Pterra Consulting

R127-06 Expert Report

On Designation of National Corridors

Prepared for

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Contents

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Section 1. Introduction

Pterra, LLC ("Pterra") was contracted by Gilberti Stinziano Heintz & Smith, P.C. to conduct a technical assessment of the National Electric Transmission Congestion Study ("Congestion Study" or "reference 1") and proposed designation of National Interest Electric Transmission Corridors ("National Corridors") by the Department of Energy ("DOE"), and the application for early designation as a National Corridor by New York Regional Interconnect, Inc. ("NYRI"). The specific respondents to this work are Ricardo Austria and Ramon Tapia.

Using available study references and within the time permitted for comment by DOE, Pterra conducted a technical assessment of the report identified as Reference 1 (see Section 1.2), and herein provide comments as solicited therein. Because of the restricted time frame for response, this assessment is necessarily of qualitative nature.

We conducted a technical assessment of the application of NYRI for designation as a national interest electric transmission corridor ("NIETC"), and herein provide comments based on the applicability of the concepts developed in the Report.

1.1. This Report

This report presents the results of our assessment. Section 2 presents our comments on the Congestion Study and designation of National Corridors, including the technical bases for the comments. Section 3 presents our comments on the NYRI Application for early designation as a national corridor.

1.2. References

The following documents are used in this report as references:

1. "National Electric Transmission Congestion Study," United States Department of Energy, August 2006.
2. "Public Technical Conference on DOE Congestion Study and Criteria for Designation of National Interest Electric Transmission Corridors," presentation material, March 26, 2006.
3. "The Comprehensive Reliability Plan 2005: A Long-Term Reliability Assessment of New York's Power System," New York Independent System Operator, August 22, 2006.
4. "System Reliability Assurance Study," Consolidated Edison Company of New York, Inc., New York, December 30, 2005.
5. New York City Energy Policy: An Electricity Resource Roadmap, prepared by the New York City Energy policy Task Force, January 2004 (update June 2006).

6. “Request for Early Designation of Constrained Area as National Interest Electric Transmission Corridor,” letter to the Office of Electricity Delivery and Energy Reliability, US Department of Energy, New York Regional Interconnect, Inc., March 6, 2006.

7. NYRI Article VII Application filed with New York State Public Service Commission, May 31, 2006.

Section 2. Comments on the Designation of National Corridors

This section presents our technical comments on the designation of National Corridors and on the supporting DOE study to identify such corridors (as documented in Reference 1 of Section 1.2). The comments are organized by topic and address the specific discussion items given in the form of questions in Section 6 of reference 1. By the nature of our assignment, we focus on Metropolitan New York congestion.

2.1. Comments on the Designation of National Corridors

Our comments presented in this section respond to Section 6 of Reference 1, which is a request for comments on the designation of National Corridors and on the study conducted by DOE to identify areas of congestion. Our comments address the three main questions of the request for comments.

> Question 1: Would designation of one or more National Corridors in these areas be appropriate and in the public interest?
>
> Question 2: How and where should DOE establish the geographic boundaries for a National Corridor?
>
> Question 3: How would the costs of a proposed transmission facility be allocated?

Furthermore, our comments are based on a technical assessment of material identified in the References (Section 1.2) and are not intended as interpretation of statute nor interpreted for any other purpose than the technical basis provided in the following subsection (Section 2.2.1).

Pterra Comment 1:

> The designation of a National Corridor does not lead to the best solution to congestion. The designation may, in fact, lead to the preference for non-optimal solutions to the transmission congestion problem. In this sense, the designation of National Corridors is not appropriate and is not in the public interest.
>
> The set of possible solutions to a congestion problem comprise of both transmission and non-transmission options. Furthermore, the solutions come from a variety of public, private regulated and private unregulated entities that are not subject to a central planning process for identifying and implementing congestion solutions, but whose individual project investments are in response to price signals from a competitive electric energy market. Designating a National Corridor gives preference to a specific transmission solution over alternatives that may provide more economic and reliable relief of congestion.

Pterra Comment 2:

Even considering transmission only solutions, the designation of a National Corridor to relieve a congestion problem does not provide the incentive for the most economic and reliable transmission solution. This comment applies to three possible ways of defining a National Corridor.

Firstly, where numerous transmission solutions are possible, the National Corridor may be designated as a broad geographic area to encompass all the transmission solutions. In the case of the metropolitan New York congestion, this geographical area would include the whole state of New York and neighboring states. In such a broad geographical area, not all transmission projects lead to relief of congestion.

Secondly, if a National Corridor is narrowly defined around the centerline of a specific transmission project, that transmission project is given an advantage over other transmission projects that may resolve the same congestion, without a comprehensive assessment of economic benefit and impact on reliability.

Thirdly, if the National Corridor were defined to be broader than the width of a potential project but less than the geographic region that spans all possible rights-of-way for a transmission solution, the transmission projects that fall within this definition of corridor are given an advantage over transmission projects that are not within the corridor, without a comprehensive assessment of economic benefit and impact on reliability.

Pterra Comment 3:

The designation of National Corridors may only be appropriate as an indicator of the presence of congestion.

Pterra Comment 4:

The cost of a transmission line built to relieve congestions should be carried by the receiving side of the line.

2.2. Technical Discussion

2.2.1. New York Congestion

The existing transmission congestion to serve the New York City and Long Island load is evidenced by the typically higher zonal energy prices in those areas with respect to the prices in other New York state zones. A snapshot of day ahead market prices in selected New York load zones for 7:37 PM on October 9, 2006 is shown in Figure 2-1. The figure shows energy prices of $70.86 per kilowatt-hour (kwh) for New York City (labeled as “NYC-J – DAM”) and $73.32 per kwh for Long Island (labeled as “Long Isl-K – DAM”). Both prices are higher than for any of the other New York load zones shown.

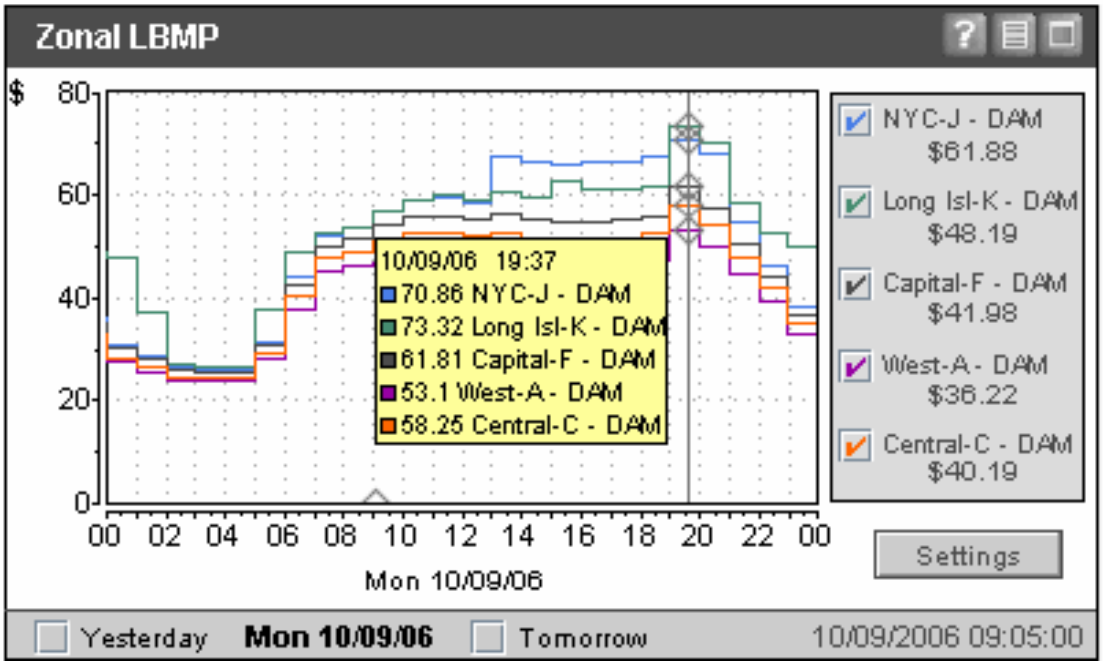

Figure 2-1: Sample Energy Prices in New York. (Day ahead market for 19:37 hrs, 10/9/2006). Source: NYISO website, http://www.nyiso.com/public/market_data/graphs.jsp.

However, for the issue of National Corridors, it is important to establish whether the congestion will continue into the future and if so, what is the extent of the congestion? Studies disagree on whether the New York congestion will continue for the next few years.

- Reference 1 identifies the Metropolitan New York area, together with the Atlantic coastal area up to northern Virginia, as a Critical Congestion Area. The Report bases this assessment on simulations of 2008 and 2011 conditions that indicate one or more of the following: a large number of hours when constraints into the area are binding, or are within 10% of binding, have interfaces that have high shadow prices and have congestion rents, under scenarios of varying fuel prices. The designation of Metropolitan New York as a Critical Congestion Area indicates that congestion was found in the 2008 and 2011 study years.

- In reference 3, the NYISO reports that there is sufficient development of projects to ensure a reliable New York energy supply up to the year 2014. The NYISO analysis takes into account projects already in the pipeline from transmission owners and merchant developers. Transmission owners' plans for the period 2006-2010 consists of Demand-Side Management in New York City of 340 MW and in Long Island of 109 MW, and Con Edison's 345 kV M29 project from Sprainbrook 345 kV to Sherman Creek 345 kV. A merchant project to connect PJM to Long Island via a high voltage direct current ("HVDC") transmission line with 660 MW capacity is also considered. New generation projects include the 326 MW Caithness project and 140 MW Florida

Power and Light Energy Off-shore wind farm project, both in Long Island, the deferred retirement of the New York Power Authority's Charles A. Poletti generating unit in New York City from 2008 until 2009, and New York Power Authority's Request for Proposals for 500 MW in 2011[1].

- In reference 2, Con Edison reports that no new resources into New York City and Long Island are required until 2012. A demand side management initiative adopted by Con Edison in its electric rate case would defer the date when New York City will need new resources to 2014.

The differences in the assessment of the above references reflect the differences in assumptions in system modeling, methodology and more importantly, in assumed generation, transmission and demand side management projects to be constructed up to 2014. Reference 1 appears to be based on outdated information and therefore presents potentially faulty conclusions.

Based on references 1 and 3, the nature of the Metropolitan New York Congestion may be described as a variegated load pocket with end points in the New York City and Long Island areas and spreading out in diminishing degrees to neighboring areas within New York State. This is illustrated by the set of constrained interfaces that mark out the general boundaries of the state's LMP zones shown in Figure 2-2. The arrows in the figure pointing in a single direction are internal constrained interfaces. The direction of the arrows indicates the direction of the flow of power that is constrained by equipment limitations and/or reliability criteria. (Note the external interfaces are indicated by double arrows pointing in opposing directions. These are inter-ISO or inter-RTO flows that may go in either direction shown, primarily monitored for energy transactions.) If we follow the general trend of the arrows, power flow within New York State is from north across the Moses South interface and from the west across the Dysinger East and West Central interfaces. Power flow across Central East and Total East is constrained in the eastern direction, and further power flow going south is constrained across the UPNY-ConEd (Upstate New York – Con Edison) and NYC Cable interfaces into the load pockets in New York City and Long Island.

Congestion is associated with the transmission access to the load pockets, and hence the last two interfaces UPNY-Coned and NYC Cable are the congested paths. This is clearly supported by the present New York energy market experience wherein these two load pockets show the highest energy cost of all the New York load zones.

[1] Merchant solutions for the period 2011-2015, according to the aforementioned NYISO report consist of 400 MW proposed power plant from NRG Power Marketing, Inc. to be installed in New York City, 550 MW proposed by KeySpan Ravenswood, LLC to be installed in New York City and a 250 MW also proposed by KeySpan Ravenswood, LLC to be installed in Long Island. Though these projects may be at risk of developing further, the NYPA RFP is assumed to enable adequate response for merchant development.

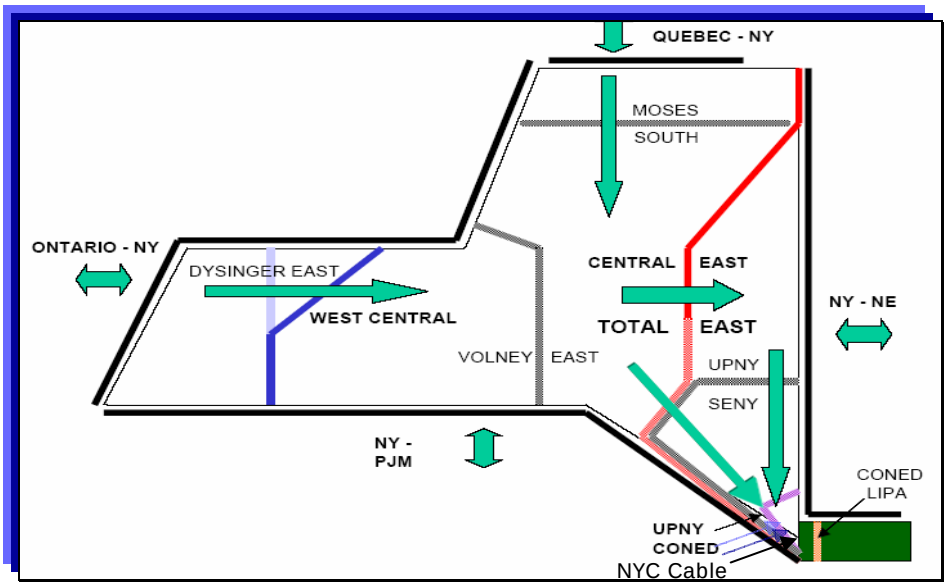

Figure 2-2: Constrained Interfaces in New York

The constrained interfaces impact the energy market by causing energy prices to differentiate across interfaces. The set of constrained interfaces in New York thus define the boundaries for price or load zones. New York's load zones are shown in Figure 2-3.

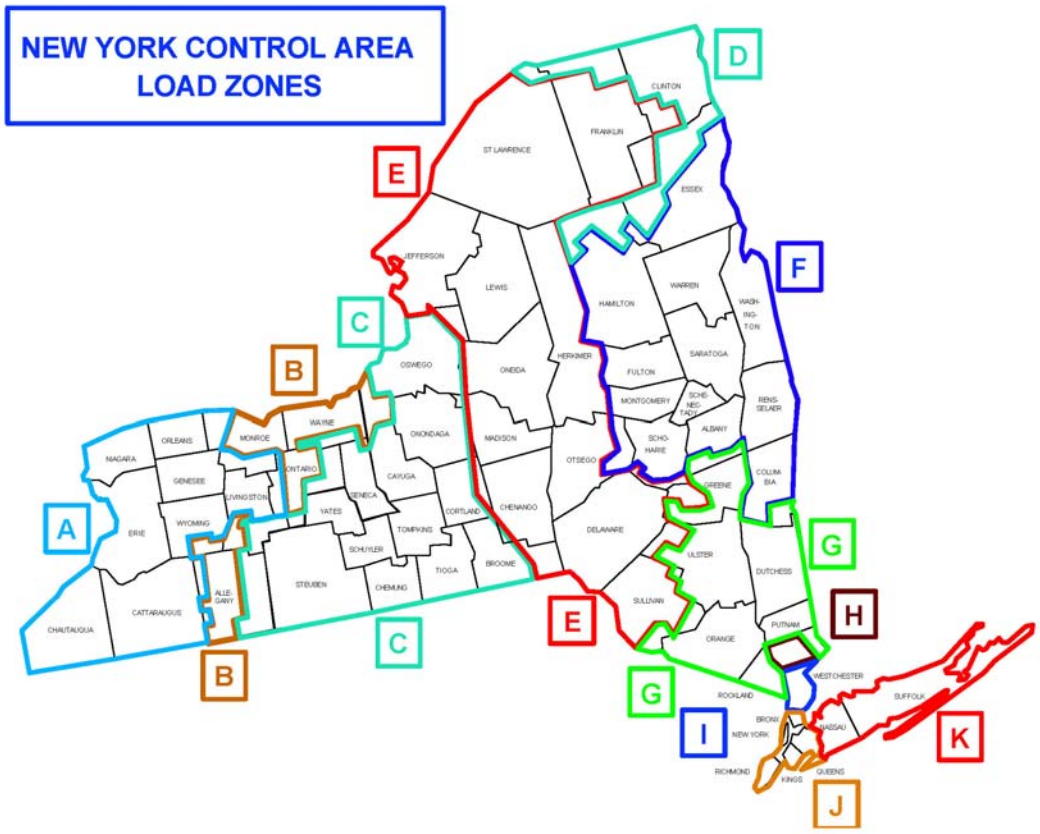

Figure 2-3: New York Load Zones. (New York City is zone J and Long Island is zone K). Source: New York ISO.

Congestion presents a form of transmission planning problem in which transmission additions or reinforcements are not the only solution. Because there is a supply cost aspect to the congestion problem, the solution involves lower priced generation being developed at the load pocket. Demand reduction is also an alternative to resolving congestion.

Hence, the solution to the Metropolitan New York Congestion problem is a complex combination of the following:

- Transmission reinforcement into zones J and K
- New generation in the load pockets
- Demand side options in the load pockets

In addition, the combined solution is a moving target. There is no single provider for the solutions. New generation may be constructed by merchant developers, new transmission lines by regulated utilities and merchant developers, and demand side management by utilities and load serving entities. Additionally, the private entities in this list, whether regulated or unregulated, are not subject to a central planning process for identifying and implementing congestion solutions, thus, their individual

project investments are in response to price signals from the competitive electric energy market.

2.2.2. Transmission Solutions to New York Congestion

As discussed in the previous section, a transmission solution to a congestion problem is just one option to compete with local supply or local demand alternatives. The transmission solution itself may come from several transmission alternatives or combinations thereof.

Reference 1 recognizes that the solution to congestion is not necessarily a reinforcement of the constrained facility[2]. We note that the solution may also not necessarily involve reinforcement at the limiting contingency, but may involve a completely new point-to-point connection.

For example, to relieve the New York congestion with a transmission solution, we can identify the following options:

- A new transmission line from anywhere north into either the load pockets of New York City or Long Island. The route of this transmission line may be:
- Albany to New York City as a 200-mile HVDC line, as proposed in the Conjunction Empire interconnection project[3]
- Hydro Quebec to Long Island via a 400-mile HVDC line along the eastern border of New York state
- A short line from Westchester just north of the City into New York City, as proposed in the M29 project
- A new transmission line from New Jersey to New York City or Long Island, as proposed in the Neptune project[4] and in the Cross-Hudson line[5]
- A new transmission line across Long Island Sound from New England to Long Island
- A new transmission line from Pennsylvania into Southeast New York

The benefit of a transmission solution to congestion derives not from the path or routing, but from the point-to-point connection it provides. In the highly-meshed network of the Northeast, and New York in particular, there are many different and innovative transmission solutions that may be feasible.

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[2] Report, p. 5.

[3] The Conjunction project consisted of a 1,000 MW, +/- 500 kV bipole interconnection from a new substation, near the New Scotland 345 kV substation, on the New Scotland 345 kV to Alps 345 kV line to Con Edison's West 49th Street 345 kV substation and a 1,000 MW, +/- 500 kV bipole interconnection from a new substation, near the Leeds 345 kV substation, on the Leeds 345 kV to Gilboa 345 kV line, to Con Edison's Rainey 345 kV substation. Though the developer has backed out of this project, it remains an approved interconnection with the NYISO.

[4] The Neptune project consists of an installation of an approximately 600 MW 500 kV HVDC underwater transmission cable that will extend from the GPU/First Energy, Inc. substation in Sayreville, New Jersey to the Long Island Power Authority (LIPA) Newbridge Road 138 kV substation in Levittown, Long Island. The longest portion of the route-more than 50 miles- is underwater in the New York Harbor and the Atlantic Ocean; 14 miles will be buried in the existing right-of-way of the Wantagh State Parkway.

[5] This project was fully approved by the NYISO and the New York State Public Service Commission for 600 MW but the developer has not proceeded with the project. However, it remains an approved interconnection with the NYISO.

Each of the transmission options offer a distinct characteristic of reliability and cost which lead to reducing congestion. The assessment to compare and select transmission projects with the objective of reducing congestion to an acceptable level has not been undertaken in any of the references[6].

Transmission projects taken one at a time would show different impacts versus a long-term plan involving several projects acting together. Singling out projects as an optimal solution is not consistent with the nature of transmission systems.

The set of transmission projects to select the best plan to address congestion in Metropolitan New York cover areas that include all of New York state, as well as Connecticut, New Jersey and Pennsylvania. Given that the point-to-point connection of each transmission project may be a complex path that is yet to be determined, the geographical region defined by this set of solutions is quite broad, encompassing and extending beyond the boundaries of New York State. This is so broad in fact that defining the problem by geographically defining the set of possible solutions makes the designation meaningless.

2.2.3. National Corridors

On the matter of National Corridors, we have two key technical points to make.

Point 1: The designation of National Corridors pre-determines a transmission solution to the congestion problem. The solution is in fact, as shown in Section 2.2.1, a complex combination of generation, demand side and transmission projects. The designation of a National Corridor may not lead to the best solution to congestion. The designation may, in fact, lead to non-optimal solutions to the transmission congestion problem.

In this sense, the designation of a National Corridor is not appropriate and is not in the public interest.

Point 2: If the desire is to seek a transmission option to be part of the complex solution described in Point 1 above, the designation of a National Corridor may lead to inequitable and sub-optimal results. We posit three mutually exclusive cases that may be used to designate a National Corridor, and discuss how each would lead to inequitable and sub-optimal results.

> Case 1: Where numerous transmission solutions are possible, the National Corridor may be designated as a broad geographic area to encompass all the transmission solutions. In Section 2.2.2, we identified the variety of transmission-based solutions to Metropolitan New York congestion, and the fact that the set of solutions cover a geographic area so broad, it covers all of New York State and neighboring states as well. If the area is so broad, why designate it at all? It does not provide the appropriate incentive to selectively identify transmission projects that relieve congestion since by making the

[6] The definition of this acceptable level is not specifically defined in reference 1. Conceivably, it is a level where the number of constrained events or cost or combination thereof are below specified thresholds.

corridor so broad numerous other projects that do not necessarily relieve congestion are included.

Case 2: A National Corridor is narrowly defined around the centerline of a specific transmission project. This designation gives an advantage to that transmission project over other transmission projects that may resolve the same congestion. Given that the congestion problem is a moving target (see Section 2.2.1), this designation restricts the solution and excludes others that may offer better cost and reliability benefits.

Case 3: A National Corridor is defined to be broader than the width of a potential project but less than the geographic region that spans all possible rights-of-way for a transmission solution. The transmission projects that fall within the designated corridor are given an advantage over transmission projects that are not within the corridor which may offer better cost and reliability benefits.

We conclude that the various ways to designate a National Corridor to identify a transmission solution to congestion lead to inequitable and sub-optimal results. The designation of National Corridors may be appropriate in the limited circumstance as an indicator of the presence of congestion. It is not technically appropriate to designate National Corridors by defining the problem (i.e., congestion) in terms of a particular solution (i.e., new transmission) without support that the chosen solution is the optimal one.

2.2.4. Allocating the Costs of Transmission

An assessment of the costs and benefits of new transmission in an energy market such as that which operates today in New York would require a detailed study involving transmission-based production simulation. Such a study would require use of software such as GE MAPS or Henwood Energy's production simulator conducted a period of months to a year. This type of study further requires an exhaustive development of models and review of input parameters that is not possible within the timeframe of response to the request for comments.

Without benefit of simulations, we offer the following general comments on cost.

- A new transmission line presents an additional cost in terms of its construction, operation and maintenance, and other external costs such as environmental and local adjustments along the right-of-way.
- The allocation of this cost should be allocated in accord with the benefits to specific classes of consumers.

Given that all perceived benefits are to the receiving end customers, the cost of new transmission should be carried by the receiving end customers.

Section 3. NYRI's Application for Early Designation

This section presents our technical comments on the NYRI Application (Reference 6 of Section 1.2), hereinafter, the "Application".

3.1. Overview of the Application

The Application is for designation of an HVDC transmission line project from Edic to Rock Tavern in New York as an NIETC. The project, developed by NYRI, purports to 1,200 MW and would connect New York load zones E and G.

The Application provides the following bases for designation an NIETC:

- Existing transmission constraints jeopardize reliable service in Southeastern New York ("SENY")
- Existing transmission constraints limit the flow of less expensive power into SENY
- The proposed transmission corridor will alleviate the existing constraints

3.2. New York Congestion as Addressed by the Application

With reference to the discussions in Section 2, we have the following observations regarding the Application.

1. The end point of the project is outside of the Congestion load zones of New York City (zone J) and Long Island (zone K). The Rock Tavern terminal of the project is in load zone G. There remains a significant congested interface between zone G and the New York load pocket in zone J, the NYC Cable interface.

   The analogy is the following: Say there that a water pipe from A to B has become too small for the flow demand of B. A proposed solution would connect a parallel pipe from A to a point just short of B. Though the solution would reduce the initial demand from point A, the congestion into B would still remain.

   Therefore, the project does not merit NIETC designation because it does not address the congestion.
2. Designation of the project as an NIETC would give preference over generation, demand side and alternative transmission options in zones J and K that may show better cost and reliability benefits than the project. (See text in Section 2.2.3).
3. Reference 1 is not a sufficient basis for designation. Other studies, such as those identified in references 3 and 4 offer refinements to the assumptions and come up with contrary conclusions regarding congestion in New York. References 3 and 4 offer local solutions for New York City and Long Island that are not taken into account in reference 1.

4. The project is completely within the jurisdiction of the NYISO and should first meet the reliability approval procedures of the NYISO before making any claims to reliability benefits. The project has not completed a System Reliability Impact Study ("SRIS"), a standard procedure for the NYISO to determine compliance with minimum interconnection standards for reliability. The SRIS will assist in evaluating any positive or negative impacts on the transfer capability of New York's internal interfaces and of interfaces between New York and other control areas.

   As an example, the impact of the contingency loss of the project, as required by reliability standards, on the transfer capability of the Central East interface could be a negative one and should be evaluated when conducting the SRIS.

   The DC terminal of the project is proposed to terminate in Central Hudson's Rock Tavern 345 kV substation which is located in a weak voltage area. DC terminals require strong reactive support in order to operate reliably. In addition, the injection of 1200 MW from NYRI into Zone G, where the Rock tavern 345 kV substation is located would impact the voltage profile if appropriate reactive support is not taken into consideration. The NYISO SRIS would assist in uncovering problems of this nature. The specifics of NYRI's application do not include details of complementary reactive support.

   The project could represent the single largest contingency (1200 MW) for the New York system. This would drastically change the rating bases for certain interfaces, not necessarily for the better.

   The reliability of the transmission system around the Edic 345 kV substation area to allow an increase of 1200 MW import has not been demonstrated.

5. The project starting at National Grid's Edic 345 kV substation will provide access for hydro capacity coming in from Canada. However, the western NY resources, including proposed wind projects, are not of sufficient magnitude to supply a significant portion of the 1200 MW total required by the NYRI project. Also, much of the proposed wind resources are west of the Dysinger East and Volney East interfaces and may be constrained from delivering power to the Edic terminal of the project. The Application also refers to hypothetical clean coal technology projects in the Western New York area which is not supported by applications for siting and studies of reliability impact assessment. Hence, the only credible energy resource for the NYRI project is the hydro generation from Canada. Designation of a National Corridor based on this sole resource may result in favoring a non-optimal solution over better options as presented in point 7 below.

6. Reference 3 from the NYISO specifically mentions that NYRI's project as an alternative regulated response is not needed for reliability.[7]

7. There are a number of other proposed projects that are designed to deliver power directly to the New York City or Long Island load pockets. Transmission examples include the Neptune and Conjunction[8] projects. There

[7] This observation is made on the assumption that the market solutions projects from 2011-2015 will materialize.

[8] See footnote 3 on p. 2.

is an application for early designation for the City of New York for a path from New Jersey to New York City. We note that this option has not been studied as extensively as other transmission options but could be meritorious because of the direct delivery to the load pocket and the access to generation development areas west of New York City. Another alternative project is the Cross-Hudson line. While the developer has not moved forward with construction, as mentioned earlier, the Cross-Hudson project is fully permitted by the NYISO and state agencies.

Based on the above comments and observations, we therefore conclude that there is no merit to NYRI application for designation as an NIETC.