA, Emissions & Generation Resource Integrated Database (eGRID), http://cfpub.epa.gov/egridweb/ghg.cfm, accessed September 16, 2013.

As shown in Table 5-1, based on the U.S. EPA eGRID data, CO2 emission rates in upstate New York are significantly lower than those in downstate areas, ranging from approximately 12% lower to 53% lower, depending on the downstate sub-region evaluated. Consequently, it is anticipated that the Project will achieve GHG emission reductions by relieving congestion between upstate and downstate areas. The degree of anticipated reductions for the proposed Project will be estimated in the Part B application based on power flow, dispatch, and emissions predictions contained in the final SRIS study results.

5.5.2 REGIONAL AIR POLLUTION AND EMISSION REDUCTION: HEALTH BENEFITS

As described in the Blueprint, health benefits are expected to result from decreased emissions of NOX and particulate matter and decreased formation of ground-level ozone caused by NOX emissions reductions. The potential health benefits of such emissions reductions are listed in Table 5-2, based on information from U.S. EPA.

TABLE 5-2. POTENTIAL HEALTH BENEFITS OF EMISSION REDUCTIONS

Pollutant	Potential Health Benefits: Anticipated Reduced Incidence of Symptoms Due to Lower Ambient Pollutant Concentrations
NOX [1]	Airway inflammation in healthy people, increased respiratory symptoms in people with asthma, increased visits to emergency departments and hospital admissions for respiratory issues, especially asthma.
Particulate Matter [2]	Premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing
Ozone [3]	Chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground level ozone also can reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue.

Notes:

(1) U.S. EPA, Nitrogen Dioxide Health, http://www.epa.gov/airquality/nitrogenoxides/health.html, accessed September 16, 2013.

(2) U.S. EPA, Particulate Matter (PM) Health, http://www.epa.gov/airquality/particlepollution/health.html, accessed September 16, 2013.

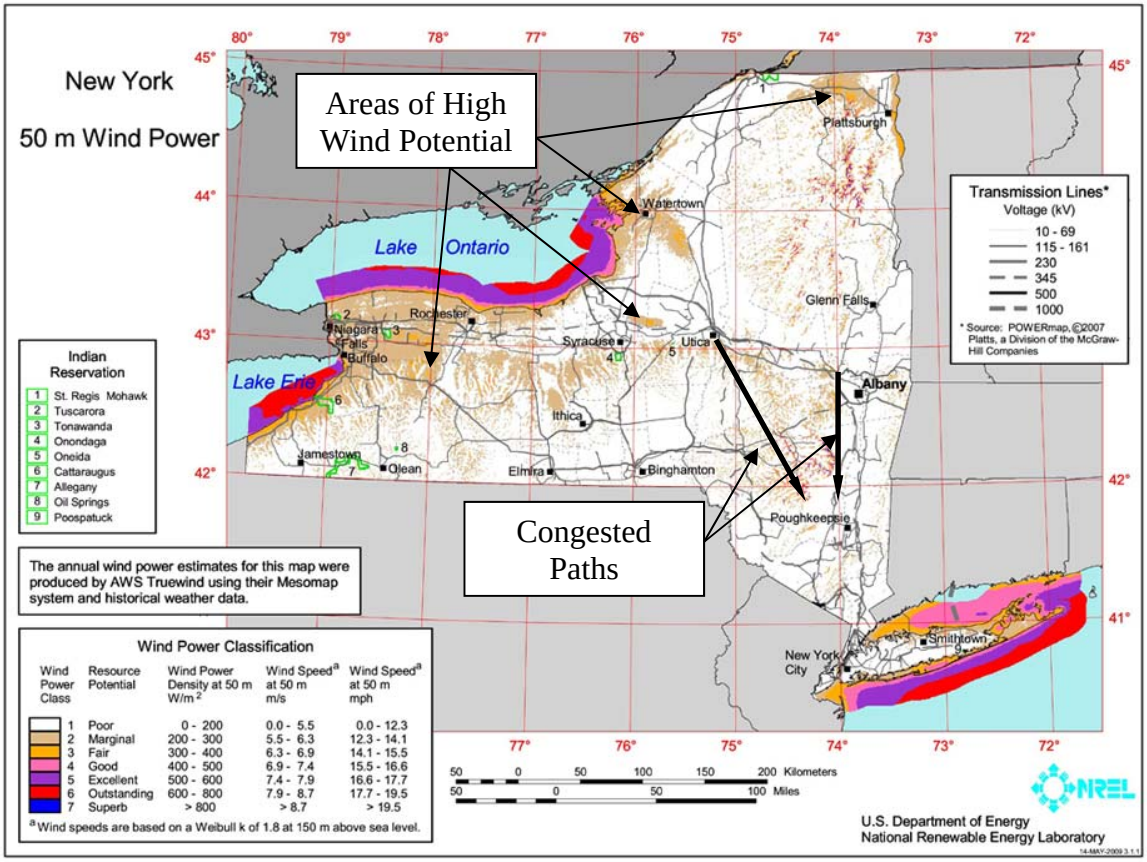
(3) U.S. EPA, Ground Level Ozone, http://www.epa.gov/glo/index.html, accessed September 16, 2013.

As shown in Table 5-2, a variety of respiratory health benefits would be expected to result from reductions in ambient concentrations of NOX, particulate matter, and ozone. Projects that result in lower ambient concentrations of these pollutants (e.g., the AC transmission upgrades) would therefore be expected to contribute to the health benefits listed above. The degree of NOX and particulate matter emissions reductions associated with the proposed Project will be estimated in the Part B application based on power flow, dispatch, and emissions predictions contained in the final SRIS study results.

5.6 INCREASED DIVERSITY IN SUPPLY

The congestion on the existing transmission system identified in the Blueprint does not just translate into higher costs for current ratepayers, it also limits the dispatch of new resources within New York State, particularly wind energy. The map below identifies the wind energy potential in New York, and it can be seen that the areas of highest land-based wind potential match very closely with the areas of existing generation excess. Therefore the congestion relief from the Project and its components can also help diversify the generation supply in New York State through the delivery of more wind energy, once new wind generation is efficiently interconnected to the grid.

FIGURE 5-2. WIND POWER POTENTIAL AND CONGESTION IN NEW YORK



5.7 LONG-TERM BENEFITS

The Project is expected to bring significant long-term benefits, including, but not limited to: job growth, development of efficient new generating resources at lower cost in upstate areas and mitigation of reliability problems that may arise with expected generator retirements. Per the Procedural Order, those benefits are detailed in the subsections below.

5.7.1 JOB GROWTH

The Project and its related congestion relief and incremental transmission capacity can lead to job growth in several different ways. There are direct and indirect construction impacts from the Project. There could also be direct and indirect construction impacts from generation capacity which would benefit from the Project, including existing generation capacity employment that could be preserved and future employment associated with construction and operation of new generation. Finally, there is the opportunity for increased

employment indirectly due to the lower costs to businesses in New York State through congestion relief, and the associated economic development impact. NAT has only attempted to quantify the job growth impacts related to the construction activities for the project.

While an economic impact study for New-Scotland-Leeds-Pleasant Valley has not been completed, an Economic Impact Study for the Edic-Fraser Project component was completed by Appleseed, included as Attachment A to the Scoping Statement and Schedule for the Edic-Fraser Component, submitted herewith. Assuming that job growth is approximately proportional to total capital investment associated with the transmission line (refer to Exhibit 9 information for each Project component for estimated capital costs), the anticipated job growth associated with New-Scotland-Leeds-Pleasant Valley would be approximately 510 person-years of employment.

5.7.2 Development of Efficient New Generating Resources at Lower Cost in Upstate Areas

It is widely recognized that most costs are higher in the New York Metropolitan Statistical Area, recognized in various cost indexes. The NYISO recognizes this effect in the Cost of New Entry (CONE), which indicates the estimated cost of new construction for new generation resources. The NYISO defined CONE in New York City and Long Island is $247 per kW per year and $197 per kW per year and the CONE for Upstate areas of NY State is $111 per kW per year.[8] However, transmission capacity limits the ability to site new lower-cost generation resources in upstate areas. New transmission capacity can enable this generation, which would create a cost savings. Ratepayers in all zones of New York State would benefit from the addition of new, relatively low cost capacity. However, calculating this cost savings is complex.

A simple back-of-the-envelope calculation would be that if a new generation resource could be constructed in upstate areas at a lower cost, the savings would be at least $86 per kW per year, or $86 million per year for a 1,000 MW generator. NAT's proposed Project will foster such savings by facilitating development of lower cost generation in Upstate NY, the benefits of which can be passed on to load customers across all load zones in NY.

5.7.3 Mitigation of Reliability Problems that May Arise with Expected Generator Retirements

Electricity generation capacity and electricity demand in New York State is out of balance. Approximately 2/3 of the electricity demand is in Zones G-K but approximately ½ of the electricity supply is in Zones A-F. While the current

[8] 2012 NYISO State of the Market Report

transmission system has been designed to account for this relative imbalance, there is still significant congestion in the state due to this relative imbalance. This imbalance would be made much worse with potential generation retirements in Zones G-K. NAT's proposed Project will reinforce the NY State transmission system by providing a strong transmission link between downstate NY load centers and upstate NY. The thermal and voltage transfer capability across major NYCA interfaces, that NAT's Project will increase, will mitigate reliability related problems that may develop due to potential generator retirements. A stronger NY transmission system will also facilitate generator retirements without compromising reliability due to its ability to supply energy from geographically diverse generators into load pockets where generators may retire over the future years. A strong transmission system may also foster additional imports of energy from neighboring areas which will be able to replace energy produced by retiring generators and mitigate reliability shortcomings that may develop due to such retirements.