

Supplement to the Application for a
Certificate of Environmental Compatibility
And Public Need

Case 03-T-1641
The Empire Connection Project

Volume 1 of 2

Submitted to: New York State Public Service Commission

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EXECUTIVE SUMMARY

Two Physically Separate Circuits

The November 17, 2003 application proposed "two physically separate direct current circuits". The independent 1,000-megawatt facilities were referred to as Circuit 1 and Circuit 2.

The application proposed that Upstate Converter Circuit 1 and Upstate Converter Circuit 2 be located at two different sites, indeed in two different counties, and interconnected at two different points in the upstate power grid, owned by two different utilities. The application also proposed that the Downstate Converter Circuit 1 and Downstate Converter Circuit 2 be located at two different sites, and interconnected at two different points in the downstate power grid.

The application further proposed that the transmission line of Circuit 1 and transmission line of Circuit 2 be physically separate. Although a large proportion of the route of the two circuits were proposed to be common to both, even along the common route Circuit 1 and Circuit 2 were to be separated within the route corridor.

This supplement to the November 17, 2003 application completes the required information on Circuit 1. Certification for this first 1,000-megawatt facility is requested.

Public Need for Circuit 1 Underscored

Timely certification will enable the completion of Circuit 1 by summer 2007, thereby meeting important public needs (improving the security of New York City's electric supply and lowering the electric bills of New Yorkers with minimal environmental impact of any kind). The public need for Circuit 1 was underscored by two recent developments.

In January 2004, the New York City Energy Policy Task Force published its report to New York City Mayor Michael R. Bloomberg. The report, entitled "New York City Energy Policy: An Electricity Resource Roadmap", identified a need for 2,605 megawatts of new electric resources for New York City, to be operational by the year 2008. Of this need, just 500 megawatts are under construction (the SCS Astoria Energy power plant), leaving a deficit of 2,105 megawatts. **Circuit 1 would fulfill 48 percent of New York City's remaining need.**

On June 4, 2004, the New York Power Authority published a request for proposals to provide new electric resources to New York City, to be operational by the year 2008, for a term of 20 years (through the year 2027). Conjunction plans to respond to this request and pledge to provide New York City with 1,000 megawatts of new electric resources, through the completion of Circuit 1, if Conjunction is awarded a contract by the New York Power Authority.

To Ensure Its Environmental Compatibility, Reconsideration of Circuit 2

With respect to the second facility proposed in the November 17, 2003 application, referred to as Circuit 2, Conjunction is reconsidering: (a) the route of this second facility, specifically in Westchester and Bronx counties, and (b) the location of Downstate Converter Circuit 2, to ensure this second facility's environmental compatibility. In particular, a more environmentally compatible location for Downstate Converter Circuit 2 is being sought by Conjunction. Therefore, certification for Circuit 2 is not requested at this time.

Approval by the New York Independent System Operator

The New York Independent System Operator approved the System Reliability Impact Study (SRIS) on March 18, 2004, without opposition. The approved SRIS is attached to this submittal.

To Ensure Its Environmental Compatibility, Enhancements to Circuit 1

Notably, this supplement clarifies that **Circuit 1 will be 100% solid cable**. For the entire distance, from one end to the other, solid cable will be buried underground (or much less commonly, attached to road structures, effectively hidden from view). Electric wires without insulation suspended in the air by prominent transmission poles and towers will not be used, making the proposed facility a model project in terms of environmental compatibility.

The completion of Circuit 1 will set a world record as the longest underground transmission line. This achievement will demonstrate to the domestic and international power industry that the public welcomes 100% solid cable transmission lines.

Additionally, Conjunction is committed to this model for Circuit 2. Both circuits would be effectively invisible over the entire course of their routes from upstate to downstate.

The commitment to 100% solid cable applies as well to Circuit 1's short-distance alternating current interconnection within New York City. As proposed in the November 17, 2003 application, the interconnection would extend to and interconnect at Consolidated Edison's Rainey substation in Queens County.

This interconnecting solid cable will not be laid underwater, avoiding the potential for environmental effects on the East River. Instead, this interconnecting solid cable will be buried underground as well, or attached to road structures or railroad structures, keeping to the model for the rest of the facility. Circuit 1 will not go through bodies of open water at any point, advantageous environmentally and minimizing distance, cost and engineering complexity.

On Randall's Island and in Queens County, this interconnecting solid cable will generally be buried underneath existing local roads in accordance with the recognized construction standards for such installations, and in the alternative attached underneath the Triborough Bridge. The Bronx Kill and East River will be traversed via direct bore or the bridge in the alternative. This supplement provides the required information on this enhancement in Circuit 1's route.

This supplement also reroutes Circuit 1 in Westchester and Bronx counties from railroad corridors to road corridors, and provides the required information. This enhancement

eliminates any potential for effects on the commuter railroad transportation system of Metro-North Railroad.

Circuit 1 will follow the New York State Thruway exclusively from the Town of Athens, Greene County, and through Ulster, Orange, Rockland and Westchester counties, always within the Thruway right of way. The facility will occupy no other land in these counties, except the single property adjacent to the New York State Thruway in the Town of Athens that the November 17, 2003 application proposed as the site for Upstate Converter Circuit 1.

Circuit 1 will follow the extension of the New York State Thruway into Bronx County, known as the Major Deegan Expressway, to the Washington Bridge in the Bronx. At that point, the facility will follow a service road, then the Oak Point Link to the Harlem River Rail Yard, and then the Harlem River Rail Yard itself to the shore of the Bronx Kill.

In the November 17, 2003 application, Downstate Converter Circuit 1 was proposed to be located within the Oak Point Rail Yard in Bronx County. This supplement proposes a new alternate site for the converter, proximate to the 145th Street Bridge in Bronx County. The new site is environmentally compatible. Its current occupant is a concrete recycling plant that can be relocated. The surroundings are heavily industrial and a buffer between the site and the nearest residential communities.

In summary, with this supplement, Circuit 1's proposed route for the direct current cable, a total distance of 124.6 miles, is:

Identical to the route proposed in the November 17, 2003 application: 86% of the distance

Nearly identical, within 200 feet of the route proposed in the application: 3%

Modified: 12%

Within highway corridors (New York State Thruway or Major Deegan Expressway): 99%

Not within highway corridors: 1%

Circuit 1's proposed route for the alternating current interconnecting cable, a distance of 4.8 miles, is:

Identical to the route proposed in the application: 29% (albeit proposed for direct current)

Modified: 71%

Buried underneath local roads: 63%

Within the Harlem River Rail Yard or attached to the associated Oak Point Link: 29%

Direct bore underneath the East River: 8%

Given this supplement to the November 17, 2003 application, it becomes evident that Circuit 1 will have: (a) no visual impact, (b) no impact on bodies of water, and (c) no impact on railroad transportation. During installation and after this facility is installed, there will be minimal environmental impact of any kind, which is quite unique for an electric power project of any magnitude let alone one that will provide New York City with 1,000 megawatts or 48% of its deficit.

Distribution to Parties List in Case 03-T-1641

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Supplement to the Matter of the Application

This supplement to the November 17, 2003 application completes the required information on Circuit 1. The description of Circuit 1 in the original Matter of the Application remains an accurate representation of the proposed facility, except that no segments will be within the riverbed of the East River or use aerial installation.

Conjunction LLC respectfully withdraws the first and second numbered paragraphs of the WHEREFORE Clause of the Matter of the Application in the November 17, 2003 Application and hereby substitutes the following:

1. A Certificate of Environmental Compatibility and Public Need for the proposed Circuit 1 of the Empire Connection project described herein and in the November 17, 2003 application.
2. Such other and further authorizations, consents, permissions and approvals as may be necessary for the construction, operation and maintenance of the facility (Circuit 1) described herein and in the November 17, 2003 application, including but not limited to waiver of those local requirements specified in Exhibit 7 pursuant to Section 126(1) (f) of the Public Service Law and issuance of a Water Quality Certificate pursuant to 33 USCA Section 1341 and Section 130 of the Public Service Law.

Respectfully submitted, Conjunction LLC



Dated: August 5, 2004

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Supplement to the Motion for Waivers of Application Requirements

With revisions presented in this supplement, Circuit 1 will be 100% solid cable. For the entire distance, from one end to the other, solid cable will be buried underground (or much less commonly, attached to road structures, effectively hidden from view). Electric wires without insulation suspended in the air by prominent transmission poles and towers will not be used.

Therefore, the potential for visual impact of the facility on its surroundings, particularly the transmission line itself, will be insignificant. Similarly, many other kinds of environmental impact will be insignificant, because of the underground model for the project, as discussed in the supplemented Exhibit 4. These revisions buttress Conjunction's request for waivers concerning project maps and photographs.

Specifically, the November 17, 2003 application requested waiver of 16 NYCRR 86.3(a)(1)(i), Request for Waiver No. 1, 16 NYCRR 86.3(a)(2), Request for Waiver No. 4, 16 NYCRR 86.3(b)(1)(iv), Request for Waiver No. 6, and 16 NYCRR 86.3(b)(2), Request for Waiver No. 7. These four requests are further justified given the full adoption of the underground model by this supplement, with the following exception.

Conjunction's February 12, 2004 letter to the Honorable Robert R. Garlin, Presiding Officer and Administrative Law Judge, "Clarification and Withdrawal of Certain Requests for Waivers in Conjunction's Motion for Waivers filed pursuant to 16 NYCRR 85-2.4", modified Request for Waiver No. 1 as well as Request for Waiver No. 3, among other items of discussion. Recognizing that the two converters of Empire Connection Circuit 1 will be above the ground, this supplement does map a five-mile radius around Upstate Converter Circuit 1 and Downstate Converter Circuit 1 as required by 16 NYCRR 86.3(a) (1) (i) as well as indicate historic, scenic and park areas within a three-mile radius as required by 16 NYCRR 86.3(a) (1) (iii). Historic sites within a Three-mile radius of Upstate Converter Circuit 1 and alternate Downstate Converter Circuit 1 are shown in Table 4.13.2b and Table 4.13.2c of this supplement.

The New York Power Authority issued a request for proposals on June 4, 2004, and Conjunction plans to respond by submitting a proposal to meet the requirements with the completion of Circuit 1. Conjunction will be competing with other projects on price and non-price factors, including projects whose costs are not publicly known. This request for proposals buttresses Conjunction's request for a waiver concerning project costs, specifically request 9 to waive 16 NYCRR 86.10. The request for a waiver is further addressed in Conjunction's February 12, 2004 letter to the Honorable Robert R. Garlin, Presiding Officer and Administrative Law Judge, specifically on pages 2 through 4.

Terminology in this Supplement

Aerial transmission: Uninsulated electric transmission wires suspended in the air with transmission towers and poles. The Empire Connection project will not use aerial transmission.

Alternating current: An electric current that reverses its direction at periodic intervals, 60 cycles per second in the U.S. Almost all electric transmission and distribution lines in the U.S. conduct alternating current. The Empire Connection project must therefore interconnect with the upstate and downstate electric grids with alternating current although direct current will be used for 96% of Circuit 1's route distance.

Ambient environment: The surrounding environmental conditions presently, without the installation of the proposed facility, Circuit 1.

Article VII: New York State Consolidated Laws, specifically the Public Service Law Sections 120-130, Article VII, "Siting of Major Utility Transmission Facilities" governs the process and requirements for an application and the granting of a certificate of environmental compatibility and public need. The New York State Legislature enacted Article VII in 1970 to establish a single forum under the leadership of the New York State Public Service Commission for reviewing the need for and environmental impact of projects such as Empire Connection Circuit 1.

Bronx Kill: A narrow strait connecting the Harlem River and the East River in New York City delineating the southernmost extent of Bronx County and separating the Bronx from Randall's Island.

Cable: Insulated electric transmission wires typically buried underground. The proposed facility, Circuit 1, will use Mass Impregnated Non-Draining (MIND) solid cable for its 500 kiloVolt direct current portion and Cross-Linked Polypropylene (XLPE) solid cable for its 345 kiloVolt alternating current portion.

Circuit 1: The proposed facility, a 1,000 megawatt circuit with its northern terminus in the Town of Athens, Greene County and its southern terminus in Queens County for a total distance of 129.4 miles (including the 124.6 mile direct current and 4.8 mile alternating current portions).

Circuit 2: In the November 17, 2003 application, a second 1,000 megawatt circuit, with its northern terminus in the Town of Coeymans, Albany County and its southern terminus in New York County for a total distance of 142 miles (including the direct current and alternating current portions). This supplement to the application states that Conjunction is reconsidering aspects of Circuit 2 to ensure its environmental compatibility and therefore is not seeking certification of this second facility at this time.

Construction and demolition debris: The waste generated during construction, renovation and demolition projects which can include wood, concrete, steel, brick and gypsum.

Converter: Electronic equipment and filters that change alternating current to direct current, as the proposed facility must do to interconnect with the upstate electric grid, or vice-versa, as the proposed facility must do to interconnect with the downstate grid.

Direct bore: Direct bore is a method for installing sub-surface pipe, conduit or cable by using a surface or sub-surface mechanical rig to drill a guided hole along a predetermined path. The hole is reamed to enlarge it to approximately one and a half times the diameter of the pipe, conduit or cable, which is pulled back through the hole. Tracking equipment is used to guide, track and direct the boring. The proposed facility, Circuit 1, will use direct bore in: (i) Major Deegan Expressway to Exterior Street, underneath two Metro-North Railroad tracks, proximate to the Washington Bridge in the Bronx; (ii) Harlem River Rail Yard to Randall's Island, underneath the Bronx Kill, proximate to the Triborough Bridge in the Bronx and Randall's Island; and (iii) Randall's Island to Queens, underneath the East River, proximate to the Triborough Bridge in Randall's Island and the 8th Street alley in Queens. Additionally, Circuit 1 may use short-distance bores as necessary to avoid environmental impact, consistent with the project's Environmental Management and Construction Plan.

Direct current: An electric current flowing in one direction. The only two major transmission lines in the U.S. that conduct direct current bring power from western Canada to California and eastern Canada to New England. In June 2004, the Long Island Power Authority announced its intention to contract with the 67-mile Neptune Regional Transmission System to bring direct current and power from New Jersey to Long Island.

Downstate Converter Circuit 1: A converter located in Bronx County, within the Oak Point Rail Yard as proposed in the November 17, 2003 application or the new alternate site proximate to the 145th Street Bridge, that will convert the direct current of Circuit 1 into the 345 kiloVolt alternating current required by Consolidated Edison.

Downstate Converter Circuit 2: A converter located at a yet to be determined location that will convert the direct current of Circuit 2 into the 345 kiloVolt alternating current form required by Consolidated Edison.

Empire Connection: The name of the proposed project, consisting of Circuit 1, for which Conjunction LLC requests a Certificate of Environmental Compatibility and Public Need, and a second Circuit 2, for which a Certificate is not being pursued at this time.

Environmental Management and Construction Plan: Following certification, the (New York State Public Service) Commission typically requires an Article VII applicant to submit various additional documents to verify its compliance with the certification order. The most important of these, an "Environmental Management and Compliance Plan" (EM&CP), if required, must be approved by the Commission before construction can begin. The EM&CP details the precise "field" location of the facilities and the special precautions that will be taken during construction to ensure environmental compatibility. Deviations of up to 1/8 mile (660 feet) in either direction from the certified centerline are sometimes allowed to accommodate design refinements, property lines, soil conditions, new structures, and other concerns identified during final facility design. The EM&CP must also indicate the practices to be followed to ensure that the facility is constructed in compliance with applicable safety codes and the measures to be employed in maintaining and operating the facility once it is constructed.

Facility (also Facilities): Facility, also referred to as the transmission facility, means any and all cables, conduits, wires, boxes, vaults, buildings, access manholes or other similar equipment or structures designed, installed, or constructed for the purpose of, or in connection with, the transmission of electricity for the Empire Connection project, Circuit 1 specifically.

Groundwater aquifers: Water-bearing rock structures readily able to transmit water to wells and springs.

Hallets Point: A body of land in Astoria, Queens bordered by 8th Street, Astoria Boulevard, Shore Avenue and the East River. Circuit 1's proposed route for alternating current interconnection is underneath local roads in Hallets Point, buried in accordance with Consolidated Edison standards for cable burial, for a distance of 1.1 miles.

Harlem River Rail Yard: The Oak Point Link connects directly with the Harlem River Rail Yard at just below the 3rd Avenue Bridge crossing of the Harlem River. This rail yard is currently leased for 99 years to Harlem River Rail Yard Ventures. Harlem River Rail Yard Ventures has built intermodal tracks currently used by Waste Management, Inc. and has leased various parts of the yard to others for various uses.

Hazardous substance sites: Sites that have substances on the list promulgated pursuant to the Environmental Conservation Law Section 37-0103 excepting petroleum, crude oil, fractions, natural gas and synthetic gas usable for fuel, residues of emissions from engine exhaust, and most nuclear materials.

Hell Gate: A narrow tidal channel in the East River separating Randall's Island and Hallets Point in Queens County. The name is a corruption of the Dutch phrase Hellegate (hell hole). Historically, navigation in this channel was extremely hazardous because of underwater rocks and swift waters.

Hell Gate Railroad Bridge: Amtrak's 3.2 mile long railroad bridge and viaduct from Bronx County to Queens County carrying four tracks over the Harlem River Rail Yard, Bronx Kill, Randall's Island and the East River.

In-City: Electric generation capacity located within New York City or considered to be located within the City for electric reliability purposes such as upstate generators using the Empire Connection direct current transmission facility.

Long Island Power Authority: One of two authorities in New York State dedicated to facilitating the provision of economical, reliable electric power to New Yorkers. Commonly referred to as LIPA, this authority focuses on the energy needs of Nassau and Suffolk counties.

Magnetic field profile: The value of magnetic flux density as measured or predicted at lateral points orthogonal to the center-line of the transmission circuit. Magnetic flux density is typically given in units of Tesla (T) or milliGauss (mG) where 1 Tesla equals 10,000 milliGauss.

Major Deegan Expressway: A major highway in Bronx County operated by the New York City Department of Transportation. 5.2 miles or 4% of Circuit 1's proposed route for direct current cable is within the Major Deegan Expressway right of way, from the Bronx and Westchester border to the Washington Bridge in the Bronx.

New York Control Area: Encompassing the upstate and downstate electric grids within New York State, these grids being under the control of the New York Independent System Operator.

New York Independent System Operator: The organization responsible for the reliable operation of New York's upstate and downstate grids and efficient competitive markets for electric capacity and energy. This organization, authorized by the Federal Energy Regulatory Commission,

approved Empire Connection's System Reliability Impact Study without opposition on March 18, 2004.

New York Power Authority: One of two authorities in New York State dedicated to facilitating the provision of economical, reliable electric power to New Yorkers. Commonly referred to as NYPA, this authority has a 1990 all-requirements contract with the New York City government to meet all the City's demand for electricity.

New York State Thruway: The New York State highway system operated by the New York State Thruway Authority. The proposed facility, Circuit 1, will generally be buried within the Thruway right of way from Greene County through Westchester County for 117.6 miles or 94% of the project's total distance of direct current cable installation.

November 17, 2003 application: Conjunction LLC's application to the New York State Public Service Commission for a Certificate of Environmental Compatibility and Public Need, dated November 17, 2003.

Oak Point Link: A 1.8 mile single-track freight railroad link to the Harlem River Rail Yard built on a combination of 72 inch and 36 inch diameter reinforced concrete caissons, piles, spread footings and land along the Bronx shore of the Harlem River. The track was constructed by the New York State Department of Transportation approximately 20 years ago to allow freight trains to move from upstate to the Harlem River Rail Yard and from there on to the Oak Point Rail Yard. The proposed facility, Circuit 1, will be attached to this structure underneath the track area.

145th Street Bridge: A highway bridge across the Harlem River linking 145th Street in Manhattan to 149th Street in the Bronx. This supplement proposes an alternate site for Downstate Converter Circuit 1 at a site proximate to this bridge presently occupied by a concrete recycling plant.

Rainey 345 kilovolt substation: The Consolidated Edison substation located in Queens, New York that is the southern terminus of Circuit 1.

Randall's Island: The 480-acre island consists of two formerly-separate islands (Randall's Island and Ward's Island) in the middle of the East River at the intersection of three boroughs, New York County (of which it is a part), Queens County and Bronx County. The Triborough Bridge and the Hell Gate Railroad Bridge cross the middle of the joined island from north to south.

Short-circuit duty: The requirement for a component of an electric grid such as a transmission line or substation to withstand the negative effects of a short circuit in the grid.

Soil, Sediment and Groundwater Management Plan: A series of plans used to: identify potentially contaminated soils or groundwater (media); determine how to manage the media if they are to be disturbed during construction; and methods available for the ultimate disposition, beneficial use or disposal of the media.

Solid cable: Cable that contains no liquid or fluid insulation material. The Mass Impregnated Non-Draining cable and Cross Linked Polypropylene cable that will be used by Empire Connection to conduct direct current and alternating current, respectively, are examples of solid cable.

Submarine installation: Installation of cable in a marine environment either by plowing the cable under the bottom of the marine environment or laying cable directly on the bottom. This

supplement retracts the proposal in the November 17, 2003 application to install a segment of the alternating current interconnection in the East River. The application's discussion of possible marine environment impacts is also retracted. Circuit 1 will not go through bodies of water at any point.

System reinforcements: Equipment enhancements to an electric grid to mitigate negative effects of a new power plant or transmission line if any.

System Reliability Impact Study: The requirement of the New York Independent System Operator to comprehensively evaluate the effects of a new power plant or transmission line on the reliability of the New York electric grid.

Tappan Zee Bridge: A New York State Thruway bridge that crosses the Hudson River connecting Rockland and Westchester Counties. The proposed facility, Empire Connection Circuit 1, 1000 megawatts direct current, will be attached beneath the bridge safely and out of sight.

Transitions: An area comprised of electric equipment that provides for the transition from overhead wire to underground cable, and vice-versa. The Empire Connection project will not use overhead wire, so transitions will not be used.

Triborough Bridge: Actually, three bridges, a viaduct, and 14 miles of approach roads connecting Manhattan, Queens and the Bronx. The bridge's three branches meet on Randall's Island, where an interchange and two toll plazas sort out traffic flowing in 12 directions and provide access to the island itself. The longest span of the bridge, the East River suspension bridge to Queens, connects with the Grand Central Parkway and the Brooklyn-Queens Expressway.

Underground model: An electric power transmission system that uses insulated cable solely, buried underground or attached to structures out of sight, instead of uninsulated wires visibly suspended in the air and by transmission towers and poles. The proposed facility, Empire Connection Circuit 1, will strictly follow this model of environmental compatibility.

Upstate Converter Circuit 1: Part of the proposed facility, a converter located in the Town of Athens, Greene County, connected to the New York Power Authority's Gilboa-Leeds 345 kilovolt alternating current line that will convert the alternating current to direct current.

Upstate Converter Circuit 2: A converter located in the Town of Coeymans, Albany County, connected to the New Scotland-Alps 345 kilovolt alternating current line operated by National Grid USA (Niagara Mohawk) that will convert the alternating current to direct current.

Visual sensitive resource: Sensitive land uses including aesthetic resources of statewide significance, in visual proximity to a proposed facility.

Ward's Island: The southernmost portion of Randall's Island that abuts the East River at Hell Gate. Formerly a separate island, landfill in the 18th century joined Ward's Island and Randall's Island. In this supplement, the joined island is consistently referred to as Randall's Island.

Washington Bridge: The highway bridge over the Harlem River linking 181st Street in Manhattan to the Cross Bronx Expressway at 173rd Street in the Bronx.

Water systems: The total of all components required to acquire, pump, convey, treat, and distribute water. A term usually used in reference to municipal water systems.

*Part 86 General Exhibits*Supplement to Exhibit 2 - Location of Facilities

Circuit 1 will follow the New York State Thruway exclusively for approximately 117.6 miles from the Town of Athens, Greene County, and through Ulster, Orange, Rockland and Westchester counties, always within the Thruway right of way. The facility will occupy no other land in these counties, except the single property adjacent to the New York State Thruway in the Town of Athens that the November 17, 2003 application proposed as the site for Upstate Converter Circuit 1.

The final approximate 12.8-mile segment of the Thruway route (11% of the Thruway route), through Westchester County, is a revision of Circuit 1's location. The November 17, 2003 application proposed a Metro-North Railroad route through Westchester County; this proposal is hereby retracted. The change eliminates any potential for effects on Metro-North Railroad.

Circuit 1 will follow the extension of the New York State Thruway into Bronx County known as the Major Deegan Expressway, to the Washington Bridge in the Bronx, a distance of approximately 5.2 miles. The Washington Bridge is the Harlem River crossing at West 172nd Street in Bronx County and West 181st Street in New York County. The proposal of the November 17, 2003 application to use a Metro-North Railroad route in Bronx County is hereby retracted.

At the Washington Bridge, Circuit 1 will leave the Major Deegan Expressway for a lightly utilized service road along the Harlem River, Exterior Street, via a short-distance direct bore deep into the ground underneath and perpendicular to two Metro-North Railroad tracks. Following this service road, the facility will reach and then attach underneath the Oak Point Link. The Oak Point Link is a lightly utilized freight railroad trestle structure and single track of less than two miles along the Harlem River controlled by the New York State Department of Transportation.

A Metro-North Railroad maintenance yard is proximate to the area where the service road reaches the Oak Point Link. Circuit 1 will have no adverse impact on this maintenance yard either because: (a) the yard property will be bypassed, (b) Conjunction will contract with Metro-North Railroad to traverse the yard property in a manner acceptable to Metro North Railroad, or (c) a short-distance direct bore will go deep into the ground underneath a small portion of the yard.

The Oak Point Link leads into the Harlem River Rail Yard. Harlem River Rail Yard Ventures controls Harlem River Rail Yard through a long-term lease with New York State.

Through the Harlem River Rail Yard, a distance of less than a mile, Circuit 1 will reach the shore of the Bronx Kill. The Bronx Kill is the narrow body of water separating Bronx County and Randall's Island.

In the November 17, 2003 application, Downstate Converter Circuit 1 was proposed to be located within the Oak Point Rail Yard in Bronx County. This supplement proposes a new, alternate site for the converter along the Oak Point Link route, proximate to the 145th Street Bridge in Bronx County, approximately 1.8 miles from the Washington Bridge in the Bronx.

The 145th Street Bridge is the Harlem River crossing at East 149th Street in Bronx County and West 145th Street in New York County.

This new, alternate site for Downstate Converter Circuit 1 would avoid extending the proposed facility to the Port Morris and Hunts Point neighborhoods of Bronx County to reach the Oak Point Rail Yard. Additionally, the new alternate site is environmentally compatible. The current occupant of this site is a concrete recycling plant and the surroundings are commercial-industrial.

The new, alternate site for the converter is bordered by the Major Deegan Expressway to the east, Harlem River to the west, 145th Street Bridge to the north and commercial-industrial property to the south. Beyond the Major Deegan Expressway to the east are River Avenue and its intersection with East 146th Street. Beyond the Harlem River to the west is Harlem River Drive in New York County. Industrial-commercial properties line the Harlem River to the north, beyond the 145th Street Bridge, and further south to the Madison Avenue Bridge.

In aggregate, Circuit 1 is proposed to have a direct current route distance of approximately 124.6 miles from Greene County to Bronx County. Of this total, approximately 104.8 miles of the direct current route distance, or 84%, is unchanged from the November 17, 2003 application.

This supplement hereby retracts the proposal to lay the interconnecting alternating current cable underwater in the East River so as to avoid the potential for environmental effects on the river and minimize distance, cost and engineering complexity. Instead, in the Harlem River Rail Yard, at the shore of the Bronx Kill, Circuit 1 will traverse the Bronx Kill via a short-distance direct bore and reach Randall's Island. The Bronx Kill is a narrow shallow body of water separating Bronx County from Randall's Island (New York County).

The direct bore will be proximate to the crossing of the Bronx Kill by the Triborough Bridge and Hell Gate Railroad Bridge. This point is approximately 1.4 miles of alternating current route distance from the 145th Street Bridge. Exhibit 4 of the November 17, 2003 application describes effects of drilling direct bores, as is proposed beneath the Bronx Kill.

The Triborough Bridge and Hell Gate Railroad Bridge cross Randall's Island north to south from its northern shore, on the Bronx Kill, to its southern shore, on the East River. The Triborough Bridge crosses Randall's Island north to south approximately 400 feet to the west of the Hell Gate Railroad Bridge for most of the distance. Then, the Hell Gate Bridge diverges to the east towards the East River and Queens County beyond, at the southern shore on Randall's Island, in Wards Island Park.

Circuit 1's interconnecting alternating current cable will cross Randall's Island north to south in the corridor between the Triborough Bridge and Hell Gate Bridge. This interconnecting cable will generally be buried beneath the local roads that travel between and parallel to the two bridges.

The interconnecting cable will traverse the East River via a direct bore of approximately 2,000 feet in distance, deep in the ground beneath the river. The direct bore will reach Queens County proximate to 8th Street in Halletts Point.

8th Street is no longer an active road from the East River shore to 27th Avenue. The interconnecting cable will be buried beneath 8th Street between its intersections with 27th Avenue and with Main Avenue, a distance of approximately 1,000 feet.

Next, the interconnecting cable will be buried beneath Main Avenue for approximately 200 feet to the west until Main Avenue becomes Vernon Boulevard. Finally, the interconnecting cable will be buried beneath Vernon Boulevard for approximately 4,000 feet to the south to the intersection of Vernon Boulevard and 35th Avenue, the location of Consolidated Edison's Rainey 345 kiloVolt substation. The Rainey substation is the point at which the proposed facility interconnects with the downstate power grid, as was proposed in the November 17, 2003 application.

The Rainey substation is approximately 3.4 miles of alternating current cable route distance from the Bronx Kill, Bronx County. Aggregate alternating current route distance is approximately 4.8 miles, unchanged from the November 17, 2003 application.

Alternatively, Randall's Island will be crossed with an attachment to the Triborough Bridge. In this plan, within the Harlem River Rail Yard, the interconnecting cable would be attached to one or two of the cylindrical concrete bridge piers that support the Triborough Bridge to climb up to the underside of the bridge. The cable would be attached underneath the Triborough Bridge as the bridge crosses over the Bronx Kill, Randall's Island, and the East River and then reaches Queens County.

The interconnecting cable would climb down from the underside of the Triborough Bridge at 21st Street and South Hoyt Avenue, Queens County, attached to one or two of the cylindrical concrete bridge piers there. These piers presently have similar-looking attachments (drainage pipes). Next, the cable would be buried beneath 21st Street from South Hoyt Avenue to 35th Avenue, a distance of approximately 5,800 feet southwest. Finally, the cable would be buried beneath 35th Avenue from 21st Street to Vernon Boulevard, the location of the substation, a distance of approximately 1,800 feet northwest. The Triborough Bridge attachment alternative lengthens the overall distance of the alternating current interconnection slightly, by about 0.4 mile.

Errata to Supplement, Exhibit 2

While the plates were in reproduction, it was found that several plates had the wrong title. The following is a corrected list:

Plate	Correct Title
1 FLM	Town of Athens – Greene County
2 FLM	Town of Athens – Greene County
3 FLM	Town of Bronx – Bronx County
4 FLM	Town of Bronx – Bronx County
14 A. Photo	Town of Bronx – Bronx County
15 A. Photo	Town of Bronx – Bronx County
23 A. Photo	Town of Astoria – Queens County
24 A. Photo	Town of Astoria – Queens County
25 A. Photo	Town of Astoria – Queens County
1 Bedrock	Town of Greenburgh – Westchester County
2 Bedrock	Town of Yonkers – Westchester County
3 Bedrock	Town of Bronx – Bronx County
4 Bedrock	Town of Astoria – Queens County
2 Surficial	Town of Yonkers – Westchester County
3 Surficial	Town of Bronx – Bronx County
4 Surficial	Town of Astoria – Queens County
2 Wetland	Town of Yonkers – Westchester County
3 Wetland	Town of Bronx – Bronx County
4 Wetland	Town of Astoria – Queens County
2 A & WS	Town of Yonkers – Westchester County
3 A & WS	Town of Bronx – Bronx County
4 A & WS	Town of Astoria – Queens County

Supplement to Exhibit 2(a)(1) - New York State Department of Transportation Maps
(1:24,000 topographic edition)

(i) Proposed Right of Way

As discussed above, this supplement revises approximately 16% of the direct current route distance, about 19.8 miles in Westchester and Bronx counties, and all the alternating current route distance, approximately 4.8 miles in Bronx, New York and Queens counties. The maps for these segments, 24.6 miles total, are provided in Volume 2 of this supplement.

Consistent with the November 17, 2003 application, the topographic maps in the separate volume include a one-mile corridor on either side of the proposed right of way. The application requested a waiver from the requirement for a five-mile corridor on either side (Request for Waiver No. 1). The proposed cable will not be apparent even up close, even in the rare circumstances when the line is not buried underground. Additionally, the line will be installed within existing heavily-disturbed heavily-traveled corridors. However a five-mile radius is mapped around Upstate Converter Circuit 1 and Downstate Converter Circuit 1, consistent with Conjunction's February 12, 2004 letter to the

Honorable Robert R. Garlin, Presiding Officer and Administrative Law Judge, since the two converters will be above the ground.

(ii) Permanent Clearing or Other Changes to the Topography, Vegetation or Man-Made Structures

In these 24.6 miles of revised right of way, the proposed facility will not necessitate permanent clearing or other changes to the topography, vegetation or man-made structures anywhere. If the alternate site for Downstate Converter Circuit 1, proximate to the 145th Street Bridge, is used, the existing concrete recycling plant, a man-made structure, would be eliminated. The location of this site is indicated on the appropriate topographic map.

(iii) Any Known Archeologic, Geologic, Historical or Scenic Area, Park or Untouched Wilderness

The November 17, 2003 application requested a waiver from the requirement to map geologic, historical or scenic area, park or untouched wilderness on or within three miles of the right of way (Motion for Waiver No. 3). The proposed transmission line will not be apparent, even in the rare circumstances when the line is not buried underground. Additionally, the cable will be installed within existing heavily-disturbed, heavily-traveled corridors.

However, this supplement does map a three-mile radius around Upstate Converter Circuit 1 and Downstate Converter Circuit 1 so as to indicate these special resources, consistent with Conjunction's February 12, 2004 letter to the Honorable Robert R. Garlin, Presiding Officer and Administrative Law Judge. The logic again is that the two converters will be above the ground.

As in the November 17, 2003 application and as discussed in the application's Motion for Waiver, this supplement addresses archeologic resource impacts entirely within Exhibit 4 (Request for Waiver No. 3).

Supplement to Exhibit 2(a) (2) - New York State Department of Transportation Maps (scale 1:250,000)

(i) Proposed Facility

As discussed in the November 17, 2003 application, Motion for Waiver, for national security reasons, the required maps are unavailable (Request for Waiver No. 4) and thus, the application and this supplement are providing U.S. Geologic Survey topographic maps scale 1:250,000.

As discussed above, this supplement revises approximately 16% of the direct current route distance, approximately 19.8 miles in Westchester and Bronx counties, and all the alternating current route distance, approximately 4.8 miles in Bronx, New York and Queens Counties. The U.S. Geologic Survey topographic maps scale 1:250,000 for these segments, 24.6 miles total, are provided in Volume 2 of this supplement.

Indicated on these maps are the two existing facilities related to or connected with the proposed facility, these being the New York State Department of Transportation's Oak Point Link and Consolidated Edison's Rainey 345 kiloVolt substation. Circuit 1, the proposed

facility, will be attached beneath the Oak Point Link in Bronx County, and will interconnect with the Rainey substation in Queens County.

These maps also show where the proposed facility will be single-circuit 500 kiloVolt plus/minus direct current (from upstate to Downstate Converter Circuit 1) and where the proposed facility will be two-circuit 345 kiloVolt alternating current (approximately 4.8 miles from Downstate Converter Circuit 1 to the Rainey substation). The power transfer capacity in both the direct current and alternating current segments is 1,000 megawatts.

(ii) Any Structure to be Built

The only structure proposed to be built that was not addressed in the November 17, 2003 application would be located at the alternate site for Downstate Converter Circuit 1, proximate to the 145th Street Bridge. The appropriate map indicates this site.

(iii) Point of Connection Between an Existing and Proposed Facility

Indicated on these maps are the two existing facilities related to or connected with the proposed facility, these being the New York State Department of Transportation's Oak Point Link and Consolidated Edison's Rainey 345 kiloVolt substation. Circuit 1, the proposed facility, will be attached beneath the Oak Point Link in Bronx County, and will interconnect with the Rainey substation in Queens County.

(iv) Nearby, Crossing or Connecting Rights of Ways of Facilities or Other Utilities

The November 17, 2003 application, Motion for Waiver, requested a limited waiver from the requirement (Request for Waiver No. 5). The application and this supplement as well indicate only proximate gas and electric power lines on the 1:250,000 maps and indicates the remaining proximate facilities on the more useful, larger scale 1:24,000 maps.

Supplement to Exhibit 2(b) (1) - Aerial Photographs

(i) Proposed Right of Way

As discussed above, this supplement revises approximately 16% of the direct current route distance, approximately 19.8 miles in Westchester and Bronx counties, and all the alternating current route distance, approximately 4.8 miles in Bronx, New York and Queens Counties. The aerial photographs for these segments, 24.6 miles total, are provided in Volume 2 of this supplement.

(ii) Permanent Clearing or Other Changes to the Topography, Vegetation or Man-Made Structures

In these 24.6 miles of revised right of way, the proposed facility is not expected to necessitate permanent clearing or other changes to the topography, vegetation or man-made structures anywhere. If the alternate site for Downstate Converter Circuit 1, proximate to the 145th Street Bridge, is used, the existing concrete recycling plant, a man-made structure, would be eliminated. The location of this site is indicated on the appropriate aerial photograph.

(iii) Access and Maintenance Routes

In these 24.6 miles of revised right of way, the proposed facility is not expected to necessitate access or maintenance routes anywhere.

(iv) Facility on the Right of Way

The November 17, 2003 application, Motion for Waiver, requested a waiver from the requirement to indicate the precise location of the generally underground cable within the proposed right of way (Request for Waiver No. 6). Notably, the right of way is typically a narrow existing highway or local road corridor so the nearly exact location within a narrow band of land is implicit.

Volume 2: Supplement to Exhibit 2 Maps and Aerial Photographs; Photographic Renderings of the Views of the New Alternate Site for Downstate Converter Circuit 1

I. U.S. Geologic Survey topographic maps scale 1:250,000 of the 24.6 mile revised route, indicating:

- a. Alternate route segment through Metro-North Railroad Yard,
- b. Alternate circuit 1 converter,
- c. Rainey substation interconnection,
- d. Proximate gas and electric power lines.

II. New York State Department of Transportation maps (1:24,000 topographic edition), a three-mile radius around the two above-ground converters, indicating:

- a. Upstate Converter Circuit 1,
- b. Downstate Converter Circuit 1 (alternate site)
- c. Historical sites
- d. Parks and recreational areas

III. Aerial photographs of the 24.6 mile revised route, indicating:

- a. Proposed right of way, and
- b. Downstate Converter Circuit 1 (alternate site),
- c. Existing Rainey substation interconnection.

IV. New York State Department of Transportation maps (1:24,000 topographic edition),

- a. Bedrock geology
- b. Surficial geology
- c. Wetlands
- d. Aquifers and water supplies

V. USGS maps (7.5 minute quadrangle), Alternate route mileposts

VI. Photographs and Photographic Renderings of New Alternate Site of Downstate Converter

Supplement to Exhibit 4 - Environmental Impact

See the additional testimony of Dennis E. Ahern attached to this supplement.

Existing Conditions, Potential Impacts and Avoidance/Mitigation:

1. Topography

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

2. Geology

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

Herein is a discussion on geology and soil of the East River, specifically in the Hell Gate area, where the proposed project may entail a direct bore.

2.1 Existing Conditions

The general geology of the area is described in Exhibit 4, Section 4.3.2. Additionally, the geology of the lower Bronx Borough and East River are described in Exhibit 4, Appendix D. Based on these references, from the Westchester/Bronx border to just north of the Bronx Kill, the predominant bedrock material is of the Manhattan Formation, consisting of metamorphic rock comprised of schists, calcite marble, and amphibolite, with calcsilicate rock at the base.

Following the Harlem River south from the location of the alternate Downstate Converter Circuit One, the material varies slightly as the route encounters interspersed pockets of Inwood Marble and Fordham Gneiss, before arriving at the Bronx Kill where the Manhattan formation again emerges.

Directly across the Bronx Kill, the Empire Connection project route crosses Randall's Island, which is underlain with the same three bedrock materials mentioned above (the Randall's Island area included large quantities of fill that have been deposited there for development purposes).

Little information is available documenting the bedrock materials below the East River, but once across the East River the remainder of the route through the Astoria region of Queens to the Rainey Substation will encounter a bedrock foundation of either Fordham or Harrison Gneiss.

2.2 Potential Impacts

The ground surface at the alternate Downstate Converter Circuit One will require excavation and grading to allow construction of the foundations and pads upon which the required facilities will be installed.

At the southern shore of Randall's Island and in Queens, an additional minimal impact of existing bedrock materials will be required to accommodate the directional boring proposed under the Hell Gate Channel. This bore will be approximately 2,200 feet in length, and is expected to produce approximately 75,000 cubic feet of bore material. Most of the geologic deposits are compact and stable in place.

2.3 Avoidance and Mitigation

Some minor disturbance to the underlying geologic deposits will occur during construction of the alternate Downstate Converter Circuit One and the boring required under the East River; however, the related impacts will be minimal and will be mitigated by proper construction practices and site restoration, to the degree practicable, following construction.

3. Soil

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application. See section 2 above for the discussion of soil issues associated with the possible direct bore underneath the East River in the Hell Gate area.

4. Hydrology

4.1 Surface Water and Drainage

4.1.1 Existing Conditions

Water Bodies – North to South along the New York State Thruway and Major Deegan Expressway Route

The references to Mile Posts in this Hydrology section of the Supplement are in accordance with the Mile Posts shown in the MP1, MP2, and MP3 maps included in the attached Volume 2. As described in Exhibit 2 above, Circuit 1 cables will, at all times, be within the right of way of the New York State Thruway, the Major Deegan Expressway, the Oak Point Link or the right of way of existing roads.

According to the Westchester County Planning Department GIS web site, the Empire Connection project enters into the lower Hudson River drainage area as it reaches land fall at the east end of the Tappan Zee Bridge. The first feature crossed by the proposed route is the Old Croton Aqueduct, which loops around Interchange 9, the interconnection between Interstate Routes 87/287 and South Broadway. The local watershed at the north end of this section, before the route turns south, is Sheldon Brook, found just beyond the 1st Mile Post. This is a small perennial stream in the town of Tarrytown, which drains a small man-made lake and an extensive wetland system. The 100-year floodplain for this system is located to the north of the New York State Thruway.

After splitting with Interstate Route 287 and turning to the south at about the 2nd Mile Post, the route passes through a long stretch of country side consisting of suburban development and an extensive area of woodlands and parks extending almost to the Cross County Parkway found at Mile Post 11. The route then joins the Saw Mill River watershed at the south end of the Town of Greenburgh at about Mile Post 3, where the Interstate 87 crosses the Saw Mill River Parkway. The proposed Circuit 1 route, following Interstate Route 87, then parallels and crisscrosses the Saw Mill River and its 100-year floodplain for over 2.5 miles.

At the Saw Mill River Parkway, the route crosses to the east side of the Saw Mill River and parallels the river down stream at approximately the upper edge of the 100-year floodplain. The route continues south and passes Woodlands Lake on its east side at Mile Post 4 and V. E. Macy Park on both sides.

South of Woodlands Lake, Interstate Route 87 and the route cross back to the west of the Saw Mill River and then back to the east side of the river just after Mile Post 6. The Interstate and the route continue to parallel the river in or at the edge of the 100-year floodplain. It also passes into the Bronx River drainage at about this point in the town of Greenburgh just west of the Dobbs Ferry / Hasting-on-Hudson town boundary.

Upon approaching the southern boundary of Ardsley and reentering the town of Greenburgh at about Mile Post 6.5, the Interstate and the route departs from the Saw Mill River floodplain. At this point, the route passes up a ridgeline and enters the Sprain Brook watershed at about Jackson Avenue. Continuing south from Jackson Avenue at Mile Post 7, the route begins paralleling the Grassy Sprain Reservoir and Sprain Brook until approximately Mile Post 9, where Tuckahoe Road intersects the Interstate. Separating this stretch of the interstate from the Grassy Sprain Reservoir is Sprain Ridge Park, which is approximately a half a mile in width.

At about the Tuckahoe Road Intersection (just beyond Mile Post 9), Sprain Brook flows to the east of Interstate Route 87 along the Sprain Brook Parkway, and the Thruway turns south toward the Cross County Parkway. Just after this turn, the Thruway crosses the Catskill Aqueduct.

The next major water body is not encountered until after Interstate 87 and the route cross the Cross County Parkway. The route turns south southwest passing around the west side of Yonkers Raceway and then passes to the west of Hillview Reservoir at about Mile Post 12.5. South of the Cross County Parkway, the territory surrounding the expressway also changes. At about this point there is less evidence of the mix of suburban and forested landscape and the community becomes more urban, with denser adjacent development and, in many cases, substantial placement of noise barriers along the route. This latter addition makes it very difficult to see the community from the highway and vice versa.

South of Hillview Reservoir, at about Mile Post 13, the route passes back into the Hudson River watershed. Upon entering the Bronx, the route also passes over Van Cortlandt Park. According to the New York City Department of Parks and Recreation, Van Cortlandt Park is 1,146 acres atop the ridges and valleys of the northwest Bronx. It is New York City's third largest park. Playing fields and playgrounds are scattered about the park's edges, surrounding a richly forested heartland fed by Tibbets Brook. Van Cortlandt is home to the country's first public golf course, the oldest house in the Bronx, and the borough's largest freshwater lake, Van Cortlandt Lake, which is within a short distance of the interstate. This lake was formed in the 1690s when Jacobus Van Cortlandt dammed Tibbetts Brook to power two mills. Tibbetts Brook eventually drains into the Hudson River. Circuit 1 cable installation will be the right of way of the major Deegan Expressway at this point and will not interfere with Van Cortlandt Park facilities.

South of this point the route passes into the Harlem River drainage. Included in the Harlem River drainage to the south of Van Cortlandt Park is the Jerome Park Reservoir. The Jerome Park reservoir is located between Mile Posts 15 and 16 approximately one quarter of a mile east of the Interstate Thruway. The Major Deegan Expressway remains in the Harlem River drainage until it enters the alternate site for Downstate Converter Circuit 1 at the 145th Street Bridge. Except for the Bronx Kill, at Mile Post 22, the water bodies and water system along this portion of the route have been previously described in the initial application in Exhibit 4, Sections 4.3.4 and 4.3.13. The Bronx Kill, in the vicinity of the proposed crossing, is a narrow slow moving water body connecting the Harlem River to the East River. At the time of a recent site visit (1:00 PM, July 21, 2004), although the East River was moving at a considerable pace, there was no detectable flow in the Bronx Kill.

4.1.2 Potential Impacts

The converter, which will occupy approximately five acres, could have potential for minimal impact to surface waters by altering original drainage patterns and surface soil permeabilities. Equipment containing oils could result in accidental small spills or leaks. In addition, potential impacts may occur during facility construction as a result of clearing and grubbing, establishment of equipment laydown areas, site grading, and possible accidental petroleum leaks from construction equipment.

Since Circuit 1 of the Empire Connection project will be constructed either above ground only at converter sites or below ground or suspended from structures such as trestles and entirely within the right of way of established roads and railroads, permanent impacts to surface drainage and water quality are not expected. No significant impacts are anticipated along the underground sections of the Empire Connection project because the excavations will be backfilled primarily with the originally excavated soils and road surfaces restored, where applicable. Crossings by buried cables of the minor streams will be accomplished by either hanging the cables from structures, or by directional boring beneath the streambed.

4.1.3 Avoidance and Mitigation

During facility construction, it will be standard engineering practice to minimize any changes to existing topography and vegetative cover. These general procedures will minimize any impacts to existing surface drainage and water quality. In addition to this general engineering standard, an Environmental Management & Construction Plan will be submitted as a Compliance Filing prior to conducting any field construction activities. This Plan will address appropriate protocols for storm water discharge from construction activities and industrial runoff. If needed, the plan will also include a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP will identify, as needed, best practices and standards for erosion and sediment control incorporating engineering standards developed by the Empire State Chapter of the Soil and Water Conservation Society (1997) and the New York State Department of Environmental Conservation. These practices include engineering controls such as silt fences, hay bales, geofabric installation, storm water retention, and infiltration basins. If needed, a Spill Prevention Control and Countermeasures (SPCC) plan will also be developed to address the potential for minor accidental spills or leaks from construction equipment or electric transmission equipment. The SPCC plan will include provisions for inspections, secondary containment, equipment refueling practices, and spill response.

4.2 Wetlands

4.2.1 New York State Department of Environmental Conservation Wetlands

According to the New York State Department of Environmental Conservation (NYSDEC), freshwater wetlands are those areas of land and water that support a preponderance of characteristic wetlands plants that out-compete upland plants because of the presence of wetlands hydrology (such as prolonged flooding) or hydric (wet) soils. Freshwater wetlands commonly include marshes, swamps, bogs, and fens. The New York State Legislature passed the Freshwater Wetlands Act in 1975 with the intent to preserve, protect and conserve freshwater wetlands and their benefits, consistent with the general welfare and beneficial economic, social and agricultural development of the state. The Act requires the New York State Department of Environmental Conservation to map all those wetlands protected by the Act (12.4 acres in size and larger) so that affected landowners can be notified, and as a means for other interested parties to know where jurisdictional wetlands exist.

Certain activities are exempt from regulation; other activities that could have negative impact on wetlands are regulated. To conduct any regulated activity in a protected wetland or its adjacent area, a permit is required. The permit standards in the regulations require that impacts to wetlands be avoided and minimized. If the proposed activity will not seriously affect the wetland, a permit with various conditions is usually issued. If the proposed activity will affect the wetland, the benefits gained by allowing the action to occur must outweigh the wetland benefits lost in order for a permit to be issued. Compensatory mitigation often is required for significant impacts to wetlands. This may include creating or restoring wetlands to replace the benefits lost by the proposed project.

New York State Department of Environmental Conservation (NYSDEC) Wetland maps for Westchester¹, Bronx² and Queens³ Counties were reviewed for the Circuit 1 route. Several NYSDEC wetlands were found to be in the general vicinity of the proposed route. These included wetland W-3 along Sheldon Brook, just east of the Tappan Zee Bridge and just west of the intersection of Interstate Routes 87 and 287. Other NYSDEC wetlands in the general vicinity of the route in Westchester County include MV-2 and MV-4 in the town of Greenburgh and the City of Yonkers, respectively.

In Bronx County, the primary wetlands are YO-1 and YO-2 located in Van Cortlandt Park. YO-1 is located on the west side of the route as a string of wetlands along Tibbetts Brook. YO-2 is a small wetland to the east of the express way at the northern edge of Bronx County. There are no other New York State Department of Environmental Conservation designated wetlands in Bronx County.

There are no New York State Department of Environmental Conservation designated wetlands in Queens County.

4.2.2 National Wetlands Inventory Wetlands

Wetlands shown on the New York State Department of Environmental Conservation maps usually are also protected by the U.S. Army Corps of Engineers (the Corps), but there are additional wetlands not shown on the new maps because they are smaller than 12.4 acres in size that are protected by the Corps. There are numerous Corps wetlands in the general vicinity of the route. National Wetland Inventory (NWI) maps for the White Plains⁴, Mt. Vernon⁵, Yonkers⁶ and Central Park⁷ topographic quadrangles for the revised Circuit 1 route were reviewed. Several NWI wetlands were found to be in the general vicinity of the proposed route, many of them scattered across the countryside along the corridor. The more notable wetlands are discussed below.

In the area of the White Plains quad, at the landfall of the proposed route on the east end of the Tappan Zee Bridge, there are several large palustrine wetlands associated with Sheldon Brook at the north end of the revised route, primarily in the town of Tarrytown. The next is a series of

¹ New York State Freshwater Wetlands Map, Westchester County, NY Map 10, 12, & 13 of 14.

² New York State Freshwater Wetlands Map, Bronx County, NY Map 1, & 3 of 4.

³ New York State Freshwater Wetlands Map, Queens County, NY Map 1 of 10.

⁴ US Dept of the Interior, Fish & Wildlife Dept, National Wetlands Inventory White Plains Quadrangle, 1994.

⁵ US Dept of the Interior, Fish & Wildlife Dept, National Wetlands Inventory Mt Vernon Quadrangle, 1990.

⁶ US Dept of the Interior, Fish & Wildlife Dept, National Wetlands Inventory Yonkers Quadrangle, 1990.

⁷ US Dept of the Interior, Fish & Wildlife Dept, National Wetlands Inventory Central Park Quadrangle, ND.

riverine and palustrine wetlands associated with the Saw Mill River in the town of Greenburgh, a direct tributary of the Hudson. This river parallels the interstate and the route for approximately 2.5 miles. This system includes a variety of streams and ponds including Woodlands Lake, which is located in V. E. Macy Park.

In the Mt. Vernon quad, also in the Town of Greenburgh, the interstate and the route cross over to the Sprain Brook flowage, a tributary of the Bronx River. The route parallels this stream course for about two miles passing primarily riverine wetlands. The only other major National Wetland Inventory wetland encountered on the Mt. Vernon quad is Hillview Reservoir in the City of Yonkers.

National Wetland Inventory wetlands mapped on the Yonkers quad are primarily associated with the Tibbetts Brook drainage where it passes through Van Cortlandt Park. This is a series of palustrine wetlands located to the west of the route in the City of Yonkers. The Jerome Park Reservoir, located about a quarter of a mile to the east, is also found in the vicinity and slightly to the south of the park.

There are no National Wetland Inventory palustrine wetlands on the Central Park quad for Bronx County located in the vicinity of the proposed route. There are numerous riverine wetlands along the route, including the Harlem River, the Bronx Kill and the East River, all of which, except for the Bronx Kill, have been described in the earlier submittal.

4.2.3 Tidal Wetlands

The route for Empire Connection Circuit 1 described in the November 17, 2003 application turned along the east bank of the Hudson River. The placement of this route resulted in Empire Connection Circuit 1 being placed in close proximity to the tidal systems of the Hudson River. The proposed new route of Empire Connection Circuit 1 now passes inland from the east end of the Tappan Zee Bridge, thus avoiding all tidal wetlands until it approaches the Harlem River in the Bronx. From the Harlem River south the tidal wetlands are as described in Exhibit 4, Section 4.3.10 of the November 17, 2003 application. The only exception to this is the crossing of Bronx Kill⁸. The Bronx Kill in the vicinity of the proposed crossing is classified as Littoral Zone. A small coastal shoal, bar or mudflat is located on the other side (east) of the Amtrak Railroad bridge from the crossing.

4.2.4 Potential Impacts

This section presents the hydrologic aspects of potential impacts to wetlands located near the proposed route. No wetlands exist on the alternate site for Downstate Converter Circuit 1.

In areas where construction may proceed below ground, the cable will be laid in the Thruway right of way, at the bottom of a trench that will be up to six feet deep and two feet wide. The trench will be excavated with equipment, such as backhoes or a trench cutter.

No significant permanent impacts to wetlands are expected since the trenches will be backfilled and revegetated, and the original topography restored. Short-term construction impacts to the hydrologic regime of a wetland may include the potential for increased siltation from excavated-soil runoff, drainage changes caused by the channeling effects of a temporary open trench, and drainage changes caused by compacting the soils under the weight of equipment.

⁸ New York State Department of Environmental Conservation Tidal Wetland Map 590-516.

Loss of vegetation and soil compaction may inhibit infiltration and increase runoff, resulting in the potential for increased surface water recharge and siltation to the wetland system. There is also potential for accidental petroleum contamination due to minor leaks or spills from equipment.

Downstate Converter Circuit 1 will cover less than 10 acres. The potential short-term impacts from the construction of the site will be similar to that of the trenches, i.e. siltation from excavated soils, compaction of soils from equipment, and drainage changes from clearing, grubbing and grading activities. Construction at the sites may cause localized minimal changes that could potentially impact wetlands by altering drainage patterns and surface soil permeabilities. There is also the potential for accidental oil spills or leaks from equipment. Although these potential impacts are not likely to be significant, avoidance and mitigation measures (discussed in next section) will be implemented to avoid, where possible, and minimize potential impacts.

4.2.5 Avoidance and Mitigation

Until the exact trench locations are determined in the detail design stage of the Empire Connection project, it will not be possible to definitively determine whether any construction in wetlands or wetland affected areas will be necessary. Once detailed design allows for such determinations, specific avoidance and mitigation measures that are tailored to the individual construction impacts will be identified. These specific mitigation measures will be described in the Environmental Management & Construction Plan.

The Environmental Management & Construction Plan (EM&CP) will be submitted as a Compliance Filing prior to the start of construction. The EM&CP will address any potential hydrologic impacts to wetlands and mitigation measures. Part of the EM&CP, if necessary, will include the development of a Storm Water Pollution Prevention Plan.

As indicated in Exhibit 4 of the November 17, 2003 application, the proposed route and converter will be located in such a way that wetlands will be avoided to the maximum extent practicable. However, along the proposed route itself, complete avoidance of these wetlands may not be possible. Where complete avoidance is not possible short-term impacts from siltation and erosion during construction can be mitigated by utilizing best engineering construction practices to prevent or minimize erosion of excavated soils and by careful project planning.

Engineering erosion controls to be implemented will include the use of hay bales, silt fences, mulch placement, reseeded, geofabric installation, temporary drainage swales or dikes, rip-rap, and sediment traps or basins. Project planning will also minimize potential impacts by ensuring that work is completed as quickly as possible, construction vehicles are confined to as limited an area as possible, and work activities in severe weather conditions are limited.

The portions of the cable within the 100-year and 500-year floodplains south of the Tappan Zee Bridge will be buried and the land will be returned to its original grade, or the cable will be suspended from structures. The upland cable route is fully developed and paved or covered with gravel ballast or otherwise previously disturbed, and all work within the floodplain will be conducted such that no significant alteration to existing grades will occur. No flood volume displacement will occur as part of the cable installation. Therefore, no impacts to the floodplain are expected from the construction and operation of the transmission line portions of the Empire Connection project.

There is some potential for minor impacts to the estuarine zone at the crossing points. However, specialized installation techniques will be used to minimize impacts. The Empire Connection project will avoid most disturbances to any nearshore wetlands with the use of directional drilling construction techniques from an upland staging area, most likely on the north side of the river.

The potential for accidental release of drilling fluids exists within the estuarine zones in conjunction with directional drilling. To minimize the potential for impacts associated with the accidental release of drilling fluids, drilling fluid volume will be carefully monitored and an appropriate drilling fluid loss and response plan will be developed. Further, appropriate bentonite drilling fluids will be used, which solidify upon contact with salt water, minimizing impacts resulting from breakthrough.

Spill prevention plans will also be developed to address potential water quality concerns from equipment leaks and accidental releases. These plans will establish procedures for vehicle refueling, equipment inspections, preventive maintenance, secondary containment, and spill response.

Prior to construction, the entirety of the rights of way will be walked and any wetlands not mapped will be identified and delineated. Each identified area will be assessed individually to determine whether it can be avoided or whether some other form of mitigation is needed.

In the event that the Empire Connection project will result in any unavoidable net loss of wetlands or wetland functions, a wetland restoration/replacement plan will be prepared and submitted as a compliance filing, as necessary.

4.3 Water Systems

The primary water systems in the general vicinity of the proposed route are the aqueducts bringing potable water from the Croton, Catskills and Delaware drainages south to New York City. These include the Old Croton Aqueduct, the New Croton Aqueduct and the Catskill Aqueduct. In addition, the Hillview Reservoir is used as a water storage area for the City of New York Water Department, and is located along the Catskill Aqueduct. Because it is greatly elevated above the surrounding terrain it is not directly visible from the Interstate.

Most of the other water bodies along the proposed route from the Tappan Zee Bridge to the Rainey Substation that are labeled as reservoirs are no longer used as potable water supply reservoirs. In addition, according to the "Patterns for Westchester," publication of the Westchester Planning Department, the New York City reservoir system and its watershed encompass much of the land of northern Westchester County.

The need to enhance protection of the drinking water supply will have land use and infrastructure impacts on existing developed areas, as well as on the type and extent of future development. Possible limitations on development may make central and southern Westchester County more logical locations for some development.

4.3.1 Potential Impacts

The discussion applicable to Section 4.2.4, above, is also applicable to Section 4.3.

4.3.2 Avoidance and Mitigation

The discussion applicable to Section 4.2.5, above, is also applicable to Section 4.3.

5. Sites of Special Interest

The November 17, 2003 application identified the following kinds of sites within one mile of the proposed facility, as well as potential impacts of the project on such sites and proposed avoidance and mitigation practices:

- hazardous waste sites,
- hazardous substance sites,
- petroleum contaminated sites,
- solid waste sites and landfills,
- registered above-ground and underground storage tanks,
- reported leaking storage tanks,
- recycling facilities,
- reported spill sites, and
- toxic chemical releases.

This supplement discusses the types of sites of special interest that may emerge as relevant for the first time because of Circuit 1's proposed route revision and thus were not addressed in the November 17, 2003 application.

Just 12% of Circuit 1's direct current route has been modified by this supplement. This continuous 14.8 mile segment in Westchester and Bronx counties from the Tappan Zee Bridge to the point at which the Major Deegan Expressway reaches the Harlem River shore, coming alongside the Metro-North Railroad Hudson Division tracks, is the only segment of Circuit 1's direct current route that is not either identical to the proposed route in the November 17, 2003 application or nearly identical (within 200 feet of that original route).

Additionally, 71% of Circuit 1's alternating current interconnection route has been modified by this supplement. This continuous 3.4 mile segment in New York and Queens counties from the Harlem River Rail Yard to Consolidated Edison's Rainey 345 kV substation is the only segment of Circuit 1's alternating current route that is not identical to the proposed route in the November 17, 2003 application (albeit a segment was proposed as direct current).

These two continuous segments of Circuit 1's route, an aggregate distance of 18.2 miles, are located in a very densely-settled region of the New York City metropolitan area that has been subject to intensive industrial and urban activity for over 100 years. A very large number of sites of special interest were identified. Our purpose here is to discuss sites along these new additions to Circuit 1's route that may be potentially contaminated with hazardous constituents or are involved in the handling of hazardous substances.

Federal, state and local government records were searched for potential sites of special interest for the November 17, 2003 application. Over 4,000 sites were identified. See Exhibit 4, Table 4.3.5.5. Sites similar to those listed in the November 7, 2003 application are located within the one-mile corridor on either side of the new route additions in Westchester, Bronx, New York and Queens counties.

Within a one-mile radius of the new, alternate site for Downstate Converter Circuit 1, proximate to the 145th Street Bridge in Bronx County, there exist over two dozen sites of special interest. However, since the original and revised Circuit 1 route includes this new, alternate site, the November 17, 2003 application has already identified these sites.

Typical of this area's industrial character, the sites generally had public records indicating:

- current tanks containing petroleum or hazardous materials,
- closed underground tanks; spills or releases,
- construction and demolition debris operations
- waste transfer stations, or
- recycling operations.

5.1 Potential Impacts

Because the 18.2 miles of new route additions are almost exclusively within the right of way of the existing transportation corridor (highways and local roads), as is the balance of the route, Circuit 1's installation will be similar to that described in the November 17, 2003 application, will generally be in previously disturbed soils and will therefore have no impact on undisturbed soils. Soils within the proposed right of way are reworked or recent fills and they will be restored to like conditions after the Empire Connection project's construction.

Given the narrow dimensions of the trenches that will be excavated, any disturbance to potentially contaminated soil will be minimal. In addition, construction of Downstate Converter Circuit 1 will be above ground with minimal ground intrusion, thus limiting the amount of potentially contaminated soil that may be encountered.

5.2 Avoidance and Mitigation

Sites of special interest will not be adversely affected by Empire Connection construction. Neither will they affect the Project.

This avoidance of impacts is due to:

- the distance of these sites from the proposed facility (albeit within one mile),
- intermediate topographic features,
- the extent and type of contamination where it exists, and
- the materials being managed by these sites.

In addition, some of the listings previously acquired indicate that the sites are compliant with applicable environmental regulations or that previously known environmental problems have been addressed.

Cut and cover construction and isolated directional boring within the New York State Thruway and Major Deegan Expressway right of way, as the November 17, 2003 and this supplement propose, will result in no adverse change to existing soils. Actions to be taken upon encountering unknown hazardous constituents in the soil during construction will be addressed in the Environmental Management and Construction Plan. The necessity to deal with hazardous or suspected hazardous constituents during construction will be dealt with on an occurrence basis.

A Soil, Sediment, and Groundwater Management Plan will be prepared as a component of the Environmental Management and Construction Plan. This component will specify how suspect soil, sediment, and groundwater will be identified and handled during construction.

In general, the soils, sediment, or other suspect waste materials which may include hazardous characteristics of ignitability, reactivity and corrosivity will be sampled and sent for laboratory analysis. The material will then be managed, handled and disposed of as required.

Management of any potentially hazardous substance will be undertaken in accordance with all applicable rules and regulations, specifically those promulgated by the New York State Department of Environmental Conservation in the New York Codes of Rules and Regulations. Where contaminated soil is removed for controlled treatment and/or offsite disposal, clean soil will be used for backfill (See Exhibit 4, Section 4.3.5.6.3).

6. Visual

This supplement clarifies that Circuit 1 will be 100% solid cable. For the entire distance, from one end to the other, solid cable will be buried underground (or much less commonly, attached to road structures, effectively hidden from view). Electric wires without insulation suspended in the air by prominent transmission poles and towers will not be used, at any point under any circumstances, making the proposed facility a model project in terms of visual and environmental compatibility.

The proposal in the November 17, 2003 application for aerial and aboveground transmission erections of various types is hereby retracted. The visual impact analyses in the application's Exhibit 4 concerning such erections are no longer relevant, including several sections of the report by the project's expert consultant Environmental Design & Research, P.C. entitled "Visibility and Visual Impact Analysis".

This supplement proposes a revised route for Circuit 1's direct current transmission line in Westchester and Bronx counties and alternating current transmission line in Bronx, New York and Queens Counties. However, 100% of this direct current transmission line and 100% of this alternating current transmission line will either be completely invisible or, in limited special circumstances where it will be attached to road structures or the Oak Point Link, virtually invisible beyond a few feet from the proposed right of way.

Visual impact analyses are not required for underground solid cable since the cable will not be within any viewshed. See New York State Department of Environmental Conservation program policy entitled "Assessing and Mitigating Visual Impacts", DEP-00-2, issued July 31, 2000. Specifically, section III states:

"When a facility is potentially within the viewshed of designated aesthetic resources, the Department (of Environmental Conservation) will require a visual assessment ..."

Similarly, visual impact analyses are not required for solid cable attached to road structures or the Oak Point Link since the cable will also not be within any viewshed.

The program policy DEP-00-2 defines a "viewshed" as:

"A map that shows the geographic area from which a proposed action may be seen ..."

A component of a proposed facility that cannot be seen more than a few feet away from the proposed right of way does not have a significant viewshed and hence cannot impact an aesthetic resource however nearby.

This supplement proposes an alternate site for Downstate Converter Circuit 1, requiring a visual impact analysis for this new element of the project. The alternate site for the converter is along the Oak Point Link route, proximate to the 145th Street Bridge in Bronx County, approximately 1.8 miles from the Washington Bridge. The 145th Street Bridge is the Harlem River crossing at East 149th Street in Bronx County and West 145th Street in New York County. The current occupant of this site is a concrete recycling plant and the surroundings are commercial-industrial.

The new alternate site for the converter is bordered by the Major Deegan Expressway to the east, Harlem River to the west, 145th Street Bridge to the north and commercial-industrial property to the south. Beyond the Major Deegan Expressway to the east are River Avenue and its intersection with East 146th Street. Beyond the Harlem River to the west is Harlem River Drive in New York County and beyond Harlem River Drive, Colonel C. Young Playground. Industrial-commercial properties line the Harlem River to the north, beyond the 145th Street Bridge, and further south to the Madison Avenue Bridge.

A. Inventory of Aesthetic Resources in the Area of the New Alternate Site for Downstate Converter Circuit 1

The report by the project's expert consultant Environmental Design & Research, P.C. entitled "Visibility and Visual Impact Analysis" listed visual sensitive resources within one mile of any component of the Empire Connection project as it was proposed in the November 17, 2003 application, including both Circuit 1 and Circuit 2 and the upstate and downstate converters associated with each circuit. See Table 1, "Visually Sensitive Resources and Intensive Land Uses". The new, alternate site for Downstate Converter Circuit 1 is on the route that was studied in the visual impact analysis report. No visual sensitive resources were identified within one mile of the new, alternate site for Downstate Converter Circuit 1.

The report refers to section 4.3.14 of the November 17, 2003 application for a list of historic sites within one mile of any component of the Empire Connection project as it was proposed in the application, including both Circuit 1 and Circuit 2 and the upstate and downstate converters associated with each circuit. In section 4.3.14 of the application, see:

- a. Table 4.3.14-2, "Non-Archeological Properties List on the State and/or National Registers of Historic Places that are Within One Mile of the Project Route" concerning visual sensitive resources in Bronx County that may be in the area of Downstate Converter Circuit 1, and
- b. Table 4.3.14-3, "Historical Sites Within One Mile of the Project Route, National and State Register of Historic Places (Manhattan Only)" concerning visual sensitive resources in New York County that may be in the area of Downstate Converter Circuit 1.

The data provided by these tables established that the following historic sites are within one mile of the new alternate site of Downstate Converter Circuit 1:

- a. Historic Sites in Bronx County Within One Mile of the New Alternate Site for Downstate Converter Circuit 1: Generally, the 15 historic sites in Bronx County from the Central Park U.S. Geologic Survey Quad, sites 113 and 115 through 128.
- b. Historic Sites in New York County Within Three Miles of the New, Alternate Site for Downstate Converter Circuit 1 are shown in Table 4.13.2b in the Table Section of this document.

B. Visual Assessment of the New Alternate Site for Downstate Converter Circuit 1

Project staff inspected the site and surrounding area. Using a large 70 foot billboard sign as a marker and scale, the team assessed the likely locations where the converter could be viewed, considering public access. Based on site-specific topographic and land use conditions, the study area was defined as a one-mile radius around the new alternate site.

Given this environment, a heavily urbanized locale with many visual impediments, the study area is very broadly defined for a visual impact analysis.

The one-mile radius incorporates parts of Bronx and New York counties. Bronx County from 166th Street and Jerome Avenue to the north, East 149th Street and Cauldwell Avenue to the east, and the Willis Avenue Bridge to the south, is incorporated. New York County from West 162nd Street and Edgecombe Avenue to the north, West 145th Street and Broadway to the west, and 126th Street and Fifth Avenue to the south, is incorporated.

The one mile radius incorporates five Harlem River bridges: the Macombs Dam Bridge, 145th Street Bridge, Madison Avenue Bridge, Third Avenue Bridge and Willis Avenue Bridge. It incorporates two major highways on either side of the Harlem River: the Major Deegan Expressway in Bronx County and Harlem River Drive in New York County.

It incorporates several major streets in Bronx County such as: Grand Concourse from East 166th Street to East 138th Street, East 161st Street from the Macombs Dam Bridge to Third Avenue, East 149th Street from the 145th Street Bridge to Cauldwell Avenue, and Melrose Avenue from the Willis Avenue Bridge to East 163rd Street. It incorporates several major streets in New York County such as: Malcolm X Boulevard from the 145th Street Bridge to West 127th Street, Fifth Avenue from 142nd Street to 126th Street, Madison Avenue from the Madison Avenue Bridge to East 126th Street, West 145th Street from the 145th Street Bridge to Broadway, and West 155th Street from the Macombs Dam Bridge to Amsterdam Avenue.

The one mile radius incorporates in Bronx County: Yankee Stadium, Bronx Terminal Market, Lincoln Medical Center, Macombs Dam Park, John Mullaley Park, J. Kilmer Park, Franz Sigel Park and St. Mary's Park. It incorporates in New York County: Trinity Cemetery, City College, Jasper Oval, A. Lewisohn Plaza, Harlem Hospital, the former Polo Grounds Stadium, Holcombe Rucker Memorial Playground, Highbridge Park, Jackie Robinson Park, Colonel C. Young Playground, St. Nicholas Park, and Harlem River Drive Park.

The concrete recycling plant located presently at the new, alternate site for Downstate Converter Circuit 1 is not visible from most of the above streets, bridges, parks, hospitals and cultural resources. The views are obscured by the screening of man-made structures generally, including: the 145th Street Bridge that abuts the new alternate site to the north and severely blocks views, Major Deegan Expressway that abuts the site to the east and severely blocks views, and Harlem River Drive to the west that severely blocks views from New York County.

If located at the new alternate site, Downstate Converter Circuit 1 will be able to be viewed by the following visual sensitive resources:

a. 145th Street Bridge. Motorists driving in the bridge lanes from New York County to Bronx County may see Downstate Converter Circuit 1 where they presently see the concrete recycling plant.

b. Major Deegan Expressway. Motorists driving in the highway lanes southeast towards the Triborough Bridge will see Downstate Converter Circuit 1 where they presently see the concrete recycling plant.

c. Harlem River Drive. Motorists driving in the highway lanes northeast towards the Henry Hudson Parkway will be able to see Downstate Converter Circuit 1 across the Harlem River where they presently see the concrete recycling plant.

d. Colonel C. Young Playground. This playground is located between Malcolm X Boulevard to the west, Harlem River Drive to the east, West 145th Street to the north, and West 143rd Street to the south. It is approximately 700 feet to the west of the new alternate site, with Harlem River Drive and the Harlem River between it and the new alternate site. Users of the playground will have partially-obscured views of Downstate Converter Circuit 1 where presently they see the concrete recycling plant.

Other proximate visual sensitive resources may have a limited view of the upper portion of Downstate Converter Circuit 1 at the new, alternate site. Within 3,000 feet of the site are Yankee Stadium, Bronx Terminal Market, Lincoln Medical Center, Franz Sigel Park, and Macombs Dam Park in Bronx County and Harlem Hospital in New York County. In each case, the proposed Downstate Converter Circuit 1 will be at least partially obscured by intervening man-made structures.

A separate volume to this supplement provides photography and renderings of the views of the new alternate site from the 145th Street Bridge, Harlem River Drive and Colonel C. Young Playground. This photography and renderings demonstrate the proposed Downstate Converter Circuit 1 will be visible from close-in locations due to its height and mass.

C. Significance of Aesthetic Impact of the New Alternate Site for Downstate Converter Circuit 1

The visual analysis demonstrates that due to the structure's height and mass, it will be visible from close-in locations and will likely be partially visible from some locations at a distance. Visual sensitive resources are relatively distant from this location, and views are generally at least partially blocked by man-made structures abutting the site and within the area.

The program policy of the New York State Department of Environmental Conservation states:

"Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Significant aesthetic impacts are those that may cause a diminishment of the public enjoyment and appreciation of an inventoried resource, or one that impairs the character or quality of such a place." DEP-00-2, section V (Procedure), part C (Significance).

The new structure will generally be larger than other nearby structures. Additionally, portions of the filter structure are filled electrical equipment that will likely catch-the-eye of the beholder. The steel structural members are not unlike similar support structures on the adjacent and nearby bridges. The size, mass and complexity of the converter will draw attention, however, it is not out of character with the industrial character of the surroundings. By this standard, Downstate Converter Circuit 1 if located at the alternate site would not have a significant visual impact.

D. Mitigation of Visual Impact of the New Alternate Site for Downstate Converter Circuit 1

To the extent possible, Downstate Converter Circuit 1 will incorporate visually friendly design principles and components. For example, the converter will be: screened at street level; engineers

will continue to work on a design to minimize its height; and it will use non-specular materials and obscuring lighting.

7. Heavily Timbered (Forested) Areas and Agricultural Areas

7.1 Heavily Timbered Areas

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

7.2 Agricultural Areas

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

8. High Points, Ridge Lines and Steep Slopes

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

9. Present or Future Land Use

A concrete recycling plant presently occupies the new, alternate site for Downstate Converter Circuit 1. If Downstate Converter Circuit 1 is located at this site, its land use for commercial/industrial purposes will not be affected.

9.1 Existing Conditions

The alternate site for Downstate Converter Circuit 1 is located in a medium performance manufacturing area, zoned M2-1. Approximately five acres in size and located at the intersection of the 145th St. Bridge and the Major Deegan Expressway, the proposed site is bordered to the west by the Harlem River, to the north (beyond the 145th Street Bridge) and south by other M2-1 manufacturing lots, and to the east by the right of way of the Major Deegan Expressway. Currently occupied by a concrete recycling facility, and surrounded by areas of advanced urban development, this site has been previously disturbed and no new adverse impacts to existing land use are anticipated. Two additional current uses include an easement for the Oak Point Link and site use for a large advertising billboard. Past site uses are believed to have included an automobile collision storage yard.

9.2 Potential Impacts

The 145th St. site proposed for the placement of the downstate converter meets the occupancy requirements set forth by the New York City Department of City Planning Section 17C use categorization. This alternate site for Downstate Converter Circuit 1 will not adversely impact the surrounding area, as its proposed use will be consistent with current site uses as well as adjacent uses.

9.3 Avoidance and Mitigation

The alternate Downstate Converter Circuit One site will require minor Land Use mitigation once all construction activities have been completed.

9.4 Coastal Zone Management:

Given that portions of the project have been sited in close proximity to the Harlem River and other coastal management zones, care will be taken to insure consistency with Coastal Management Program (CMP) State Coastal Policies, and the New York City Waterfront Revitalization Program. The proposed new route south of the Tappan Zee Bridge for Circuit 1 was designed to comply with the policies of the Coastal Zone Management (CZM) program. A summary of the CZM policies and the new project development consistency with each applicable policy is presented below.

Policy 2: Facilitate the Siting of Water-Dependent Uses and Facilities on or Adjacent to Coastal Waters.

The Circuit 1 corridor considered in this supplement is located within the existing highly disturbed road rights of way from its approach to the Harlem River to its divergences southward across the Hell Gate Channel of the East River. Therefore, although this route is adjacent to the Coastal Zone in some locations, it is located in an area that is already highly disturbed and occupied by existing infrastructure of a similar type. The alternate site for the Downstate Converter Circuit 1 and the transmission line route are not anticipated to cause any impact to the future potential for the development of water dependent uses. Although the converter is not considered to be a water-dependent use, the proposed siting of the transmission line and need to cross from the Bronx side of the East River to the Queens side of the East River necessitates that the converter be located at the proposed site or similar location.

Fish and Wildlife Policies:

Policy 7: Significant Coastal Fish and Wildlife Habitats Will be Protected, Preserved, and Where Practical, Restored so as to Maintain Their Viability as Habitats.

There are no anticipated impacts to fish and wildlife habitats due the construction or operation of Circuit 1. Proposed construction methods will avoid these resources as all water crossings will be bored beneath the water body and will not disturb bottom sediments or the water column.

Flooding & Erosion Hazard Policies:

Policy 11: Buildings and Other Structures Will be Sited in the Coastal Area so as to Minimize Damage to Property and the Endangering of Human Lives Caused by Flooding and Erosion.

Although certain stretches of facilities proposed in this supplement will be installed along the Harlem River and in close proximity to other coastal areas, the Empire Connection project is generally sited outside of the mapped floodplain. Any portion of the cable system to be installed within the mapped floodplain will be installed underground or beneath the riverbed, and is not an above ground structure that would displace floodwaters and cause flooding beyond the existing coastal zone. The converter will be partially constructed within a Federal Energy Management Agency mapped 100-year floodplain. Portions of the site will be brought up to the 100-year floodplain elevation for the protection of the facility. The filling of this flood volume will have no significant effect as this is a coastal site.

Policy 12: Activities or Development in the Coastal Area Will Be Undertaken so as to Minimize Damage to Natural Resources and Property from Flooding and Erosion by Protecting Natural Protective Features Including Beaches, Dunes, Barrier Islands and Bluffs.

The new Circuit 1 route and its converter are proposed to be located within existing highly disturbed areas, and will not directly or indirectly impact any natural protective features including beaches, dunes, barrier islands, or bluffs.

Policy 15: *Mining, Excavation or Dredging In Coastal Waters Shall not Significantly Interfere With the Natural Coastal Processes Which Supply Beach Materials to Land Adjacent to Such Waters and Shall be Undertaken in a Manner Which Will not Cause an Increase in Erosion of Such Land.*

The Empire Connection does not involve mining or dredging.

Policy 17: *Non-Structural Measures to Minimize Damage to Natural Resources and Property From Flooding and Erosion Shall be Used Whenever Possible.*

The small portion of the cable transmission system to be installed within the mapped floodplain will be installed underground. The new, alternate converter will be partially constructed within a Federal Energy Management Agency mapped 100-year floodplain. Portions of the site will be brought up to the 100-year floodplain elevation for the protection of the facility. The filling of this flood volume will have no significant effect as this is a coastal site.

General Safeguard Policies

Policy 18: *To Safeguard The Vital Economic, Social And Environmental Interests Of The State And Of Its Citizens, Proposed Major Actions In The Coastal Area Must Give Full Consideration To Those Interests, And To The Safeguards Which The State Has Established To Protect Valuable Coastal Resource Areas.*

The project will not adversely impact the economic, social or environmental interests of the state of New York. The cable will be buried underground and construction impacts will be temporary. The converter will be located in a currently industrialized location and will not adversely affect residential and commercial interests. The proposed project provides a benefit to the interests of the state of New York by providing reliable power source to the area as well as 48% of the energy shortfall as described in the original application and the Executive Summary of this report.

Public Access Policies

Policy 19: *Protect, Maintain, and Increase the Level and Types of Access to Public Water-Related Recreation Resources and Facilities.*

No public water-related recreation resources or facilities are located in the vicinity of the new alternate Downstate Converter Circuit 1 site. The transmission route follows existing developed road right of way or will be buried below public access ways. Due to safety considerations, Empire Connection facilities do not provide any opportunity for additional public access to water related recreational resources, nor does it hinder them.

Policy 20: *Access to the Publicly-Owned Foreshore and to Lands Immediately Adjacent to the Foreshore or the Water's Edge that are Publicly-Owned Shall be Provided and it Shall be Provided in a Manner Compatible With Adjoining Uses.*

The alternate Downstate Converter Circuit 1 will be constructed within privately owned property and the cable will be buried beneath existing private or state-owned or city-owned lands. The cable will be installed under the river or waterways via directional drilling or boring and will not disturb these resources nor will it interfere with existing public uses of the East River such as recreation or navigation. Coastal resources such as water quality, fisheries, wetlands, and coastal habitats, were considered in the siting and design of the proposed project. No permanent impacts to these resources are anticipated and any temporary impacts from construction activities will be mitigated.

Policy 21: *Water-Dependent and Water-Enhanced Recreation Will be Encouraged and Facilitated, and Will be Given Priority Over Non-Water-Related Uses, Along the Coast.*

Although the Empire Connection project is not a water-related use, the cable will be buried and it will not interfere with any existing water-related uses as previously described.

Policy 22: Development, When Located Adjacent to the Shore, Will Provide for Water-Related Recreation, Whenever Such Use is Compatible With Reasonably Anticipated Demand for Such Activities, and is Compatible With the Primary Purpose Of the Development.

As previously described, the cable system will be buried and will be compatible with existing water-related recreational uses of the Harlem River and the East River. No water-related recreation is anticipated at the new alternate Downstate Converter Circuit 1 site as part of the Empire Connection.

Energy and Ice Management Policies

Policy 27: Decisions of the Siting and Construction of Major Energy Facilities in the Coastal Area Will be Based on Public Energy Needs, Compatibility of Such Facilities With the Environment, and the Facility's Need for a Shorefront Location.

As the impetus for the initial application to the project, a demonstration has been made that the project will address public energy needs. The project route has been redesigned in a fashion that is compatible with the existing infrastructure and environmental conditions.

Policy 28: Ice Management Practices Shall not Interfere with the Production of Hydroelectric Power, Damage Significant Fish and Wildlife and Their Habitats, or Increase Shoreline Erosion or Flooding.

No ice management practices are proposed or will be required for the Empire Connection project.

Water and Air Resources Policies

Policy 30: Municipal, Industrial, and Commercial Discharge of Pollutants including, but not limited to, Toxic and Hazardous Substances, into Coastal Waters will Conform to State and National Water Quality Standards.

The project will not result in direct or indirect discharges of any pollutants to the groundwater or surface water, including the Harlem River, the Hudson River or the East River. Construction related methods and mitigation procedures are described in Exhibit E-3 and in Exhibit 4, Sections 4.3.5 and 4.3.15.

Policy 33: Best Management Practices Will be Used to Ensure the Control of Stormwater Runoff and Combined Sewer Overflows Draining into Coastal Waters.

The project will develop a project specific Environmental Management and Construction Plan to address the control of stormwater runoff during construction, and a Storm Water Pollution Prevention Plan to ensure the control of storm water runoff draining into coastal waters during operation. These documents will detail Best Management Practices for both construction and operation of the project

Policy 35: Dredging and Dredge Spoil Disposal in Coastal Waters will be Undertaken in a Manner that Meets Existing State Dredging Permit Requirements, and Protects Significant Fish and Wildlife Habitats, Scenic Resources, Natural Protective Features, Important Agricultural Lands, and Wetlands.

The Empire Connection project does not involve dredging.

Policy 38: The Quality and Quantity of Surface Water and Groundwater Supplies will be Conserved and Protected, Particularly Where Such Waters Constitute the Primary or Sole Source of Water Supply.

No pollutants will be discharged to the surface water, groundwater or drinking water supplies. In addition, Empire Connection does not require the use of groundwater or surface water (other than for nominal uses such as dust control) during construction or operation.

Policy 40: Effluent Discharge From Major Steam Electric Generating and Industrial Discharges into Coastal Waters will not be Unduly Injurious to Fish and Wildlife and Shall Conform to State Water Quality Standards.

The Empire Connection is not a Major Steam Electric Generating facility and will not result in any effluent discharge or industrial discharge to coastal waters.

Policy 44: Preserve and Protect Tidal and Freshwater Wetlands and Preserve the Benefits Derived From These Areas.

The Empire Connection was sited to avoid wetland resource areas along the shoreline in the vicinity of the Converter. All proposed activities will, to the extent practicable, be kept outside the New York State Department of Environmental Conservation mapped freshwater wetlands and their 100-foot adjacent area. No permanent impacts to mapped tidal or freshwater wetlands or adjacent areas are expected from the construction or operation of Empire Connection. Potential temporary impacts from the installation of the cable are limited to where the construction right of way comes to within 100 feet of a wetland resource. Special care will be taken in these areas to avoid impacting wetland resources. Potential indirect impacts will be controlled through the use of appropriate erosion and sedimentation controls which will be outlined in detail in the Environmental Management & Construction Plan.

9.5 Avoidance and Mitigation:

The location proposed in this supplement is zoned as one for medium level manufacturing, and it is surrounded by properties of similar zoning classifications and requirements. Zoning maps of the area indicate that the nearest identified residence is located several blocks away from the converter, and there are no parks, cultural or natural areas in its immediate vicinity. Therefore, there does not appear to be reason for additional preventative or corrective measures relating to landuse. The redevelopment of the site with electric utility infrastructure is consistent with existing and probable future uses within the district.

10. Plant Life and Wildlife

This supplement revises the route of the proposed facility, Circuit 1, in Westchester, Bronx, New York and Queens Counties. In Westchester County, the route will be within the New York State Thruway corridor instead of the Metro-North Railroad corridor. The route revision does not change the discussion of plant life and wildlife impacts in Exhibit 4 of the November 17, 2003 application, nor does any other aspect of this supplement.

11. Fish and Aquatic Life

This supplement retracts the proposal to install a segment of the transmission line in the East River. The discussion of possible fish and aquatic life impacts in the November 17, 2003 application is hereby retracted. Circuit 1 will not be installed in any open bodies of water.

12. Marine Environment

This supplement retracts the proposal to install a segment of the transmission line in the East River. The discussion of possible marine environment impacts in the November 17, 2003 application is hereby retracted. Circuit 1 will not be installed in any open bodies of water.

13. Scenic, Recreational and Historic/Archeological Resources

13.1 Scenic and Recreational Resources

13.1.1

Westchester County:

In the November 17, 2003 application, it was proposed that Circuit 1 follow the Metro-North Railroad / Hudson Line right of way exclusively in Westchester County, from where Circuit 1 enters Westchester County via the Tappan Zee Bridge to where it leaves the county and enters Bronx County and New York City. This Metro-North Railroad right of way is just along the Hudson River for almost the entire distance, from Tarrytown, through Irvington, Dobbs Ferry, Hastings-on-Hudson and Yonkers.

Table 4.3.14-1 of the application listed 37 parks and recreation areas within one mile of this Metro-North Railroad right of way in Westchester County. All 37 of these parks and recreation areas are local facilities. Four of them border the railroad right of way: Matthiessen Park and Scenic Hudson Park in Irvington, Waterfront Park in Dobbs Ferry and Riverview Park in Hastings-on-Hudson.

This supplement revises the route of Circuit 1 in Westchester County. Instead of the Metro-North Railroad right of way, it is proposed that Circuit 1 follow the New York State Thruway right of way exclusively in Westchester County, from where Circuit 1 enters Westchester County via the Tappan Zee Bridge to where it leaves the county and enters Bronx County and New York City.

From the Tappan Zee Bridge, in Tarrytown, the revised New York State Thruway route heads east approximately two miles, before turning south. Then, the revised New York State Thruway route goes south roughly parallel to the original Metro-North Railroad route. The revised Thruway route is approximately one and one-half miles east from the original railroad route where the latter traverses Irvington, Dobbs Ferry and Hastings-on-Hudson. In Yonkers, the revised Thruway route diverges from the original railroad route such that the distance between the two paths heading south into New York City increases to the range of two miles to two and a half miles. At the border of Westchester County and New York City, the distance between the two paths decreases to approximately one and three-quarters mile.

Since the distance between the revised Thruway route and original railroad route exceeds one mile, not all 37 of the parks and recreation areas identified in the November 17, 2003 application continue to be relevant to the consideration of Circuit 1. The revised Thruway route has its own set of Westchester County parks and recreation areas within one mile. These parks and recreation areas are listed in Table 4.13.1a of this supplement.

New York City (Bronx County):

In the November 17, 2003 application, it was proposed that Circuit 1 follow the Metro-North Railroad / Hudson Line right of way exclusively in Bronx County until that right of way converges with the Oak Point Link proximate to the Washington Bridge in the Bronx. This Metro-North Railroad right of way is just along the Hudson River south through Riverdale and Spuyten Duyvil, then just along the Harlem River east through Kingsbridge.

In Kingsbridge, the Metro-North Railroad right of way intersects with the Major Deegan Expressway right of way. This supplement's revised route follows the Major Deegan Expressway from the border of Westchester County and New York City to this point of intersection in Kingsbridge, going through Van Cortlandt Park and Van Cortlandt Village for a total distance of approximately two miles. At this point, the original railroad route and revised route abut each other and continue to do so all the way into the Harlem River Rail Yard and its shore on the Bronx Kill.

Therefore, in Bronx County, the revised route necessitates only the identification of parks and recreation areas within one mile of this new approximate two-mile distance through Van Cortlandt Park and Van Cortlandt Village. These parks and recreation areas are listed in Table 4.13.1a of this supplement.

Table 4.3.14-1 of the application listed 29 parks and recreation areas in Bronx County and 135 parks and recreation areas in New York County within one mile of the original railroad route (there being a few redundant entries). All but two of these 164 parks and recreation areas are local jurisdiction (excepting General Grant National Memorial and Riverbank State Park). Eight of them bordered the right of way: Riverdale Park and Macombs Dam Park in Bronx County, and Inwood Hill Park, Fort Washington Park, Riverbank State Park, Riverside Park, Harlem Lane Park, and Randall's Island / Ward's Island (throughout this supplement referred to as simply Randall's Island) in New York County. With the rerouting of this supplement, some of these parks and recreation areas are no longer within one mile of the proposed Circuit 1 corridor such as Riverdale Park and many more are associated exclusively with the proposed Circuit 2 corridor, on the west side of Manhattan, which is not a subject of this supplement.

New York City (New York County / Randall's Island):

The original route in the November 17, 2003 application reached Queens County and Consolidated Edison's Rainey substation from Bronx County with alternating current interconnection cable laid at the bottom of the East River. As discussed above, this supplement makes a revision such that this distance will be traversed without entering any bodies of water including the East River. Most of the distance is accomplished by burying the cable beneath north-to-south local roads generally on Randall's Island that are situated between the Triborough Bridge and Hell Gate Railroad Bridge.

This revised route is approximately one-quarter of a mile west of the original East River route. The application cited Randall's Island itself as a park and recreation area within one mile of the proposed corridor and this remains true for the revised route.

New York City (Queens County):

The original route in the November 17, 2003 application reached Consolidated Edison's Rainey substation in Queens County with alternating current interconnection cable laid at the bottom of the East River around Halletts Point. As discussed above, this supplement makes a revision such that this distance will be traversed without entering any bodies of water including the East River. Instead, for just over one mile, the cable will be buried beneath 8th Street, Main Avenue and Vernon Boulevard conforming to Consolidated Edison standards.

This revised route is approximately one-quarter of a mile east of the original East River route.

13.1.2 Potential Impacts

The project route discussed in this supplement is located almost entirely within the Interstate 87 right of way corridor, which limits any adverse impact the project could have on surrounding parks or recreational areas. Due to the use of this underground model for transmission line siting the scenic and recreational resources identified within the study area will not be impacted or otherwise adversely affected. Temporary impacts during construction will be short-term, and mitigated as described below.

13.1.3 Avoidance and Mitigation

To the extent practicable, construction equipment will use existing access roads. Contactors and subcontractors will be instructed about nearby resources and work methods to avoid impacts.

The November 17, 2003 application asserted that the proposed facility, Circuit 1, will not have an adverse visual or other effect on parks and recreation areas because the project's cable will be buried underground generally. This supplement commits to the 100% cable model underscoring the supposition that there will be no such impacts.

13.2 Historic and Archeological Resources

13.2.1

Westchester County:

In the November 17, 2003 application, it was proposed that Circuit 1 follow the Metro-North Railroad / Hudson Line right of way exclusively in Westchester County, from where Circuit 1 enters Westchester County via the Tappan Zee Bridge to where it leaves the county and enters Bronx County and New York City. This Metro-North Railroad right of way is just along the Hudson River for almost the entire distance, from Tarrytown, through Irvington, Dobbs Ferry, Hastings-on-Hudson and Yonkers.

Table 4.3.14-2 of the application listed 34 non-archeological historic resources on the New York State or National Registers of Historic Places within one mile of this Metro-North Railroad right of way in Westchester County. Additionally, Table 4.3.14-4 of the application listed 30 previously recorded archeological resources in the U.S. Geologic Survey Quad of White Plains or Yonkers.

This supplement revises the route of Circuit 1 in Westchester County. Instead of the Metro-North Railroad right of way, it is proposed that Circuit 1 follow the New York State Thruway right of way exclusively in Westchester County, from where Circuit 1 enters Westchester County via the Tappan Zee Bridge to where it leaves the county and enters Bronx County and New York City.

From the Tappan Zee Bridge, in Tarrytown, the revised New York State Thruway route heads east approximately two miles, before turning south. Then, the revised New York State Thruway route goes south roughly parallel to the original Metro-North Railroad route. The revised Thruway route is approximately one and one-half miles east from the original railroad route where the latter traverses Irvington, Dobbs Ferry and Hastings-on-Hudson. In Yonkers, the revised Thruway route diverges from the original railroad route such that the distance between the two paths heading south into New York City increases to the range of two miles to 2.5 miles. At

the border of Westchester County and New York City, the distance between the two paths decreases to approximately 1.75.

Since the distance between the revised Thruway route and original railroad route exceeds one mile, some of the historic and archeological resources in the November 17, 2003 application are no longer relevant to the consideration of Circuit 1. The revised Thruway route has its own set of Westchester County historic resources within one mile. Additional Westchester County historic resources listed on the National Register of Historic Places are shown in Table 4.13.2a of this supplement.

New York City (Bronx County):

In the November 17, 2003 application, it was proposed that Circuit 1 follow the Metro-North Railroad / Hudson Line right of way exclusively in Bronx County until that right of way converges with the Oak Point Link proximate to the Washington Bridge in the Bronx. This Metro-North Railroad right of way is just along the Hudson River south through Riverdale and Spuyten Duyvil, then just along the Harlem River east through Kingsbridge.

In Kingsbridge, the Metro-North Railroad right of way intersects with the Major Deegan Expressway right of way. This supplement's revised route follows the Major Deegan Expressway from the border of Westchester County and New York City to this point of intersection in Kingsbridge, going through Van Cortlandt Park and Van Cortlandt Village for a total distance of approximately two miles. At this point, the original railroad route and revised route abut each other and continue to do so all the way into the Harlem River Rail Yard and its shore on the Bronx Kill.

Tables 4.3.14-2, 4.3.14-3 and 4.3.14-4 of the application listed a large number of historic and archeological resources in Bronx County and New York County within one mile of the original route. With the rerouting of this supplement, most of these historic and archeological resources are within one mile of the proposed Circuit 1 corridor are still valid from the Yonkers / Bronx boarder through to the Randall's Island area.. Many are associated exclusively with the proposed Circuit 2 corridor, on the west side of Manhattan, which is not a subject of this supplement, but have not been differentiated on the Tables.

Additional Bronx County historic resources listed on the National Register of Historic Places are shown in Table 4.13.2a of this supplement. Table 4.13.2.b of this supplement lists historic sites within three miles of the alternate Downstate Converter Circuit 1 located in Bronx County.

A Phase IA archaeological/historic survey was performed for the new, alternate site for Downstate Converter Circuit 1. Available information suggests that the site does not have a high probability of containing significant historic or archaeological remains (Personal communication, Milner Associates, 2004).

There are no previously recorded archaeological sites within or in the immediate vicinity of the site. The nearest previously recorded archaeological sites indicate only traces of Native American occupation across the Harlem River (in Manhattan) and a Native American burial site (NYCLPC Site 32) approximately one-mile east of the Harlem River and the site. A review of historic mapping indicates that the site is located on made land resulting from shoreline filling during the 1890s. A rail freight station occupied an area north of 146th street in 1919, but no structures of that era are recorded south of 146th Street within or in the vicinity of the proposed site.

New York City (New York County / Randall's Island):

The original route in the November 17, 2003 application reached Queens County and Consolidated Edison's Rainey substation from Bronx County with alternating current interconnection cable laid at the bottom of the East River. As discussed above, this supplement makes a revision such that this distance will be traversed without entering any bodies of water including the East River. Most of the distance is accomplished by burying the cable beneath north-to-south local roads generally on Randall's Island that are situated between the Triborough Bridge and Hell Gate Railroad Bridge.

This revised route is approximately .25 mile west of the original East River route. The historic and archeological resources in the November 17, 2003 application are still valid; no new National Registers of Historic Places locations were identified within the small extension east.

New York City (Queens County):

The original route in the November 17, 2003 application reached Consolidated Edison's Rainey substation in Queens County with alternating current interconnection cable laid at the bottom of the East River around Hallets Point. As discussed above, this supplement makes a revision such that this distance will be traversed without entering any bodies of water including the East River. Instead, for just over one mile, the cable will be buried beneath 8th Street, Main Avenue and Vernon Boulevard conforming to Consolidated Edison standards.

This revised route is approximately .25 mile west of the original East River route. The historic and archeological resources in the November 17, 2003 application are still valid; no new National Registers of Historic Places locations were identified within the small extension east.

13.2.2 Potential Impacts

The November 17, 2003 application asserted that the proposed facility, Circuit 1, would not have an adverse visual or other effect on historic and archeological resources because the project's cable will be buried underground or attached to other structural elements. This supplement commits to the 100% cable model underscoring the supposition that there will be no such impacts.

The new alternate site for Downstate Converter Circuit 1 is a highly disturbed property presently occupied by a concrete recycling plant.

13.2.3 Avoidance and Mitigation

The Environmental Management and Construction Plan for the proposed project will insure good practices concerning the discovery and avoidance of unanticipated historic and archeological resources during installation.

14. Construction Activities

Nothing in this supplement changes the discussion of this topic in Exhibit 4, Exhibit 5 (Appendix A, "Construction Work Plan") and Exhibit E-3 of the November 17, 2003 application. However,

herein is some detail on construction activities for the direct bore drilling underneath the East River from Randall's Island to the 8th Street alley of Hallets Point in Queens County.

Horizontal directional drilling will be used to install the alternating current cable under the bed of the East River from Randall's Island at the southern shore of Randall's Island to the 8th Street alley of Hallets Point in Queens County. This procedure precludes having to cut through the shoreline.

A pit will be excavated at both the Randall's Island and Hallets Point locations for the horizontal directional drilling equipment. The pits will be excavated with conventional excavating equipment. Material, if suitable for reuse, will be stockpiled onsite. Unsuitable material will be removed from the site and disposed of in accordance with New York State and New York City regulations.

Horizontal holes will be drilled 5 to 10 feet underneath the river bottom and two 30-inch diameter casings of approximately 2,000 feet in length will be installed in the drilled holes. The cross-linked polypropylene cable used to carry the 345-kiloVolt alternating current interconnection will be installed in the casing pipe. The exact drilling length, depth and location will be determined based on existing geological information and field conditions.

The ground in the disturbed areas of excavation will be stabilized and returned to its original condition shortly after installation of the cable.

15. Pesticide and Herbicide Use

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

16. Noise

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

17. Project Cleanup and Restoration

Nothing in this supplement changes the discussion of this topic in Exhibit 4 of the November 17, 2003 application.

Supplement to Exhibits 1, 3, 5, 6, 7, 8 and 9

Supplement to Exhibit 1 - General Information Regarding Application

- 1) No change.
- 2) The Applicant's address has been changed to:
- 3) The Applicant's telephone number has been changed to:

1230 Central Avenue, Suite 2828
Albany, New York 12205

(518) 475-2828

- 4) The principal officer's address has been changed to:

1230 Central Avenue, Suite 2828
Albany, New York 12205

- 5) Documents and correspondence are no longer requested to be served upon Jeanine Hull, Esq. The address and telephone number of Steven A. Mitnick has been changed to:

1230 Central Avenue, Suite 2828
Albany, New York 12205
Phone: (518) 475-2828

Supplement to Exhibit 3 - Alternatives

(a)(1) Consideration to Any Alternative Route

This supplement proposes a revision to Circuit 1's route to enhance the project's environmental compatibility. The revision entails 16% of the direct current route distance (approximately 19.8 miles) and all of the alternating current route distance (approximately 4.8 miles).

With this proposed route change, several kinds of environmental impacts are eliminated. In particular, the potential adverse impacts on the East River and commuter railroad transportation are eliminated.

The revised route which was considered and adopted is extensively described in this supplement, including its merits relative to the route in Westchester, Bronx, New York and Queens Counties proposed in the November 17, 2003 application. The originally proposed route is now the alternative, which was extensively described in the application.

This supplement presents a significant alternative for the alternating current interconnection in which the Bronx Kill, Randall's Island, and the East River would be crossed without direct bores and underground installation, but with an attachment to the underside of the Triborough Bridge. This alternative would have cable buried beneath different streets in Queens County, relative to

the 8th Street - Main Avenue - Vernon Boulevard route, to reach the ultimate destination, the Consolidated Edison 345 kiloVolt substation.

The two possible routes for the alternating current interconnection, this supplement's proposal, primarily a burial underground and an under-the-river direct bore, and the alternative, primarily an attachment to the underside of the Triborough Bridge, offer different advantages in terms of avoiding environmental impact. The supplement's proposal avoids any interaction with the Triborough Bridge. The alternative avoids any interaction with Randall's Island. In either possibility, there would be minimal impact during a relatively brief installation period and virtually none afterwards.

From a cost and constructability standpoint, the supplement's proposal is preferable, largely because any interaction with the Triborough Bridge is complicated by other construction and maintenance activities on and around the bridge and its role as a busy transportation corridor. Installation on Randall's Island, especially if during the cold weather months, as is planned, is somewhat eased by the low level of public activity on the island during these times of the year.

(a)(2) Consideration to Expansion of Any Existing Right of Way

No change to the November 17, 2003 application.

(a)(3) Consideration to Any Alternate Method which would Fulfill Energy Requirements with Comparable Costs

In January 2004, the New York City Energy Policy Task Force published its report to Mayor Michael R. Bloomberg, entitled "New York City Energy Policy: An Electricity Resource Roadmap". The Task Force included representatives from many key constituencies concerned with the City's energy future including Consolidated Edison, KeySpan Energy, New York State Energy Research & Development Authority, New York Independent System Operator, New York City Economic Development Corporation, Natural Resources Defense Council, Partnership for New York City and others. The report states:

"To ensure reliability, to promote economic growth, and to address environmental issues, the Task Force concludes that the City needs 2,600 megawatts of new electricity resources by 2008. The best way to meet this goal will be through a combination of generation plants (both new and repowered), transmission lines, and distributed resources - including clean on-site generation and various methods of energy efficiency and demand reduction." (pages 1-2)

Conjunction believes its transmission line, the proposed facility, can help the City meet this important goal of 2,600 megawatts with an extraordinary degree of environmental compatibility relative to generation plant and above-ground transmission line projects. The proposed facility, Empire Connection Circuit 1, will partially meet the City's goal providing 1,000 megawatts or 38% of the 2,600 megawatt total. Still, in Conjunction's belief, various methods of energy efficiency and demand reduction can play a vital role to help meet the remaining 62% of the 2,600 megawatt total.

(b) New York State Department of Transportation Maps of Any Alternative Route Considered

The revised route is mapped in this supplement, specifically in the supplement to Exhibit 2. The originally proposed route is mapped in Exhibit 2 of the November 17, 2003 application.

Also mapped is the alternative for the alternating current interconnection in which the Bronx Kill, Randall's Island and the East River would be crossed with an attachment to the underside of the Triborough Bridge.

Supplement to Exhibit 5 - Design Drawings

No change to the November 17, 2003 application except the retraction of drawings that represent installation along railroad corridors, and that depict aerial transmission lines.

Supplement to Exhibit 6 - Economic Effects of Proposed Facility

The public need for Circuit 1, as discussed in the November 17, 2003 application, Exhibit 6, was underscored by two recent developments. In January 2004, the New York City Energy Policy Task Force published its report to New York City Mayor Michael R. Bloomberg. The report, entitled "New York City Energy Policy: An Electricity Resource Roadmap", identified a need for 2,600 megawatts of new electric resources for New York City, to be operational by the year 2008. Of this need, just 500 megawatts are under construction (the SCS Astoria Energy power plant), leaving a deficit of 2,100 megawatts. Circuit 1 would fulfill 48 percent of New York City's remaining need.

On June 4, 2004, the New York Power Authority published a request for proposals to provide new electric resources to New York City, to be operational by February 1, 2008, for a term of up to 20 years (through January 31, 2028). Conjunction plans to respond to this request and pledge to provide New York City with 1,000 megawatts of new electric resources, through the completion of Circuit 1, if Conjunction is awarded a contract by the New York Power Authority.

The New York City Energy Task Force, New York Power Authority, New York Independent System Operator and other experts on the City's energy needs unanimously agree that projects such as the proposed facility and additional generation and transmission projects must be completed by 2008 to ensure reliability, economic vitality and environmental quality. The proposed facility, Empire Connection Circuit 1, will provide its positive economic and other effects if it is supported by the New York Power Authority contract.

See the testimony of Steven A. Mitnick attached to this supplement.

Supplement to Exhibit 7 - Local Ordinances

The revised route of the facility within the New York State Thruway corridor in Westchester County may involve one more village in the county not discussed in the November 17, 2003 application, the Village of Ardsley. The New York State Thruway is the border between the Village of Ardsley and the Village of Dobbs Ferry the local ordinances of which were discussed in the application.

The Village of Ardsley Code contains provisions that may prohibit the construction of the proposed facility or require approvals, consents, permits, or certificates or authorize the imposition of conditions concerning their design, location, construction, operation and maintenance. To the extent that the substantive provisions prohibit the construction or operation of the Empire Connection, are inconsistent with the requirements of Commission rules and regulations or otherwise substantially impair Conjunction's ability to proceed under a Certificate of Environmental Compatibility and Public Need, Conjunction hereby requests waiver of these

provisions. The provisions of the Code which may be applicable to the proposed facility are as listed for the Village of Dobbs Ferry in Exhibit 7 of the application.

Supplement to Exhibit 8 - Other Pending Filings

On January 27, 2003, Conjunction LLC filed an application to the Federal Energy Regulatory Commission (FERC) to sell Empire Connection's transmission rights at negotiated rates (Docket No. ER03-452). In a May 21, 2003 order, FERC authorized Conjunction to make such sales.

On March 24, 2004, Conjunction filed a report to Federal Energy Regulatory Commission (FERC) on its February 27, 2004 auction of Empire Connection's transmission rights. Subsequently, on June 9, 2004, Conjunction filed a motion to FERC, to determine the scope of Conjunction's negotiated rate authority. In a July 28, 2004 order, FERC granted the motion " ... so it may respond to the NYPA RFP ... " FERC concluded " ... that Conjunction's seeking to respond to the NYPA RFP ... is within the scope of its previously-granted negotiated rate authority."

Conjunction does not have a pending filing, report or motion before FERC.

Supplement to Exhibit 9 - Cost of Proposed Facility

The New York Power Authority issued a request for proposals on June 4, 2004 and Conjunction plans to respond by submitting a proposal to meet the requirements with the completion of Circuit 1. Conjunction will be competing with other projects on price and non-price factors, including projects whose costs are not publicly known. The New York Power Authority competitive solicitation buttresses Conjunction's request for a waiver concerning project costs.

Supplement Tables

Table 4.13.1a: Additional Proximate Parks and Recreational Areas Tappan Zee Bridge to Queens

Table 4.13.2a: Additional Historic Sites from the National Historic Register South of the Tappan Zee Bridge in Westchester and Bronx Counties

Table 4.13.2.b: Historic Sites Within 3 Miles of the Alternate Downstate Converter Circuit 1

Table 4.13.3 c: Historic Sites Within 3 Miles of the Upstate Converter Circuit 1

Table 4.13.1a
Additional Proximate Parks and Recreational Areas
Tappan Zee Bridge to Queens

Name	Location	County	Distance to right of way (Miles)	Mile Post Location
Losee State Park	Green Street and Hudson River, Tarrytown	Westchester	0.25 N	0
St. Vincent De Paul School Playground	Directly north of the Tappan Zee Bridge entrance to Westchester county, Tarrytown	Westchester	0.1 N	0
Tappan Hill Elementary School Playground	Union Avenue, Tarrytown	Westchester	0.75 N	0.5
Transfiguration School Playground	South Broadway, Tarrytown	Westchester	0.1 N	0.5
Old Croton Aqueduct State Trailway	Intersect I-87 at Tarrytown	Westchester	0 N to S	1
Elmsford Park	North Elmsford	Westchester	1 E	2
Tarrytown Lakes Park/ Buttermilk Ridge	Northeast of Greenburgh	Westchester	0.5 NE	2
Our Lady Of Mt Carmel School Playground	Elmsford	Westchester	1 E	2
Carl Dixson Elementary School Playground	Elmsford	Westchester	1 E	2
Grady Elementary School	Elmsford	Westchester	0.75 E	2
Saw Mill River Pkwy Lands	Intersects I-87 near Greenburgh	Westchester	0 E to W	3
East Rumbrook Park	Parkview Road, Greenburgh	Westchester	0.75 E	3
West Rumbrook Park	Greenburgh	Westchester	0.1 E	3
South County Trailway	Parallels I-87 from Elmsford to Dobbs Ferry, intersecting the interstate near Elmsford	Westchester	0 N to S	3
Elmwood Day School Playground	Next to Elmwood Fire Station	Westchester	0.2 E	4
V. Everet Macy Park	Within the City Limits of Ardsley	Westchester	0 W	4
Halsey Pond Park	Castle Road, Irvington	Westchester	1 W	4
Concord Road Elementary Playground	2 Concord Road, Ardsley	Westchester	0.3 E	4
Taxter Road Nature Preserve	Intersects I-87 near Greenburgh	Westchester	0 W	4.5
Ardsley High School	Revere Road, Ardsley	Westchester	0.4 E	4.5
Juhring Park	Briary Road, Dobbs Ferry	Westchester	0.1 W	5
A.F. Veteran Park	East of Ardsley	Westchester	1 E	5
Ardsley Village Hall Park	Ashford Avenue East, Ardsley	Westchester	0.3 E	5
Gould Park	Ashford Avenue West, Dobbs Ferry	Westchester	0.75 W	5
Our Lady of Perpetual Help School Playground	Ashford Avenue East, Ardsley	Westchester	0.75 E	5.5
Ardsley Middle School Park and Swimming Pool	Sprain Road, Ardsley	Westchester	0.4 E	6
Springhurst Primary Playground	South Dobbs Ferry	Westchester	0.5 W	6
Ashford Park	East of Ardsley Middle School	Westchester	0.75 E	6
Children's Village Special Education Playground	1 Dassern Dr, Dobbs Ferry	Westchester	0.5 W	6
Hillside Elementary Playground	Hastings-on-Hudson	Westchester	0.75 W	6

Name	Location	County	Distance to right of way (Miles)	Mile Post Location
Uniontown Playground	Prince Street, Hastings- on- Hudson	Westchester	1 W	6
Lefurgy Park	Overlook Road, Hastings-on-Hudson	Westchester	0.75 E	6.5
Hillside Park	Hillside Avenue, Hasting-on-Hudson	Westchester	0.75 W	6.5
Hillside Woods	Hastings-on-Hudson	Westchester	0.5 W	6.5
Burke Estate	South of Hastings-on Hudson	Westchester	1 W	7
Sprain Ridge Swimming Pool	Jackson Avenue, South Greenburgh	Westchester	0.2 E	7
St Clares Academy Playground	South of Jackson Avenue, Greenburgh	Westchester	0.2 W	7
Sprain Ridge Park	Parallels I-87 Greenburgh	Westchester	0 E	7
Sprain Brook Parkway	East of Sprain Ridge Park, Greenburgh	Westchester	0.2 E	7.5
Sprain Lake Golf Course	East of Sprain Lake, Greenburgh	Westchester	0.5 E	8
Moore Park	East Grassy Sprain Road, Greenburgh	Westchester	0.75 E	8
Lenoir Preserve	US 9 And Dudley Street, Yonkers	Westchester	1 W	8
Elementary School 22 Playground	1408 Nepperhan Ave, Yonkers	Westchester	0.5 W	8.5
Kardash Park	East of Greystone, Yonkers	Westchester	0.2 W	8.5
Family School 32 Playground	1 Montclair Place, Yonkers	Westchester	0.75E	8.5
Nepera Park	Northeast of Greystone, Yonkers	Westchester	0.2 W	9
Roosevelt High School	East Tuckahoe Road, Mohegan Height	Westchester	0.5 E	9.5
Henning Park	South of Tuckahoe Road, Yonkers	Westchester	0.2 W	10
Memorial Skating Rink	South of I-87 & Tuckahoe Road intersection, Yonkers	Westchester	0.1 W	10
St. Nicholas Field	Tuckahoe Road, Yonkers	Westchester	1 E	10
Andrus Park	Abuts Route 100, Yonkers	Westchester	0.3 E	10
P A Dichiario Early Childhood Elementary School Playground	373 Bronxville Road, Yonkers	Westchester	0.75 W	10
Welty Park / Bryn Mawr Park	North of Palmer Road, Yonkers	Westchester	0.2 W	10.5
Elementary School 5 Playground	Ramsey Avenue, Yonkers	Westchester	0.5 W	10.5
Montessori School 31 Playground	7 Ravenswood Road, Yonkers	Westchester	0.5 E	10.5
Bronx River Parkway	Bronxville south to Mt. Vernon, Yonkers	Westchester	0.75 E	10.5
Lawrence Park	North of Sunnybrook Park, Yonkers	Westchester	0.2 E	10.5
Redmond Park	North of elementary School 15, Yonkers	Westchester	0.3 W	11
Elementary School 17	745 Midland Ave, Yonkers	Westchester	0.3 W	11
Cross County Parkway	Intersects I-87 in central Yonkers	Westchester	0 E to W	11
Sunnybrook Park	Midland Avenue, Yonkers	Westchester	0.1 E	11
Gunther Park	Directly north of I-87 intersection with Cross County Parkway	Westchester	0.1 E	11
Elementary School 30 Playground	30 Nevada Place, Yonkers	Westchester	0.5 E	11
Rosemarie Ann Siragusa School	60 Crescent Place, Yonkers	Westchester	0.75 E	11
Richter Park	Jones Street and Saw Mill River Parkway, Yonkers	Westchester	1 W	11.5
St. John The Baptist Playground	Dunwoodie Heights, Yonkers	Westchester	0.2 W	11.5

Name	Location	County	Distance to right of way (Miles)	Mile Post Location
Tibbets Brook Park	West of Hillview Reservoir, Yonkers	Westchester	0.3 W	12
Lincoln High School	St. Johns Avenue, Dunwoodie Heights	Westchester	0.2 W	12
Yonkers Raceway	East of I87, Dunwoodie Heights	Westchester	0 E	12
Old Croton Aqueduct State Trailway	Trail parallels I-87 from Cross Country Parkway into Bronx County	Westchester	0.3 W	12
Pelton Park	McLean Avenue, Yonkers	Westchester	1 W	12.5
Elementary School 13 Playground	195 McLean Ave, Yonkers	Westchester	.75 W	12.5
Elementary School 21 Playground	100 Lee Ave, Yonkers	Westchester	0.1 W	13
Coyne Park	South of Hillview Reservoir, Yonkers	Westchester	0.2 E	13
Elementary School 4	East Yonkers Avenue, Yonkers	Westchester	0.2 E	13
St. Barnabas School Playground	McLean Avenue, bordering Bronx County, Yonkers	Westchester	0.65 E	13
Montessori Elementary School 11 Playground	99 Wakefield Ave, Yonkers	Westchester	0.75 E	13
Elementary School 19 Playground	North of Woodlawn Lake, Woodlawn	Bronx	0.3 E	13.5
Van Cortland Park	Abuts I-87 south of Bronx County border	Bronx	0 E to W	14
Riverdale Country School Playground	West of Van Cortland Park, Riverdale	Bronx	0.80 W	14
Van Cortland Lake Playground	Southern end of Van Cortland Park	Bronx	0.2 W	15
Horace Mann School Playground	South of Van Cortland Park, Bronx	Bronx	0.3 W	15
Manhattan College Stadium	West Gun Hill Road, Bronx	Bronx	0.3 W	15
Visitation School Playground	Abuts I-87 via West Gun Hill Road, Bronx	Bronx	0 W	15
Elementary School 94 Playground	East Gun Hill Road, Williamsbridge	Bronx	0.75 E	15
Williamsbridge Playground	East of Jerome Park Reservoir, Williamsbridge	Bronx	1 E	15
Elementary School 7 Playground	Two Blocks north of Kings Bridge, Bronx	Bronx	0.1 W	15.5
Elementary School 207 Playground	One Block North of Kings Bridge, Bronx	Bronx	0.1 W	15.5
Elementary School 95 Playground	Sedgwick Avenue, Kings Bridge	Bronx	0.2 E	15.5
Fort Independence Park and Playground	Sedgwick Avenue, Kings Bridge	Bronx	0.1 E	16
Junior high School 143	South of Jerome Park Reservoir, Kings Bridge Heights	Bronx	0.1 E	16
Harris Park	West 206 th Street and Goulden Avenue	Bronx	0.75 E	16

Table 4.13.2a
Additional Historic Sites from the National Register
South of Tappan Zee Bridge
Westchester and Bronx Counties

Name	Location	NR Number
Old Croton Aqueduct	Runs N from Yonkers to New Croton Dam	90NR02435
Lyndhurst	635 S. Broadway, Tarrytown	90NR02519
Sunnyside	Sunnyside Lane, Tarrytown	90NR02518
Rockefeller, John D., Estate	Pocantico Hills, Tarrytown	90NR02442
Patriot's Park	US 9, Tarrytown	90NR02526
North Grove Street Historic District	1, 2, 8, 15, and 19 Grove St., Tarrytown	90NR02520
Music Hall	11 Main St., Tarrytown	90NR02521
Foster Memorial A.M.E. Zion Church	90 Wildey St., Tarrytown	90NR02522
First Baptist Church and Rectory	56 S. Broadway, Tarrytown	90NR02523
Christ Episcopal Church	Broadway and Elizabeth Sts., Tarrytown	90NR02525
Harden, Edward, Mansion	200 North Broadway, Tarrytown	02NR04906
Elmsford Reformed Church and Cemetery	30 S. Central Ave., Elmsford	90NR02550
Church of St. Joseph of Arimathea	2172 Saw Mill River Road, Elmsford	01NR01832
Romer-Van tassel House	2121 Saw Mill River Road	94NR00759
Friedlander, Leo, Studio	825 W. Hartsdale Rd., White Plains	90NR02491
Armour-Stiner House	45 W. Clinton Ave., Irvington	90NR02537
Villa Lewaro	N. Broadway, Irvington	90NR02538
Nuits	Hudson Rd. and Clifton Pl., Ardsley On Hudson	90NR02539
Irvington Town Hall	85 Main St., Irvington	90NR02540
East Irvington School	Taxter Rd., East Irvington	90NR02437
Lord and Burnham Building	2 Main Street, Irvington	99NR01436
Church of St. Barnabas	15 North Broadway, Irvington	98NR01386
Irving, Washington, Memorial	Broadway and Sunnyside Lane, Irvington	99NR01557
McVickar House	131 Main Street, Irvington	03NR05072
Crosey, Jasper F., House and Studio	49 Washington Ave., Hasting on Hudson	90NR02535
Draper, John W., House	407 Broadway, Hastings On Hudson	90NR02536
Hastings Prototype House	546 Farragut Pkwy., Hastings On Hudson	91NR00291
Estherwood and Carriage House	Clinton Ave., Dobbs Ferry	90NR02533
Hyatt-Livingston House	152 Broadway, Dobbs Ferry	90NR02532
US Post Office--Dobbs Ferry	Main St., Dobbs Ferry	90NR02534
South Presbyterian Church	343 Broadway, Dobbs Ferry	00NR01575
Untermeyer Park	Warburton Ave. and N. Broadway S. of jct. with Odell Ave., Yonkers	90NR02464
Trevor, John Bond, House	511 Warburton Ave., Yonkers	90NR02463
Odell House	425 Ridge Rd., Greenburgh	90NR02436
Fonthill Castle and the Administration Building of the College of Mount St. Vincent	W. 261st St. and Riverdale Ave., Yonkers	90NR00045
Delavan Terrace Historic District	Roughly bounded by Delaware Terr. and Palisade and Park Aves., Yonkers	90NR02470
Smith, Alexander, Carpet Mills Historic District	Roughly bounded by Saw Mill River Rd., Orchard St., Lake and Ashburton Aves., Yonkers	90NR02469
Philipse Manor Hall	Warburton Ave. and Dock St., Yonkers	90NR02462
Thompson, W. B., Mansion	1061 N. Broadway, Yonkers	90NR02468
Bronx River Parkway Reservation	Bronx River Pkwy. from jct. with Sprain Brook Rd. to and including Kensico Dam Plaza, Bronxville	91NR03356
Hart, Eleazer, House	243 Bronxville Rd., Yonkers	90NR02466
St. John's Protestant Episcopal Church	One Hudson St., Yonkers	90NR02467

Name	Location	NR Number
Sherwood House	340 Tuckahoe Rd., Yonkers	90NR02471
Bell Place-Locust Avenue Historic District	Roughly bounded by Cromwell Pl., Locust Hill Ave., Baldwin Pl. & N. Broadway, Yonkers	90NR02472
Copcutt, John, Mansion	239 Nepperhan Ave., Yonkers	90NR02473
Public Bath House No. 2	27 Vineyard Ave., Yonkers	90NR02474
Public Bath House No. 3	48 Yonkers Ave., Yonkers	90NR02475
Public Bath House No. 4	138 Linden St., Yonkers	90NR02476
US Post Office--Yonkers	79--81 Main St., Yonkers	90NR02477
Halcyon Place Historic District	Halcyon Pl., Yonkers	91NR03354
Yonkers Water Works: Tubewell Station	Saw Mill River Road, Yonkers	90NR02465
Yonkers Water Works: Gate House, Grassy Sprain Reservoir	Grassy Sprain Road, Yonkers	90NR02465
Yonkers Water Works: Tuckahoe Road Pump Station	Tuckahoe Road, Yonkers	90NR02465
Flagg, Ethan, House (Blessed Sacrament Monastery)	23 Park Avenue, Yonkers	98NR01359
Yonkers Trolley Barn	92 Main Street, Yonkers	01NR01765
Philipsburgh Building	2-8 Hudson Street, Yonkers	02NR01911
Van Cortlandt, Frederick, House	Van Cortlandt Park at 242nd St., Bronx	90NR00073
Jerome Park Reservoir	Goulden Avenue, Bronx	99NR01517
Colgate, Robert, House	5225 Sycamore Ave., Bronx	90NR00053
Wave Hill	675 W. 252nd St., Bronx	90NR00055
Dodge, William E., House	690 W. 247th St., Bronx	90NR00049
Edgehill Church of Spuyten Duyvil	2550 Independence Ave., Bronx	90NR00066
Eighth Regiment Armory	29 W. Kingsbridge Rd., Bronx	90NR00071

Table 4.13.2b
Historic Sites within 3-Miles of the Alternate Downstate Converter Circuit 1
Shaded References Only
(Map ID refers to Exhibit 2 mapping of locations)

MAP ID	NAME	LOCATION
1	Old Croton Aqueduct. Includes 2 buildings; 1 vacant structure.	Yonkers and NY
2	Christ Episcopal Church; 3 buildings currently serving religious functions	Tarrytown, NY
2	First Baptist Church and Rectory. Includes 2 buildings currently serving religious functions	Tarrytown, NY
2	Music Hall – includes 1 building, used for recreation and culture	Tarrytown, NY
2	North Grove Street Historic District. 6 buildings used for domestic, recreation and culture	Tarrytown, NY
3	Foster Memorial A.M.E. Zion Church. Includes 1 building used for religious functions	Tarrytown, NY
3	Patriot's Park. 40 acres landscape	Tarrytown, NY
4	Phillipsburg Manor. 1 building used for recreation and culture	Upper Mills, NY
5	Irving, Washington, High School. 1 vacant building	Tarrytown, NY
6	Tarrytown Lighthouse. Vacant	North Tarrytown, NY
7	Croton Aqueduct, Old. 2 vacant buildings	Yonkers and NY
7	Irvington Town Hall. 1 Building used for Government, education, recreation and culture.	Irvington, NY
8	Lyndhurst. 11 buildings used for recreation/culture	Tarrytown, NY
9	Rockefeller, John D., Estate. 12 buildings, landscape.	Mt. Pleasant, NY
10	Phillipsburg Manor. 1 building used for recreation and culture	Upper Mills, NY
11	Sunnyside. 2 buildings used for recreation and culture.	Tarrytown, NY
12	Philipse Manor Railroad Station. 1 vacant building.	North Tarrytown, NY
13	East Irvington School. 1 vacant building.	East Irvington, NY
14	Dutch Reformed Church. 1 building used for religious functions.	North Tarrytown, NY
15	Villa Lewaro. 1 building used as health care facility.	Irvington, NY
16	Armour-Stiner House. 1 building, domestic.	Irvington, NY
17	Nuits. 1 building, domestic	Ardsley-on-Hudson, NY
18	US Post Office-Dobbs Ferry. 1 government building used for postal services	Dobbs Ferry, NY
18	Estherwood and Carriage House. 2 buildings used for education purposes	Dobbs Ferry, NY
19	Hyatt-Livingston House. 1 vacant building	Dobbs Ferry, NY
20	Cropsey, Jasper F. –House and Studio. 2 buildings, domestic	Hastings-on-Hudson, NY
20	Draper, John W. – House. 1 building, domestic	Hastings-on-Hudson, NY
21	Hastings Prototype House. 2 buildings, domestic	Hastings-on-Hudson, NY
22	Thompson, W.B., Mansion. 1 building used for education purposes	Yonkers, NY
22	Armstrong, Edwin H., House. 1 building, domestic	Yonkers, NY
23	Untermyer Park. 1 building, landscape	Yonkers, NY
24	Yonkers Water Works. 3 buildings, industry, processing, extraction, government	Yonkers, NY
25	Trevor, John Bond, House. 1 building used for recreation and culture	Yonkers, NY
26	Halcyon Place Historic District. 12 buildings, domestic	Yonkers, NY
27	Flagg, Ethan, House – Blessed Sacrament Monastery. 1 building used for health care	Yonkers, NY
28	Public Bath House No. 2. 1 building used for religious functions.	Yonkers, NY
29	Smith, Alexander, Carpet Mills Historic District. 85 buildings used for industry, processing, extraction, commerce, trade	Yonkers, NY
30	Bell Place-Locust Avenue Historic District. 11 buildings, domestic	Yonkers, NY
30	Philipse Manor Hall. 1 building used for recreation and culture (work in progress)	Yonkers, NY

MAP ID	NAME	LOCATION
30	St. John's Protestant Episcopal Church. 1 building used for religious functions	Yonkers, NY
31	US Post Office – Yonkers. 1 government building used for postal services	Yonkers, NY
32	Copcutt, John, Mansion. 1 building Used for religious functions	Yonkers, NY
32	Public Bath House No. 3. 1 building used for recreation and culture, government	Yonkers, NY
33	Public Bath House No. 4. 1 building used for recreation and culture, government	Yonkers, NY
34	Fonthill Castle and the Administration Building of the College of Mount St. Vincent. 3 buildings used for education purposes	New York, NY
35	Colgate, Robert, House. 1 building, domestic	New York, NY
36	Wave Hill. 5 buildings, 209 acres of landscape	New York, NY
36	Spaulding, Henry F., Coachman's House. 1 building, domestic	New York, NY
37	Christ Church Complex. 2 buildings used for religious functions	New York, NY
38	Riverdale Presbyterian Church Complex. 3 buildings used for religious functions, domestic	New York, NY
39	Dodge, William E. House. 1 building used for education purposes.	New York, NY
40	Van Cortlandt, Frederick, House. 1 building used for recreation and culture	New York, NY
41	Bell Place-Locust Avenue Historic District. 11 buildings, domestic	Yonkers, NY
42	Dyckman, William, House. 1 building used for recreation and culture	New York, NY
42	US Post Office – Inwood Station. 1 building used for postal services	New York, NY
43	Fort Tryon Park and the Cloisters. 5 buildings used for recreation and culture, landscape	New York, NY
44	Hall of Fame Complex. 4 buildings used for education recreation and culture	New York, NY
45	Jeffrey's Hook Lighthouse. Vacant	New York, NY
46	Grand Concourse Historic District. 82 buildings, domestic	New York, NY
47	Fort Washington Avenue Armory. 1 building, Defense	New York, NY
48	Public School 11. 1 building used for education purposes	New York, NY
49	Jumel Terrace Historic District. 49 buildings, domestic, landscape	New York, NY
49	Morris-Jumel Mansion. 1 building used for recreation and culture, landscape	New York, NY
49	Robeson, Paul, Home. 1 building, domestic	New York, NY
50	Chapel of the Intercession Complex and Trinity Cemetery. 2 bldgs. used for funerary and religious functions	New York, NY
50	Audubon Terrace Historic District. 4 buildings used for social, recreation and culture, religious functions	New York, NY
51	Park Plaza Apartments. 1 building, domestic	New York, NY
52	Lehigh Valley Railroad Barge No. 79. Work in Progress	Edgewater, NJ
53	Bailey House. 1 building, domestic, commerce/trade	New York, NY
54	Bronx County Courthouse. 1 building used for Government purposes	New York, NY
55	Harlem River Houses. 3 buildings, domestic	New York, NY
55	Dunbar Apartments. 6 buildings, domestic	New York, NY
55	Henson, Matthew, Residence. 1 building, domestic	New York, NY
55	Mills, Florence, House. 1 building, domestic	New York, NY
56	Ellington, Edward Kennedy "Duke", House. 1 building, domestic	New York, NY
57	New York Public Library, Hamilton Grange Branch. 1 building used for education purposes.	New York, NY
57	Hamilton Heights Historic District. 192 buildings, domestic	New York, NY
57	Our Lady of Lourdes Roman Catholic Church. 2 buildings used for religious functions.	New York, NY
58	Hamilton Grange National Memorial. 1 building used for recreation and culture, government, landscape	New York, NY
59	College of the City of New York. 6 buildings used for education purposes	New York, NY
60	Croton Aqueduct Gate House. 1 building used for industry/processing, extraction	New York, NY
61	St. Nicholas Historic District. 130 buildings, domestic	New York, NY
61	Riverside Park and Drive. 1 site, used for recreation culture, transportation, landscape	New York, NY

MAP ID	NAME	LOCATION
61	Riverside-West 105 th Street Historic District. 30 buildings, domestic	New York, NY
62	Riverside-West 105 th Street Historic District. 30 buildings, domestic	New York, NY
62	Riverside Park and Drive, 1 Site used for recreation and culture, transportation, landscape	New York, NY
63	New York Amsterdam News Building. 1 building, domestic, commerce, trade	New York, NY
63	Schomburg Center for Research in Black Culture. 1 building used for education, recreation and culture	New York, NY
64	Public School 157. 1 building, vacant, not in use	New York, NY
64	Apollo Theater. 1 building used for recreation and culture, commerce, trade	New York, NY
65	General Grant National Memorial. 1 building used for recreation and culture, landscape	New York, NY
65	Union Theological Seminary. 8 buildings used for education and religious functions	New York, NY
66	New York Presbyterian Church. 1 building used for religious functions	New York, NY
67	Manhattan Avenue-West 120 th 123 rd Streets Historic District. 113 buildings, domestic	New York, NY
68	Union Theological Seminary. 8 buildings used for education and religion	New York, NY
68	Pupin Physics Laboratories, Columbia University. 1 building used for education purposes	New York, NY
68	Low Memorial Library, Columbia University. 1 building used for education	New York, NY
68	Casa Italiana. 1 building used for education	New York, NY
69	BINGHAMTON (ferryboat). Commerce/trade	Edgewater, NJ
69	Alcoa Edgewater Works. 1 building vacant, not in use	Edgewater, NJ
70	Mount Morris Park Historic District (Boundary Increase). 393 buildings, domestic	New York, NY
70	Mount Morris Park Historic District. 255 buildings, domestic and religious functions	New York, NY
70	Minton's Playhouse. 1 building, vacant, not in use	New York, NY
71	St. Andrew's Episcopal Church. 2 buildings used for religious functions	New York, NY
71	Hughes, Langston, House. 1 building, domestic	New York, NY
72	Delta Psi, Alpha Chapter. 1 building used for education	New York, NY
73	Church of Notre Dame and Rectory. 3 buildings used for religious purposes	New York, NY
74	Harlem Fire Watchtower. 1 structure, landscape	New York, NY
75	New York Public Library, 115 th Street Branch. 1 building used for education purposes	New York, NY
76	Schinasi House. 1 building, commerce, trade	New York, NY
77	Central Park. 56 structures, 8400 acres, landscape	New York, NY
78	Ford Motor Company Edgewater Assembly Plant. 4 buildings, vacant, not in use, work in progress	Edgewater, NJ
79	New York Cancer Hospital. 3 buildings used for health care	New York, NY
80	Association Residence Nursing Home. 1 building, vacant, not in use.	New York, NY
80	St. Michael's Church. 3 buildings used for religious functions	New York, NY
81	Pomander Walk District. 27 buildings, domestic	New York, NY
82	Claremont Stables. 1 building used for recreation and culture	New York, NY
82	Stables at 167, 169 and 171 West 89 th Street. 3 buildings used for transportation, work in progress	New York, NY
83	Sunnyslope. 1 building used for religious functions	New York, NY
84	Longwood Historic District. 58 buildings, domestic	New York, NY
85	Bronx Borough Courthouse. 1 building vacant, not in use	New York, NY
86	US Post Office - Morrisania. 1 building, used for government postal services	New York, NY
87	St. Ann's Church Complex. 1 building used for funerary, religious functions	New York, NY
87	Mott Haven Historic District. 125 buildings, domestic	New York, NY
88	Grand Concourse Historic District. 82 buildings, domestic	New York, NY
89	48 th Police Precinct Station. 1 building, vacant, not in use	New York, NY
90	Bronx County Courthouse. 1 building used for government purposes	New York, NY
91	Bronx Central Annex-U.S. Post Office. 1 building used for government postal services	New York, NY

MAP ID	NAME	LOCATION
92	Mott Avenue Control House. 1 building, vacant, not in use	New York, NY
93	Lorillard Snuff Mill. 1 building, domestic, landscape	New York, NY
94	Vassar College Observatory. 1 building used for education purposes	Poughkeepsie, NY
95	Steinway House. 1 building, domestic	New York, NY
96	Harlem Courthouse. 1 building used for government purposes	New York, NY
97	Mount Morris Bank. 1 building, vacant, not in use	New York, NY
98	Central Park. 8400 acres, landscape	New York, NY
99	St. Cecilia's Church and Convent. 1 building used for religious functions	New York, NY
100	St. Nicholas Historic District. 130 buildings, domestic	New York, NY
101	Manhattan Avenue-West 120th-123 rd Streets Historic - 113 buildings, domestic	New York, NY
102	Dahlgren, Lucy Drexel, House. 1 building, work in progress	New York, NY
102	Madison Avenue Façade of the Squadron A Armory. Work in progress	New York, NY
102	Baker, George F., Jr. and Sr., Houses. 1 building, domestic, religion	New York, NY
102	Vanderbilt, Mrs. Graham Fair, House. 1 building used for education purposes	New York, NY
102	Loew, William Goadby, House. 1 building used for health care	New York, NY
102	Warburg, Felix M., Mansion. 1 building used for recreation and culture	New York, NY
103	Municipal Asphalt Plant. 1 building, vacant, not in use	New York, NY
103	Gracie, Archibald, Mansion. 1 building, domestic	New York, NY
103	Henderson Place Historic District. 21 buildings, domestic	New York, NY
104	Houses at 120 and 122 East 92 nd Street. 2 buildings, domestic	New York, NY
104	Houses at 146-156 East 89 th Street. 6 buildings, domestic	New York, NY
104	Apartment at 1261 Madison Avenue. 1 building, domestic	New York, NY
104	Carnegie, Andrew, Mansion. 2 buildings used for recreation and culture	New York, NY
105	Casa Italiana. 1 building used for education purposes	New York, NY
106	Holy Trinity Church, St. Christopher House and Parsonage. 3 buildings used for religious functions	New York, NY
106	Metropolitan Museum of Art. 1 building used for recreation and culture	New York, NY
106	Zion-St. Mark's Evangelical Lutheran Church. 1 building used for religious functions	New York, NY
107	Lighthouse. Vacant	New York, NY
108	Morris, Lewis G., House. 1 building used for social functions	New York, NY
108	Church of St. Ignatius Loyola Complex. 4 buildings used for religious functions	New York, NY
109	Octagon, The. 1 building, vacant, not in use	New York, NY
110	City and Suburban Homes Company's York Avenue Estate and Shively Sanitary Tenements Historic District. 18 buildings, domestic	New York, NY
111	Duke Residence. 1 building, domestic, commerce/trade	New York, NY
111	Rogers, John S., House. 1 building used for education	New York, NY
111	Sinclair, Harry F., House. 1 building used for recreation and culture	New York, NY
111	Duke, James B., Mansion. 1 building used for education	New York, NY
112	New York Public Library. 1 building used for education	New York, NY
112	East 78 th Street Houses. 4 buildings, domestic	New York, NY
112	Houses at 208-218 East 78 th Street - 6 buildings, domestic	New York, NY
112	St. Jean Baptiste Church and Rectory. 2 buildings used for religious purposes	New York, NY
113	Upper East Side Historic District. 252 buildings, domestic, commerce, trade	New York, NY
113	Whitney Museum of American Art. 1 building used for recreation and culture.	New York, NY
113	Waldo, Gertrude Rhineland, Mansion. 1 building, commerce/trade	New York, NY
114	Stables at 167, 169 and 171 West 89 th Street. 3 buildings, transportation, work in progress	New York, NY
114	Claremont Stables. 1 building used for recreation and culture	New York, NY

MAP ID	NAME	LOCATION
114	Congregation B'nai Jeshurun Synagogue and Community House. 2 buildings used for education and religion	New York, NY
114	Belnord Apartments. 1 building, domestic	New York, NY
115	Sidewalk Clock at 1501 3 rd Avenue, Manhattan. 1 object, landscape	New York, NY
116	American Museum of Natural History. 1 building used for recreation and culture	New York, NY
116	Mount Neboh Synagogue. 1 building, vacant, not in use	New York, NY
116	Studio Apartments. 1 building, domestic	New York, NY
116	West 76 th Street Historic District. 44 buildings, domestic	New York, NY
117	East 73 rd Street Historic District. 15 buildings used for commerce/trade, domestic	New York, NY
117	US Post Office-Lenox Hill Station. 1 building used for postal services	New York, NY
118	United Methodist Church of St. Paul and St. Andrew Complex. 1 building used for religious functions	New York, NY
118	Rice, Isaac L. Mansion. 1 building used for religious functions	New York, NY
118	Public School 9. 1 building used for education	New York, NY
118	Red House. 1 building, domestic	New York, NY
119	Paramount Studios Complex. 6 buildings used for recreation and culture, industry, processing, extraction	New York, NY
120	East 80 th Street Houses. 4 buildings, domestic	New York, NY
120	Rowhouses at 322-344 East 69 th Street – 12 buildings, domestic	New York, NY
121	BINGHAMTON (ferryboat), commerce trade	Edgewater, NJ
122	Chapel of the Good Shepherd. 1 building, vacant, not in use	New York, NY
123	Founder's Hall, The Rockefeller University. 1 building used for education	New York, NY
124	Apthorp Apartments. 1 building, domestic	New York, NY
125	West End Collegiate Church and Collegiate School. 1 building used for religious functions	New York, NY
125	Beacon Theater and Hotel. 1 building used for recreation and culture, domestic	New York, NY
125	Level Club. 1 building domestic, work in progress	New York, NY
125	Ansonia Hotel. 1 building, domestic	New York, NY
126	Central Savings Bank. 1 building used for commerce, trade	New York, NY
126	Verdi, Giuseppe, Monument used for recreation and culture	New York, NY
126	Control House on 72 nd Street – 1 building, transportation	New York, NY
126	Dorilton – 1 building, domestic	New York, NY
127	Chatsworth Apartments and Annex. 2 buildings, domestic	New York, NY
128	Mott Avenue Control House – 1 building vacant, not in use	New York, NY
128	U.S. General Post Office – 1 building used for government postal services	New York, NY
128	Radio City Music Hall – 1 building used for recreation and culture	New York, NY
128	Church of St. Mary the Virgin Complex – 4 buildings used for religious functions	New York, NY
129	West 73 rd -74 th Street Historic District – 45 buildings, domestic	New York, NY
129	Dakota Apartments – 1 building, domestic	New York, NY
130	KESTREL (steam yacht) – vacant, not in use.	West New York, NJ
131	Plaza Hotel – 1 building, domestic, landscape	New York, NY
132	Houses at 146-156 East 89 th Street – 6 buildings, domestic	New York, NY
133	Sofia Warehouse – 1 building, vacant, not in use, work in progress	New York, NY
133	Church of St. Paul the Apostle – 2 buildings used for religious functions	New York, NY
134	Building at 45 East 66 th Street – 1 building, domestic	New York, NY
134	Seventh Regiment Armory – 1 building, social, defense	New York, NY
134	Mount Sinai Dispensary – 1 building used for religious functions	New York, NY
134	Park Avenue Houses – 4 buildings used for education, recreation and culture, government	New York, NY
135	Zion-St. Mark's Evangelical Lutheran Church – 1 building used for religious functions	New York, NY

MAP ID	NAME	LOCATION
136	Osbourne Apartments – 1 building, domestic	New York, NY
136	Carnegie Hall – 1 building used for recreation and culture	New York, NY
136	Mecca Temple – 1 building used for recreation and culture	New York, NY
136	Alwyn Court Apartments – 1 building, domestic	New York, NY
136	American Fine Arts Society – 1 building used for education	New York, NY
137	Roosevelt, Sara Delano, Memorial House – 2 buildings used for social functions	New York, NY
137	West 67 th Street Artists' Colony Historic District – 8 buildings, domestic	New York, NY
137	St. Vincent Ferrer Church and Priory – 1 building used for religious functions	New York, NY
137	Hatch, Barbara Rutherford, House – 1 building, domestic	New York, NY
138	Park East Synagogue, Congregation Zichron Ephraim – 1 building used for religious functions	New York, NY
139	US Post Office – Old Chelsea Station – 1 building, government	New York, NY
140	Sidewalk Clock at 783 5 th Avenue, Manhattan – landscape	New York, NY
140	Building at 712 Fifth Ave. – 1 building vacant, not in use	New York, NY
140	Coty Building – 1 building, vacant, not in use	New York, NY
140	Macy, R.H., and Company Store, 1 building, commerce and trade	New York, NY
141	Sullivan, Ed, Theater – 1 building used for recreation and culture, commerce and trade	New York, NY
142	Residences at 5-15 West 54 th Street – 5 buildings, domestic	New York, NY
142	University Club – 1 building used for social events	New York, NY
142	St. Thomas Church and Parish House – 1 building used for religious functions	New York, NY
142	Moore, William H. House – 1 building used for social events	New York, NY
142	Houses at 647, 651-53 Fifth Avenue and 4 East 52 nd Street – 3 buildings used for architecture, commerce	New York, NY
143	Hotel Gerard – 1 building commerce, trade, domestic	New York, NY
144	Rockefeller Center – 13 buildings used for recreation and culture, commerce and trade	New York, NY
144	Scribner's Charles, Sons Building – 1 building used for commerce and trade	New York, NY
145	USS EDSON (DD-946) – 1 structure, used for recreation, culture	New York, NY
145	USS INTREPID (aircraft carrier) – 1 structure used for recreation, culture	New York, NY
146	Queensboro Bridge – 1 structure, vacant, not in use	New York, NY
147	Lever House – 1 building used for commerce and trade	New York, NY
147	Central Synagogue – 1 building used for religious functions	New York, NY
147	St. Patrick's Cathedral – 4 buildings used for religious functions	New York, NY
147	Racquet and Tennis Club Building – 1 building used for social, recreation and culture, commerce and trade	New York, NY
147	Villard Houses – 5 buildings used for commerce and trade, domestic	New York, NY
147	St. Bartholomew's Church and Community House – 1 building used for religious functions	New York, NY
148	City and Suburban Homes Company's First Avenue Estate Historic District – 13 buildings, domestic	New York, NY
148	Smith, Abigail Adams, Museum – 1 building used for social functions	New York, NY
149	Film Center Building – 1 building used for commerce and trade	New York, NY
149	Times Square Hotel – 1 building, domestic	New York, NY
149	McGraw-Hill Building – 1 building used for commerce and trade	New York, NY
150	Houses at 311 and 313 East 58 th Street – 2 buildings, domestic, commerce and trade	New York, NY
150	Sutton Place Historic District – 12 buildings, domestic, landscape	New York, NY
151	Lamb's Club – 1 building used for religious functions	New York, NY
151	Webster Hotel – 1 building vacant, not in use, work in progress	New York, NY
151	Town Hall – 1 building	New York, NY
151	Candler Building – 1 building, vacant, not in use	New York, NY
151	New York Yacht Club – 1 building used for social functions	New York, NY

MAP ID	NAME	LOCATION
151	New Amsterdam Theater – 1 building used for recreation and culture, commerce and trade	New York, NY
151	Association of the Bar of the City of New York – 1 building used for commerce and trade	New York, NY
151	Knickerbocker Hotel – 1 building used for commerce and trade	New York, NY
152	Harvard Club of New York City – 1 building used for social functions	New York, NY
152	Century Association Building – 1 building used for social functions	New York, NY
152	Knox Building – 1 building used for commerce and trade	New York, NY
152	New York Public Library and Bryant Park – 2 buildings used for education, landscape	New York, NY
153	Blackwell House – 1 building , vacant, not in use	New York, NY
154	Lescaze House – 1 building, domestic	New York, NY
154	Turtle Bay Gardens Historic District – 1 building, domestic, landscape	New York, NY
155	Public School 35 – 1 building used for social functions	New York, NY
156	Grand Central Terminal – 1 building used for transportation, commerce and trade	New York, NY
156	Chrysler Building – 1 building used for commerce and trade	New York, NY
156	Chanin Building – 1 building used for commerce and trade	New York, NY
157	American Radiator Building – 1 building used for commerce and trade	New York, NY
158	City Hospital – 1 building, vacant, not in use	New York, NY
159	Tiffany and Company Building – 1 building vacant, not in use	New York, NY
160	Strecker Memorial Laboratory – 1 building used for education	New York, NY
160	Smallpox Hospital – 1 building, vacant, not in use	New York, NY
161	New York Architectural Terra Cotta Company Office Building – 1 building, vacant, not in use	New York, NY
162	Riverside Drive-West 80 th -81 st Streets Historic District – 35 buildings, domestic	New York, NY
163	FRYING PAN SHOALS LIGHTSHIP NO. 115 (lightship) – 1 structure, recreation and culture	New York, NY
164	Hackensack Water Company Complex – 5 buildings, industry, processing, extraction	Weehawken, NJ
165	Film Center Building – 1 building, commerce and trade	New York, NY
166	Sidewalk Clock at 522 5 th Avenue, Manhattan – landscape	New York, NY
167	Engine Company No. 2 – 1 building government	Hoboken, NJ
168	Grand Central Terminal (Boundary Increase: Park Avenue Viaduct) 1 structure - transportation	New York, NY
169	St. Patrick's Roman Catholic Church Complex	Coeymans, NY
170	Mull House and Cemetery	Coeymans, NY
171	Houghtaling, Abraham House	Coeymans, NY
172	Coeymans Ariaanje, House	Coeymans, NY
173	Coeymans School	Coeymans, NY
174	Blaisdell, Fletcher, Farm Complex	Coeymans, NY
175	Newkirk Homestead	Athens, NY
176	Van Bergen House	New Baltimore, NY
177	New Baltimore Hamlet Historic District	New Baltimore, NY
178	Houghtaling, Peter, Farm and Lime Kiln	Coxsackie, NY
179	ELEANOR (Sailing Sloop)	Catskill, NY
180	District School No. 11	Catskill, NY
181	Trumpbour Homestead Farm	Saugerties, NY
182	Senate House	Kingston, NY
183	Savage, Augusta, House & Studio	Saugerties, NY
184	Perrine's Bridge	Esopus, NY
185	Main-Partition Streets Historic District	Saugerties, NY
186	Kingston Stockade District	Kingston, NY
187	Kirkland Hotel	Kingston, NY
188	Hurley Historic District	Hurley, NY

MAP ID	NAME	LOCATION
189	Fire House, Hook and Ladder 17, 342 West 143rd Street	New York, NY
190	Clinton Avenue Historic District	Kingston, NY
191	All Saints' Chapel	Rosendale, NY
192	Orange Mill Historic District	Newburgh, NY
193	Gardner, Silas, House	Newburgh, NY
194	Belknap Stone House	Newburgh, NY
195	Bronck, Pieter, House	Coxsackie, NY
196	Leeds Dutch Reformed Church	Catskill, NY
197	Van Vechten, John House	Catskill, NY
198	Wynkoop House	Saugerties, NY
199	Dutch Church, Old, Parsonage	Kingston, NY
200	Shuart--Van Orden Stone House	Plattekill, NY
201	New Windsor Cantonment	New Windsor, NY
202	Edmonston House	New Windsor, NY
203	Woodruff House	Cornwall, Ny
204	Van Duzer--Sayer, Mary, House	Cornwall, Ny
205	Hatch, Vermont, Mansion	Cornwall, Ny
206	Brooks, Samuel, House	Cornwall, Ny
207	Kellogg, The, House	Cornwall, Ny
208	Cocks, Isaac, House	Cornwall, Ny
209	Carvey--Gatfield House	Cornwall, Ny
210	Wood, Wilford, House	Cornwall, Ny
211	Hand, Walter, House	Cornwall, Ny
212	Mountainville Grange Hall	Cornwall, Ny
213	Hand, Elias, House	Cornwall, Ny
214	Smith Clove Meetinghouse	Woodbury, NY
215	Arden	Woodbury, NY
216	Tuxedo Park Railroad Station	Tuxedo, NY
217	Old Sloatsburg Cemetery	Ramapo, NY
218	Sloat's Dam and Mill Pond	Ramapo, NY
219	Sloat House	Ramapo, NY
220	Torne Brook Farm	Ramapo, NY
221	US Post Office--Suffern	Ramapo, NY
222	DeBaun, John A., Mill	Ramapo, NY
223	Philadelphia Toboggan Company Carousel Number 15	Clarkstown, NY
224	Mount Moor African--American Cemetery	Clarkstown, NY
225	Wayside Chapel, Former	Orangetown, NY
226	US Post Office--Nyack	Orangetown, NY
227	Tappan Zee Playhouse	Orangetown, NY
228	Hopper, Edward, Birthplace and Boyhood Home	Orangetown, NY
229	Upper Nyack Firehouse	Clarkstown, NY
230	First Methodist Episcopal Church of Nyack	Clarkstown, NY
231	Ross-Hand Mansion	Orangetown, NY
232	St. Paul's United Methodist Church	Orangetown, NY
233	Panhellic Tower, 3 Mitchell Place	New York, NY
234	Former East River Savings Bank, 743 Amsterdam	New York, NY
235	YMCA Building, 180 West 135th Street	New York, NY

MAP ID	NAME	LOCATION
236	Daily News Building, 220 East 42nd Street	New York, NY
237	St. Mary's Protestant Episcopal Church, 517-723 West 126th Street	New York, NY
238	Banziger House, 345 Edgecombe	New York, NY
239	19th Police Precinct House, 177 East 104th Street	New York, NY
240	The I. Miller Building, 1552 Broadway	New York, NY
241	Louis H. Chalif School of Dance, 163 West 57 Street	New York, NY
242	Buildings at 130 and 140 West 57th Street	New York, NY
243	Former Hamilton Theater, 3560 Broadway	New York, NY
244	Riverside Church, 490 Riverside Drive	New York, NY
245	Building Located at 314 East 53rd Street	New York, NY
246	Public School 166, 132 West 89th Street	New York, NY
247	Hadley House, 5122 Post Road	New York, NY
248	Ten Eyck, Tobias, House & Cementeries	Coymans, NY
249	Coymans-Bronck House	Coymans, NY
250	Bronck Farm 13 Sided Barn	Coxsackie, NY
251	Susquehanna Turnpike	Leeds, NY
252	Dubois-Kierstede Stone House	Saugerties, NY
253	Second Reformed Dutch Church	Kingston, NY
254	Stuart, Johannis House	Modena, NY
255	Hait, Thaddeus Farm	Modena, NY
256	Knox Headquarters	Vails Gate, NY
257	Southfield Furnace Ruin	Monrpe, NY
258	Tuxedo Park	Tuxedo, NY
259	Palisades Interstate Parkway	Fort Lee/Bear Mountain, NY
260	Irvington, Washington Memorial	Irvington, NY
261	Esterwood amd Carriage House	Dobbs Ferry, NY
262	Edgehill Church od Spuyten Duyvil	Bronx, NY
263	Jerome Park Reservoir	Bronx, NY
264	Eight Regiment Armory	Bronx, NY
265	Hertlein & Schlatter Silk Trimmings Factory	Bronx, NY
266	Keepers House at Williamsbridge Reservoir	Bronx, NY
267	Casa Amadeo, antigua Casa Hernandz	Bronx, NY
268	Poe Cottage	Bronx, NY
269	St. James' Episcopal Church & Parish House	Bronx, NY
270	US Post Office--Morrisiana	Bronx, NY
271	Washington Bridge	Bronx, NY
272	Henry Hudson Bridge	Bronx, NY
273	University Heights Bridge	Yonkers, NY
274	Public School 27	Bronx, NY
not located	Hardenbergh Rhinelander Historic District	New York, NY
not located	Tremont Baptist Church, 324 East Tremont	New York, NY
not located	American Female Guardian Society and Home for the Friendless Woody Crest Home, 936 Woodycrest	New York, NY
not located	Bedford Park Church, 2988 Bainbridge	New York, NY

Table: 4.13.2c
Historic Sites within 3-Miles of the Upstate Converter Circuit 1

Site Name	Location	Distance From the Converter (Miles)
Newkirk Homestead	NW of Leeds on Sandy Plains Rd.	3.0 S

Part 88 Exhibits for Electric Transmission Filings

Supplement to Exhibit E-5 - Effect on Communications

This supplement's revised route requires an analysis of the magnetic field profile in these two new installation environments in Circuit 1's 4.8-mile alternating current interconnection, including an assessment of compliance with the New York State magnetic field standard:

a. The alternating current interconnection now will include an attachment for less than a mile beneath the Oak Point Link; a lightly used freight railroad trestle structure and single-track in Bronx County controlled by the New York State Department of Transportation.

b. The alternating current interconnection now will include burial underground beneath local roads within the Harlem River Rail Yard in Bronx County for less than a mile, on Randall's Island in New York County for approximately a mile, and in Halletts Point and Vernon Boulevard in Queens County for approximately a mile. In all cases cable burial will be performed in accordance with recognized construction standards for such underground installations.

This supplement provides the calculated magnetic field profiles and required analysis in a separate volume attached, in the form of a report by the project's expert consultant, Exponent. The expert consultant concluded that the magnetic field associated with these two new installation environments will be too weak to produce any environmental or health effect and would not cause any health-based exposure limit to be exceeded.

This expert report also provides calculated magnetic field profiles and required analysis for the direct current cable attachment beneath the Tappan Zee Bridge and Oak Point Link. These were not included in the November 17, 2003 application.

Exhibit E-5 of the November 17, 2003 application addressed in considerable depth the possible effects on the environmental, health and communications of aerial direct current transmission. Given the changes of this supplement, these analyses are hereby retracted.

Expert report by Exponent providing additional magnetic field profiles and analysis is attached.

Supplement to Exhibits E-1, E-2, E-3, E-4 and E-6

Supplement to Exhibit E-1 - Description of Proposed Transmission Line

Circuit 1 will be 100% solid cable buried underground (or much less commonly, attached to road structures, effectively hidden from view), in both the approximate 124.6-mile direct current and approximate 4.8 mile alternating current segments. Therefore, the description of aerial transmission in the November 17, 2003 application is retracted in its entirety including section E1.3 of Exhibit E-1.

As discussed extensively in this supplement, especially the supplement to Exhibit 2, Circuit 1's proposed route is revised, making inaccurate the application's brief route description in Section E1.1 of Exhibit E-1.

Supplement to Exhibit E-2 - Other Facilities

Since Circuit 1 will be 100% solid cable and no aerial transmission, the proposal for transitions to connect underground and aerial segments of a transmission line is hereby retracted as is section E-2.6 of the November 17, 2003 application.

Section E-2.1.2 of the application accurately describes the proposed Downstate Converter Circuit 1 whether the converter is located in the Oak Point Rail Yard or the alternate site proposed in this supplement, proximate to the 145th Street Bridge.

Supplement to Exhibit E-3 - Underground Construction

This supplement's revised route for Circuit 1 avoids installation in any commuter railroad corridors of Metro-North Railroad. Therefore, section E-3.1.4 of the application regarding such installations is hereby retracted.

This supplement fully commits the Empire Connection project to solid dielectric cable. Therefore, references in section E-3.2.1 of the application to the possibility of using self contained fluid filled cable are hereby retracted.

The revised route for Circuit 1 avoids installation in the East River. Therefore, section E-3.2.3 of the application about submarine installation in the river is hereby retracted.

Direct Current Cable Installation Relative to this Supplement

E-3.1 Oak Point Link

As described earlier, the Oak Point Link is a single track rail line owned by the State of New York Department of Transportation. The Oak Point Link is built largely on a trestle located in the Harlem River from Highbridge to the Harlem River Rail Yards in the Bronx, New York. The Oak Point Link currently carries approximately eight trains per day and has no signaling, communication or power utilities on its right-of-way.

It is proposed to attach the cables under the roadbed either with cleats, on a cable tray or in conduit. The cables will be located in areas that do not interfere with the Oak Point Link's operation or maintenance procedures, or with the public.

Access for construction activities will be from the river side using barge support on the Harlem River and with landside support, as required.

Alternating Current Cable Installation

E-3.2 Oak Point Link

The installation of the two 345 kV alternating current circuits will be from the new alternate site of Downstate Converter Circuit 1 proximate to the 145th Street Bridge to the north shore of the Bronx Kill in the Harlem River Rail Yards, a distance of 1.4 miles.

The alternating current circuits will be separated, one on either side of the railroad trestle of the Oak Point Link for security. It is proposed to attach the cables under the roadbed either with

cleats, on a cable tray or in conduit. The cables will be located in areas that do not interfere with the Oak Point Link's operation or maintenance procedures, or with the public.

Access for construction activities will be from the river side using barge support on the Harlem River and with landside support, as required.

E-3.4 Randall's Island

The cables will traverse a distance of approximately 1.55 miles across Randall's Island and will be installed under existing roadways with each circuit in separate trenches. The trenches will have a typical cross-section of 39.5 inches wide and 47.5 inches to 71.5 inches deep.

Working on Randall's Island will require appropriate safety training and personal protective equipment during construction. All construction activities will comply with the requirements of the New York City Parks and Recreation Department and applicable state and local standards. The location and scheduling of work activities will be approved in advance and work scheduled to minimize the impact on the public.

E-3.5 Hell Gate

The proposed route for the directional drill under the Hell Gate is from the exit point on Randall's Island to landfall on Halletts Point, Queens in the vicinity of 8th Street, a distance of approximately 0.4 miles. The depth of the Hell Gate along the proposed route is approximately 35 feet.

Drill pits will be excavated at either end of the directional drill.

E-3.6 Queens

The proposed route through Halletts Point and thence to the Rainey substation in Queens will be along 8th Street to Vernon Boulevard and along Vernon Boulevard to the Rainey substation, a distance of approximately 1.45 miles. The trenches will have a typical cross-section of 39.5 inches wide and 47.5 inches to 71.5 inches deep.

Construction methods have been previously described. Working within the right of way of the streets in Queens will require appropriate safety training and personal protective equipment during construction. All construction activities will comply with the requirements of the New York City Department of Transportation, and applicable state and local standards. The location and scheduling of work activities will be approved by the New York City Department of Transportation in advance and work scheduled to minimize the impact on the public.

Supplement to Exhibit E-4 - Engineering Justification

Section E-4.3 of the November 17, 2003 application states the expected commercial operations date is July 2006. This supplement hereby modifies the expected commercial operations date to July 2007.

The New York Independent System Operator approved the System Reliability Impact Study (SRIS) on March 18, 2004, without opposition. The approved SRIS is attached.

The SRIS found:

- a. The reliability of the New York Control Area will be significantly enhanced due to increased interface limits.
- b. System reinforcements will not be required.
- c. Short-circuit duty will not significantly increase; indeed, short-circuit duty may decrease (if in-City generation decreases).
- d. Upstate to downstate interface limits significantly increase.

Supplement to Exhibit E-6 - Effect on Transportation

Section E-6.2 of the November 17, 2003 application discussed the effect on railroad transportation. This supplement's revised route avoids railroad corridors with one exception; the 1.8-mile lightly used freight railroad structure referred to as the Oak Point Link. Therefore, section E-6.2 is hereby retracted excepting the subsection on the Oak Point Link.

As discussed in the above supplement to Exhibit 2, the revised route entails a direct bore beneath two Metro-North Railroad tracks at a single point, proximate to the Washington Bridge in the Bronx. No effect on Metro-North Railroad is anticipated.

Also as discussed, it is possible the revised route may be buried underground for a portion of a Metro-North Railroad maintenance facility, again with no anticipated impact. Conjunction intends to consider such a plan in concert with Metro-North Railroad.

Since the proposed facility, Circuit 1, will not use aerial transmission, section E-6.3 about the effect on air transportation is hereby retracted.

Since Circuit 1 will not entail installation in the East River or any other bodies of water, section E-6.4 about the effect on navigable waterways is hereby retracted.

*Additional Testimony of Dennis E. Ahern,
Shaw Environmental, Inc.*

Submitted to: New York State Public Service Commission

Submitted by: Conjunction LLC
1230 Central Avenue, Suite 2828
Albany, New York 12205

August 5, 2004

Q. Please state your name and work affiliation.

A. My name is Dennis E. Ahern. I am a Program Manager for Shaw Environmental, Inc., located in Cherry Hill, New Jersey.

Q. Please describe your professional background.

A. My resume was provided in the November 17, 2003 application filing. In summary, I have worked for over 30 years in environmental assessment of energy facilities and heavy industry. Assignments have included route and site selection, project permitting and support to operational facilities. Most of my career has been with architect/engineer/constructor companies and I have great experience with the practicalities of design, construction and environmental impact.

Q. What is the purpose of your testimony?

A. I supervised major portions of the development of Supplement, to the Empire Connection Project Article VII application.

Q. Please describe the development of the Supplement.

A. During the spring and early summer of 2004, staff of Conjunction LLC (Conjunction), reassessed the routing of Circuit No.1 south of the Tappan Zee Bridge. As described to me, further routing down the Metro-North railroad right of way became difficult because of several newly discovered "pinch-points", and because new construction at several passenger stations made access difficult. Conjunction then proceeded to further assess the continued use of the New York State Thruway through Westchester County and into the Bronx County.

At the same time, Conjunction's real estate consultant found a potential site for a converter station immediately south of the 145th Street Bridge. Use of this alternate site would shorten the overall Circuit No.1 route, allow for a less expensive route due to the shorter routing distance, and avoid complexities and concern for the placement of portions of Circuit No. 1 on the bed of the East River.

Conjunction developed a description of the routing and shared it with their consultants. They asked Shaw to assist with furthering the research on the new route and Shaw's affiliate company, Stone and Webster, did a review of the new routing.

Q. Please explain the studies performed for the Supplement.

Members of the team made a reconnaissance level survey of the route and proposed converter site. They and other team members then proceeded to complete sections of the Supplement.

Mapping was performed in 1:24,000 and 1:250,000 scale largely using electronic files originally developed by Spectra Environmental. A new converter configuration was developed by Conjunction and a graphics designer developed a scaled three-dimensional electronic rendering of the converter station and superimposed the image of digital pictures of the current site.

Discipline scientists proceeded to complete analyses in technical areas requiring updating. These areas included geology, soils, surface waters and hydrology, wetlands, land use, Coastal Zone Management Policy review, recreational, scenic and historic properties.

Q. What was the source of information used for these analyses?

A. Information included observations made as part of site visits as well as published aerial photographs, property maps, information inventories made available on a variety of New York State web sites, wetlands maps published by New York State DEC and National Wetland Inventory maps published by US Fish and Wildlife Service and New York State GIS databases. Additionally, two electronic data searches were performed by Environmental Data Resources, Inc. in late 2003. One search included sites of special interest such as hazardous waste sites and sites with reported spill events and the second search included such items as historic sites, floodplains and wetlands.

Q. What conclusions were developed as a result of your studies?

A. First and most important, because Conjunction has committed to not placing conductors aboveground on traditional tall transmission towers, all visual impacts related to the routing will be eliminated. Second, the routing is wholly within existing public or private rights-of-way. With the exception of short-term and temporary construction related impacts, all encroachments by the transmission facilities into other lands will also be eliminated.

The temporary and short-term construction impacts will be minimized by prudent construction practices which will be outlined in the project's Environmental Management and Construction Plan (EM&CP). The EM&CP practices will be enforced on the construction contractors and sub-contractors.

The new, alternate Downstate Converter Circuit One site is in an industrial and highly urbanized area. The site is surrounded by the 145th Street Bridge to the north, Major Deegan Expressway to the west and industrial and commercial facilities to the south. The siting of the converter in this developed area is consistent with existing land uses.

Q. Does that conclude your direct testimony.

A. Yes it does.

Testimony of Steven A. Mitnick, Conjunction LLC

Prefiled Direct Testimony

Submitted to: New York State Public Service Commission

Submitted by: Conjunction LLC
1230 Central Avenue, Suite 2828
Albany, New York 12205

August 5, 2004

Q. Please state your name, title, affiliation and address.

A. My name is Steven A. Mitnick. I am Chief Executive Officer of Conjunction LLC. My business address is 1230 Central Avenue, Suite 2828, Albany, New York 12205.

Q. Mr. Mitnick, what are the duties of your employment?

A. I am the senior executive of Conjunction responsible for overall management of the company and, most particularly, the successful completion of the Empire Connection project.

Q. How are you qualified to perform your employment duties?

A. I am a graduate of Brooklyn Technical High School of Brooklyn, New York, in electrical engineering, Rensselaer Polytechnic Institute of Troy, New York, with two Bachelor of Science degrees in Physics and in Political Science, and The Wharton School, University of Pennsylvania of Philadelphia, Pennsylvania, with a Masters of Business Administration degree. I completed all the requirements for a Doctorate in Economics from Georgetown University of Washington, D.C. with the exception of a finalized doctoral dissertation analyzing the capital investment behavior of the petroleum industry. I was a member of the faculty of Georgetown University from 1980 to 1982 where I taught undergraduate classes in economics and in statistics. For 23 years, from 1977 to 2000, I was a consultant on energy and environmental policy and corporate strategy, especially concerning the electric power supply sector. During the last seven years, from 1993 to 2000, I was a consultant with Hagler Bailly and from 1998 to 2000 with its primary subsidiary PHB Hagler Bailly. When I retired from consulting, in 2000, I was a Senior Vice President and the co-leader of the international commercial energy division of PHB Hagler Bailly that employed over 200 consultants and supporting personnel and generated a majority of the net income for Hagler Bailly, which at that time was a public company (listed on the NASDAQ exchange as HBIX). More recently, I was Chief Executive Officer of energyLeader.com, an Internet business funded by electric power utilities, and since the spring of 2002, the Chief Executive Officer of Conjunction. I have published approximately 20 articles in journals on the electric power issues, chaired or spoken at approximately 30 conferences on electric power issues, testified before the Federal Energy Regulatory Commission, New York Public Service Commission and several other state and Canadian provincial utility regulatory commissions, and am a member of the Editorial Advisory Board of The Electricity Journal. I developed "75Check", a computer program used by a majority of the electric power utilities subject to the acid rain program of the 1990 Clean Air Act Amendments and "Real Time", a widely-used electric power grid commitment and dispatch model.

Q. Does your curriculum vita, which is attached, fairly and accurately represent your experience?

A. Yes.

Q. What is the scope of your testimony in this proceeding?

A. The November 17, 2003 application included an analysis of the economic effects of the Empire Connection project composed of "two physically separate direct current circuits". This supplement completes the required information on Circuit 1 and requests Certification for this first 1,000-megawatt facility. My testimony is intended to summarize my expert opinion that the economic effects of the project's Circuit 1, while not as large in magnitude as might result from

both Circuit 1 and Circuit 2, are nonetheless significant and of the same character as analyzed in the November 17, 2003 application for both circuits.

Q. What are those economic effects?

A. As discussed in the attached supplement to Exhibit 6, a discussion that I prepared, there is a broad consensus that New York City requires a mix of additional electric power generation, transmission and distributed resources to ensure reliability, economic vitality and environmental quality. Empire Connection Circuit 1 if completed will help the City meet its goal of adding 2,600 megawatts of additional supply by 2008, provide redundancy to mitigate the negative impacts of outages of critical downstate power grid components, increase supply competition lowering consumer rates and bills, and lessen generation and emission of air pollutants within the densely-populated metropolitan area.

Q. Are the benefits of Circuit 1 significant?

A. Circuit 1 will add 1,000 megawatts to the supply mix serving the City. This amount is approximately 13% of the average demand for electric power in the City and 38% of the City's goal for 2008.

Q. Does this conclude your direct testimony at this time?

A. Yes.

Curriculum Vitae of Steven A. Mitnick follows.

STEVEN A. MITNICK

AREAS OF QUALIFICATION

Transmission development, wholesale power markets, electric industry competition, utility restructuring, electric system operations

EMPLOYMENT HISTORY

- Chief Executive Officer - Conjunction LLC, Albany, NY, 2002-Present
- Chief Executive Officer – Energy Leader Consulting, Washington, DC, 2001-2002
- Chief Executive Officer – energyLeader.com, Washington, DC, 2000-2001
- Senior Vice President - PHB Hagler Bailly Consulting, Washington, DC, 1999-2000
- Senior Vice President, Hagler Bailly Consulting, Arlington, VA, 1997-1998
- Director, Hagler Bailly Consulting, Arlington, VA, 1995-1997
- Vice President, RCG/Hagler Bailly, Arlington, VA, 1994-1995
- Principal, RCG/Hagler Bailly, Arlington, VA, 1993-1994
- Vice President and Chief Economist, Science Applications International Corporation (SAIC), Tysons Corner, VA, 1991-1993
- Senior Consultant, Putnam, Hayes & Bartlett, Washington, DC, 1989-1991
- President, S.A. Mitnick & Associates (affiliations with Strategy Wares, Future Soft; Tenera and R. J. Rudden & Associates), Washington, DC, 1980-1989
- Member of the Faculty (lectured microeconomics, macroeconomics and statistics), Economics Department, Georgetown University, Washington, DC, 1980-1982
- Consultant to the U.S. Environmental Protection Agency, U. S. Department of Energy, U.S. Department of the Navy (at C-Exec, American Management Systems and The Wharton School Busch Center), Arlington, VA and Philadelphia, PA, 1976-1980

EDUCATION

- Georgetown University, Doctoral studies (completed, all but dissertation on petroleum industry capital investment behavior), Economics (concentration in microeconomics, econometrics and public finance), 1980
- The Wharton School, University of Pennsylvania, MBA. 1976
- Rensselaer Polytechnic Institute, BS, Political Science, 1974
- Rensselaer Polytechnic Institute. BS, Physics, 1974

PROFESSIONAL EXPERIENCE

Electric Transmission Development, 2002-Present.

In spring 2002, Mr. Mitnick co-founded Conjunction LLC to develop direct current transmission systems along fully-assembled transportation rights of ways to minimize environmental impact. Empire Connection, Conjunction's first development, will interconnect the upstate New York grid with the New York City grid to improve the City's supply reliability, lower electric bills and clean the air through lowering local power plant emissions.

Strategic and Management Consulting in Wholesale Power Markets and Electric Utility Operation, 1994-2001.

In the Spring of 2001, Mr. Mitnick co-founded Energy Leader Consulting (ELC) a company focused on helping electric companies and their affiliates develop and implement winning strategies in wholesale power markets. ELC's clients included a wholesale power trading company, several electric utilities and Amtrak.

In 2000, Mitnick founded energyLeader.com, which worked with five electric utilities to develop e-procurement capabilities for utilities' major commercial customers.

From 1994 to 2000 while at PHB Hagler Bailly (and its predecessors), Mr. Mitnick assisted numerous owners of electric generation assets in understanding their markets and asset value. He facilitated a large strategic effort for the executive management of an electric and gas utility, and was the strategy consultant for a major supplier to the energy industry. He led a consulting engagement for a non-utility that is considering entry into the electric industry as a non-utility transmission company and for a utility affiliate and an independent power producer considering acquisitions of utility electric generation assets. He also led an engagement for a consortium of companies (including utilities) considering offering a major out-source service to utilities. He led a project for a consortium of three utilities in which they jointly developed a major power marketing company. Mr. Mitnick was the project manager for a very thorough asset valuation study, which led to a utility's finalist bid in the auction of New England Electric System's generation and related assets.

Expert Testimony and Litigation Support - 1981-2000.

Competition and Utility Restructuring, 1994-2000, Mr. Mitnick has testified as an expert witness in some of the major cases of the electric industry restructuring. He was the overall witness for the Pennsylvania Electric Competition Coalition (PECC) in the landmark PECO Energy restructuring case decided favorably for the PECC. In the Union Electric and Central Illinois Public Service merger, his testimony for the Illinois Commerce Commission Staff introduced a new powerful hourly approach for measuring market power and calculating the Hirschfield - Herfindel Index (HHI). On behalf of the City and County of San Francisco Mr. Mitnick submitted an affidavit in the California Power Exchange market power proceedings of the Federal Energy Regulatory Commission (FERC), addressing issues of transmission congestion pricing and market power. He was the expert in FERC proceedings concerning the "merger" of Long Island Lighting Company and Long Island Power Authority and related transactions, on behalf of "Consumers and Potential Competitors". He assisted two utilities in their preparation of comments in response to the FERC's Open Access Notice of Proposed Rulemaking, and a utility in its filing with a state public utility commission establishing one of the first open access pilots

for retail electric service. He directed an assignment for a utility affiliate seeking to increase payments under an independent power contract and was the expert witness in the arbitration of this matter.

Expert Witness, State Public Utility Commissions, 1981-2000. Mr. Mitnick has testified as an expert witness before the public utility commissions of Illinois, Kentucky, New York, New Jersey, North Carolina, Nova Scotia, Pennsylvania and the District of Columbia. Matters included utility restructuring and stranded cost recovery, utility mergers and market power, energy Policy Act of 1992 requirements, Clean Air Act Amendments of 1990 compliance costs, integrated resource plans, cost of capital, and construction cost prudence.

Product Development, Seminars and Significant Studies

Developer of ELC's proprietary "Actual Based" production cost modeling approach, 2001-2002. Mr. Mitnick developed the "Actual Based" methodology that was used in client assignments for two large electric utilities. These assignments involved asset valuation and operating cost analysis of generating units in ECAR, PJM, NEPOOL and ERCOT.

Developer of RampUp, 1997-2000. Mr. Mitnick developed this product, the only source of actual, hourly, generating unit-specific operations, cost, and performance data of over 2,000 fossil units for over 52,500 hours (January 1, 1995 through December 31, 2000). More than 30 utilities and power marketing companies use RampUp.

Clean Air Act Management Approaches, 1992-1995. Mr. Mitnick conducted on-site seminars on the Continuous Emission Monitoring (CEM) regulations and management approaches for ensuring compliance. These seminars were performed for Missouri Public Service Company, the Texas Public Power Association, Philadelphia Electric Company (and its successor PECO Energy), Louisville Gas and Electric Company, the City of Lakeland Department of Electric and Water Utilities (with the Florida Municipal Power Agency), South Carolina Electric and Gas Company, Jacksonville Electric Authority, Centerior Energy, Florida Power Corporation, Pennsylvania Power and Light Company, and Tampa Electric Company.

Developer of 75CHECK, 1993-1995. Mr. Mitnick is the developer of 75CHECK, an automated system for evaluating the completeness, consistency, accuracy, and reasonableness of CEM data and the overall performance of a utility's CEM quality assurance/quality control program. The system development project for 75CHECK was completed in September 1993. The product went on to become an enormous success. 75CHECK was purchased by 87 electric utilities; accounting for nearly 80 percent of continental U.S. fossil fuel utility generation; 24 of the 50 Phase I affected utilities, and 63 of the 90 Phase II affected utilities.

Analyzing and Modeling of Electric Utility Systems, 1987-1993. Mr. Mitnick modeled and analyzed over 20 different electric utility systems in the United States in detail, including the PJM Interconnection power pool, Western Systems Coordinating Council, Florida Coordinating Group, New England Power Pool, Georgia Pool, and several systems outside the United States (the England/Scotland Pool, the Spanish Pool, the Northern Ireland system, Ontario Hydro, and Nova Scotia Power), On behalf of the creditors of a bankrupt rural electric cooperative, Colorado Ute Electric Association, he conducted an extensive analysis of transmission system constraints in the western United States.

STEVEN A. MITNICK <page 4>

PJM Interconnection System, 1986–1993. Much of Mr. Mitnick's experience has involved the PJM Interconnection System. He has worked on behalf of Philadelphia Electric Company, Potomac Electric Power Company, General Public Utilities, Public Service Electric and Gas, Keystone-Conemaugh Projects (owned jointly by all PJM utilities), and Atlantic City Electric with respect to system planning issues. For example, as the expert witness on damages for Philadelphia Electric in the Peach Bottom extended outage litigation in Federal Court, he developed a very detailed model of PJM operations of the 1986-1989 period.

Study on Environmental Externalities, 1992-1993. Mr. Mitnick managed a study for the Edison Electric Institute on environmental externalities. The study showed that the cost of incorporating externalities in system dispatch decisions would be high relative to estimates by other researchers in the field.

Transmission and Competition Issues, 1992-1993. Mr. Mitnick studied transmission and competition issues for several clients, including Tokyo Electric Power Company and Kansai Electric Power Company, who follow developments in the United States.

CEM Regulations under the Clean Air Act Amendments of 1990, 1992-1993. Mr. Mitnick managed a collaborative project involving three electric utilities (Houston Lighting and Power Company, Tennessee Valley Authority, and Duquesne Light Company) concerning the challenges of CEM regulations under the Clean Air Act Amendments of 1990.

Clean Air Act Compliance Plans, 1990-1992. Mr. Mitnick served as a consultant to several utilities as they prepared their Clean Air Act compliance plans, including Duquesne Light Company, Keystone-Conemaugh Projects, Wisconsin Power and Light Company, Missouri Public Service Company, Associated Electric Cooperative, Public Service Company of Indiana, Philadelphia Electric Company, Union Electric Company, Public Service Electric and Gas Company, and Alcoa Corporation (part-owner of an electric generating unit). In addition, he helped Wisconsin Power and Light develop a strategy for the first sale of sulfur dioxide emission allowances.

Evaluation of Economic Prospects of Environmental Business Opportunities for an Electric Utility, 1992. Mr. Mitnick served as a consultant to the senior management of a major electric utility that was considering the formation of an unregulated subsidiary for environmental business ventures. He also evaluated the economic prospects of environmental business opportunities.

Market Analyses for Environmental Control Technologies, 1990-1992. Mr. Mitnick conducted market analyses for a major vendor of nitrogen oxides emission control technology, a utility that owns rights to a nitrogen oxides/sulfur dioxide control technology, and a utility and non-utility that own rights to sulfur dioxide control technologies.

Developer of REAL TIME, 1986-1989. Mr. Mitnick is the developer of REAL TIME, a detailed multi-area and transmission-constrained chronological production cost model currently used by several utilities including Atlantic City Electric, Utilicorp, the Bahamas Electricity Corporation, Hoosier Energy and Lafayette Utilities System, as well as American Tractebel and the Missouri Public Service Commission.

Publisher of Electric Ratemaking, 1986-1989. Mr. Mitnick's journal on the electric utility industry had over 350 subscribers. He also published the journal *Gas Pricing & Ratemaking*.

STEVEN A. MITNICK <page 5>

Developer of ELECTRIC STRATEGY, 1982-1984. Mr. Mitnick was the developer of the first production cost model for the electric industry to run on personal computers. The ELECTRIC STRATEGY series later included products for load forecasting, cost-of-service allocation, capacity expansion assessment, revenue requirements analysis and pro-forma financial analysis. These products were purchased by over 30 electric utilities and other industry players.

EXPERT TESTIMONY BEFORE UTILITY REGULATORY AUTHORITIES

Pennsylvania Public Utility Commission, in the matter of the application of PECO Energy Company for approval of its restructuring plan, Docket No. R-00973953, September 29, 1997, on behalf of Pennsylvania Electric Competition Coalition (Enron, Conectiv - a subsidiary of Delmarva Power and Light Company, and New Energy Ventures -a subsidiary of Tucson Electric Power Company).

U.S. Federal Energy Regulatory Commission. in the matter of the analysis of the impact of the disposition of certain jurisdictional assets of. the Long Island Lighting Company to the Long Island Power Authority and related contractual agreements on the concerned ratepayers of Long Island, Docket No. EC97-45-000, September 29, 1997, Affidavit on behalf of the Counsel for Consumers and Potential Competitors.

Illinois Commerce Commission, in the matter of the merger between Union Electric Company and Central Illinois Public Service, Docket No.95-0551, May 1997, on behalf of the Staff of the Illinois Commerce Commission.

U.S. Federal Energy Regulatory Commission, in the matter of Pacific Gas and Electric Company et al application for authority to sell electric energy at market-based rates using a power exchange, Docket No. ER96-1663-000, August 1996, Affidavit on behalf of the City and County of San Francisco.

Kentucky Public Service Commission, in the matter of Big Rivets Electric Corporation application for environmental surcharge, Case No. 94-032, April 11 1994, on behalf of Kentucky Industrial Utility Consumers.

North Carolina Public Utilities Commission, consideration of certain ratemaking standards pursuant to Section 712 of the Energy Policy Act of 1992, Docket No. E-I00. Sub 67, May 26, 1993, on behalf of the North Carolina Utilities Commission.

Province of Nova Scotia. Board of Commissioners of Public Utilities, in the matter of an application of Nova Scotia Power Corporation for approval of certain revisions to its rates, charges, and regulations: "On the Subject of Nova Scotia Power Corporation's Proposed Capacity Expansion Plan," March 1989, on behalf of the Board of Commissioners.

District of Columbia Public Service Commission, in the matter of the application of Washington Gas Light for authority to increase existing rates and charges for gas service, Formal Case No. 787, November 1982, on behalf of the Public Service Commission staff.

STEVEN A. MITNICK <page 6>

New York State Public Service Commission, in the matter of the application of Niagara Mohawk Power Corporation for an increase in existing rates and charges for electric and gas services, Case No.28225-7, September 10, 1982, on behalf of the County of Erie, NY.

District of Columbia Public Service Commission, in the matter of the application of Potomac Electric Power Company for an increase in its retail rates for sale of electric energy, Formal Case No.785. July 29, 1982, on behalf of the Public Service Commission staff.

District of Columbia Public Service Commission, in the matter of the application of Washington Gas Light Company for authority to increase existing rates and charges for gas service, Formal Case No 769, November 1981, on behalf of the Public Service Commission staff.

New Jersey Board of Public Utilities, in the matter of the petition of Public Service Electric and Gas Company for an increase in rates, Docket No.812-76: "Coal Conversion at Bergen Station," August 1981, on behalf of the New Jersey Department of Public Advocacy.

EXPERT TESTIMONY AND LITIGATION SUPPORT BEFORE THE COURTS INVOLVING UTILITIES

Expert liability witness on behalf of an independent power producer affiliate of an electric utility in a contract arbitration matter with another utility, affidavit on February 3, 1997, expert report on February 28, 1997, and cross-examination on March 14, 1997; matter considered by the arbitration panel.

Economic damages witness on behalf of Philadelphia Electric Company in Public Service Enterprise Group Inc. and Public Service Electric and Gas Company versus Philadelphia Electric Company, U.S. District Court for the District of New Jersey, Civil Action No.88-3214, and Atlantic City Electric Company and Delmarva Power and Light Company versus Philadelphia Electric Company, Civil Action No.88-3286, 1991-1992; actions settled by the parties.

Developed testimony for witness Howard Pifer, on behalf of Thermo Electron Corporation in Thermo Electron Corporation, et al. versus Florida Power and Light Company. et al.. U.S. District Court for the Southern District of Florida, Civil Action No.88-2145, 1989-1990.

PROFESSIONAL AFFILIATIONS AND HONORS

- The Governors Regulatory Reform Advisory Board: Appointed by Governor of Virginia Charles Robb on October 4, 1982; Final Report issued October 21, 1985
- Office of the Secretary of Defense "Special Services Award," awarded by Deputy Assistant Secretary of Defense Joseph P. Walsch on October 20, 1975
- University of Pennsylvania Wharton Graduate School "Public Policy Fellow," awarded by Dean Donald C. Carroll on July 24, 1975
- Editorial Advisory Board, *The Electricity Journal*

Exponent®

**The Empire Connection
Project**

Supplement to Exhibit E-5

**of the Application for a
Certificate of Environmental
Compatibility and Public Need**

Case 03-T-1641

**Magnetic Fields from
Underground Cables—New
Route Sections**

Exponent®

The Empire Connection Project

**Supplement to Exhibit E-5
Of the Application for a Certificate
of Environmental Compatibility
and Public Need**

Case 03-T-1641

**Magnetic Fields from Underground
Cables—
New Route Sections**

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August 2, 2004

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Notice

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1 Introduction

Conjunction LLC proposes to construct a transmission line, Upstate Converter Circuit 1 in its Application "Circuit 1" to deliver 1,000 megawatts (MW) of electricity to New York City. The power will be carried on an underground circuit.

The interconnection to the power grid is shown in a simplified, one-line schematic (Figure 1). The first leg of **Circuit 1**, as shown in Figure 1, will begin at a converter station in Greene County and carry power on an underground 500-kV, bi-polar direct current (dc) circuit for 124.6 miles to a converter station at the Oak Point railroad freight yard in the Bronx. After converting to alternating current (ac), the power will flow on two underground 345-kV circuits for a short distance before dropping down and crossing under the bottom of the East River and traversing south for 4.8 miles to Consolidated Edison's Rainey Substation on the west shore of Queens County.

The purpose of this report is to characterize the potential electrical effects of the proposed sections of underground transmission line and to evaluate these effects at the present stage of project design. The evaluation considers the general effects of the proposed conceptual design and the likelihood that the proposed project would meet critical design and environmental criteria.

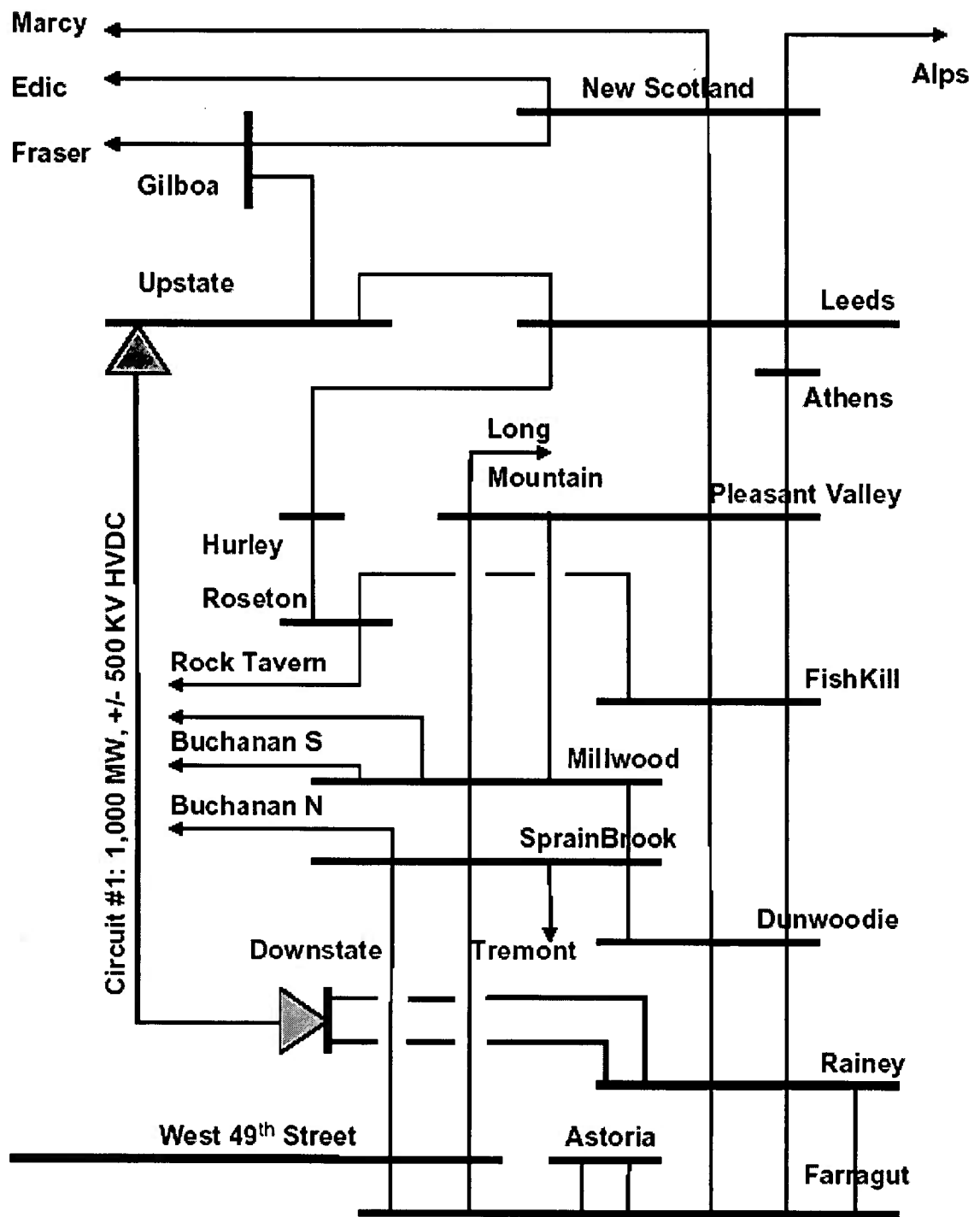


Figure 1. Empire Connection & UPNY/SENY 345 kV Transmission Grid

2 Electrical Environment: Definitions, Sources and Occurrence

The environment of the earth is quite complex. Among its many attributes are the distribution and movement of charges in the earth and surrounding atmosphere that give rise to electric and magnetic fields.

Electric fields arise naturally from electrical storms, from the separation of charges (e.g., static shock), and from voltages applied to electrical conductors and equipment. The electric field is expressed in measurement units of volts per meter (V/m) or kilovolts per meter kV/m (a kilovolt is equal to 1000 volts [V]). Most objects including fences, shrubbery and buildings easily block electric fields. This prevents outside sources, such as power lines, from contributing significantly to electric field exposures indoors where people spend most of their time. For the underground/underwater sections of the proposed transmission lines, the conductive wrappings on the cable and the ground or water between the line and the surface will block electric fields. For this reason, electric fields from these sources were not considered further in regards to these circuit configurations.

Magnetic fields are produced by the flow of electric currents but, unlike electric fields, are not readily blocked by most materials. Magnetic flux density is expressed in units of Tesla (T) according to the *International System of Units (SI)*. Magnetic fields at environmental levels are commonly given in mT or μT , where $1 \text{ mT} = 10 \text{ gauss}$ and $0.1 \mu\text{T} = 1 \text{ milligauss}$ (an older unit of magnetic flux density). In this report, values of magnetic flux density are given in SI units if quoted from a reference; otherwise those values will be given in the older, but more common, units of gauss or milligauss.

A background dc magnetic field level originates from the metallic core of the earth and the electrical currents flowing in the upper layer of the Earth's crust. The strength of this geomagnetic field is highest at the magnetic poles ($\sim 700 \text{ mG}$) and lowest at the equator ($\sim 300 \text{ mG}$).

AC electric and magnetic fields that are associated with the transport and use of electricity are often termed EMF, but most often the focus is on magnetic fields. These fields oscillate at the power frequency of 60 Hz. Transmission and distribution lines are sources of these fields. Other sources of these fields are household appliances, power tools, office machines, building wiring, and any other type of electrical equipment. A less common source is current flowing on water pipes or grounding systems. In most of our homes, background ac magnetic field levels average about 1 mG when not near a particular source. Higher ac magnetic field levels are commonly measured indoors in the vicinity of appliances, water pipes, and wiring; outdoor sources include transmission and distribution lines.

3 Converter Stations and Proposed Transmission Circuits

Two components of the project – the converter facilities and the interconnecting ac and dc transmission lines – are potential sources of electric and magnetic fields.

3.1 Converter Stations

The proposed dc stations that will convert ac power to dc power (and vice versa) will receive power from existing ac transmission lines. The Greene County converter station will tap the New York Power Authority's Leeds-Gilboa 345-kV transmission line to provide power to Circuit 1. The transmission line feeding power to the northern converter station are existing sources of ac voltages and currents that give rise to electric and magnetic fields, respectively, and are therefore not considered in this evaluation. The proposed underground Circuit 1 will continue south to terminate at a converter station located in the Bronx where dc power will be converted back to ac power.

At the converter station site the new equipment with potential to generate ac fields such as the gas-insulated converter station and converter thyristor valves will be located within metal buildings that provide shielding from the electric field and partial shielding from the magnetic field. Those buildings will not be located near the existing property boundaries. The buildings will also shield the dc electric fields that are produced by voltages of constant polarity. Conductive objects such as trees, shrubbery, and metal fences surrounding the sites will further shield electric fields.

The northern converter station is to be located on a rural site near the New York State Thruway. The southern converter site is located on a smaller tract but is isolated from nearby communities at Oak Point. The proposed converter station at Oak Point for Circuit 1 will be located in an open industrial area surrounded by the Oak Point freight yard to the west, north and east, and by the East River to the south. The area reserved for this converter station is within a much larger railroad property, and is separated from the residential neighborhoods of Hunts Point, Port Morris and Mott Haven, by the rail yards and its numerous train tracks. The new alternate southern converter site at 145th Street in the Bronx is bordered by the Major Deegan Expressway to the east, the Harlem River to the west, the 145th Street Bridge to the north, and commercial-industrial property to the south. Beyond the Major Deegan Expressway to the east are River Avenue and its intersection with East 146th Street. Beyond the Harlem River to the west is Harlem River Drive in New York County. Industrial-commercial properties line the Harlem River to the north, beyond the 145th Street Bridge, and further south to the Madison Avenue Bridge. The site is located in an industrial zone and is isolated from residential communities for a distance of several city blocks.

Given the size or location of the proposed sites for the converter stations, there will be no significant impact of these facilities on field levels outside the site boundary. For such sites, higher fields are only associated with transmission lines connecting to the converter station.

3.2 Transmission Circuits

The Application describes many configurations of the proposed transmission circuits that may be employed to address site-specific conditions. This supplement provides additional information about the electrical effects of the transmission circuits along six sections of Circuit 1 not previously evaluated: 1) the dc cable configuration for the crossing the Tappan Zee bridge (part of original route of Circuit 1; 2) the dc cable configuration for a railroad trestle crossing on the Oak Point Link; 3) the ac cable configuration for a railroad trestle crossing on the Oak Point Link; 4) the under-roadway installation at Randall's Island; 5) the under-river installation at Hell Gate; and 6) the under-roadway installation in Queens.

4 Environmental Assessment and Design Criteria

The acceptability of potential environmental impacts of transmission lines is considered first in the design process and then again during the siting of the line.

To minimize the possibility of known potential impacts relating to electrical safety and shock, transmission lines are designed to conform to the National Electrical Safety Code (IEEE, 2002). Other potential effects of underground transmission circuits of potential significance include electric fields (converter stations only) and magnetic field levels (converter stations and transmission lines). These effects are judged by regulatory agencies not to be of environmental significance if critical values fall below recommended limits. The limits listed in Table 1 are referenced as criteria for the evaluation of the significance of environmental effects.

Table 1. Environmental Assessment Standards and Guidelines for AC and DC Transmission lines

Electrical Parameter	Limit at Edge of ROW	Limit on ROW	Comment	Reference
AC magnetic field	200 mG		Emission limit at WNC	NYSPSC (1988)
AC magnetic field	830 mG		Exposure of general public	ICNIRP (1998)
	9040 mG			ICES (2002)
AC electric field:	1.6 kV/m		Emission limit at WSTE	NYSPSC (1990)
Public road		7.0 kV/m		
Private road		11.0 kV/m		
Other terrain		11.8 kV/m		
DC electric field	25 kV/m		Exposure of general public	NRPB (1993)
	28 kV/m*			ICES (2002)
DC magnetic field	40 mT (400 gauss)		Continuous exposure of general public	ICNIRP (1994)
	40 mT (400 gauss)			NRPB (2004)
	167 mT (1670 gauss)			ICES (2002)

WNC: winter normal continuous conductor load rating

WSTE: winter short-term emergency conductor load rating

* For a resistance of 1000 M-OHM. The value increases with lower resistance.

Other potential environmental impacts not considered by the above standards and guidelines are evaluated based upon the magnitude of the change from ambient background conditions at relevant sensitive receptors and by independent evaluations of their potential environmental, safety, or health significance.

5 Calculation Methods

DC magnetic fields from underground dc circuits were calculated by the law of Bio-Savart for nominal conductor voltages of ± 500 kV and maximum current flow of 1,000 A.

The dc and ac magnetic fields associated with the operation of the cable circuit were calculated by a computer program developed by the Bonneville Power Administration, an agency of the U.S. Department of Energy (BPA, 1991). This program has been shown to accurately predict these parameters near transmission lines and other current-carrying conductors.

The inputs to field calculations include data regarding voltage, current flow, and conductor configuration. The fields associated with the proposed circuits were calculated along profiles perpendicular to the circuits and at a standard height of 3.28 feet above ground unless specified otherwise in accordance with IEEE Std 644 (1994). The calculation model assumes balanced currents on phases, horizontal conductors, and flat terrain.

For the ac underground/submarine circuits a maximum cable rating of 500 megawatts (MW) resulting in a current of 837 A per phase was assumed. No shielding effect of the cable was assumed for these screening level calculations.

6 Magnetic Fields Associated with Circuits on New Route Sections

6.1 DC Magnetic Field

The background geomagnetic field at the earth's surface is a static field that largely originates from direct current flow in the liquid part of the earth's core and from metallic elements in the crust of the earth. The magnetic field of the earth has a dipole structure like that of a bar magnet, with the poles of the dipole closely aligned with the geographic poles of the earth. This horizontal component of this field orients a compass needle in the magnetic north/south direction. The highest values of the geomagnetic field are measured at the magnetic poles (~ 700 mG) and lowest at the equator (~ 300 mG), i.e., 0.7 and 0.3 gauss.

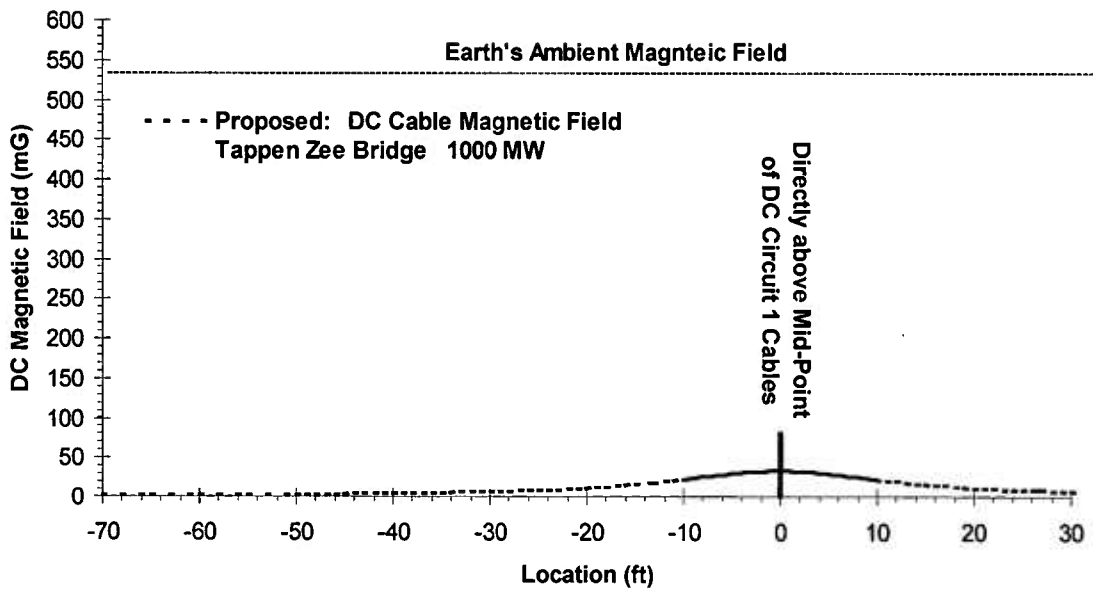


Figure 3. Magnetic field from dc Circuit 1 on Tappan Zee Bridge (1000 MW).

6.1.2 Oak Point Rail Yard

Circuit 1 proposes to be installed underneath the trestle of the single-track railroad owned by the New York Department of Transportation. The maximum effect of the DC underground cable at a trestle along the Oak Point Link in the Bronx, NY, was evaluated. The geometry of the dc cable on the trestle at the Oak Point Link is shown in Figure 4. The effect of the underground dc line is plotted as the maximum calculated change in the magnetic field in Figure 5. The ambient geomagnetic field of the Earth is plotted for reference.

The maximum change in the dc magnetic field at a standard height above the trestle was calculated as 56.9 mG. It is clear that the underground dc line will perturb the ambient magnetic field for only a short distance from the conductors and will not interfere with the railroad operations.

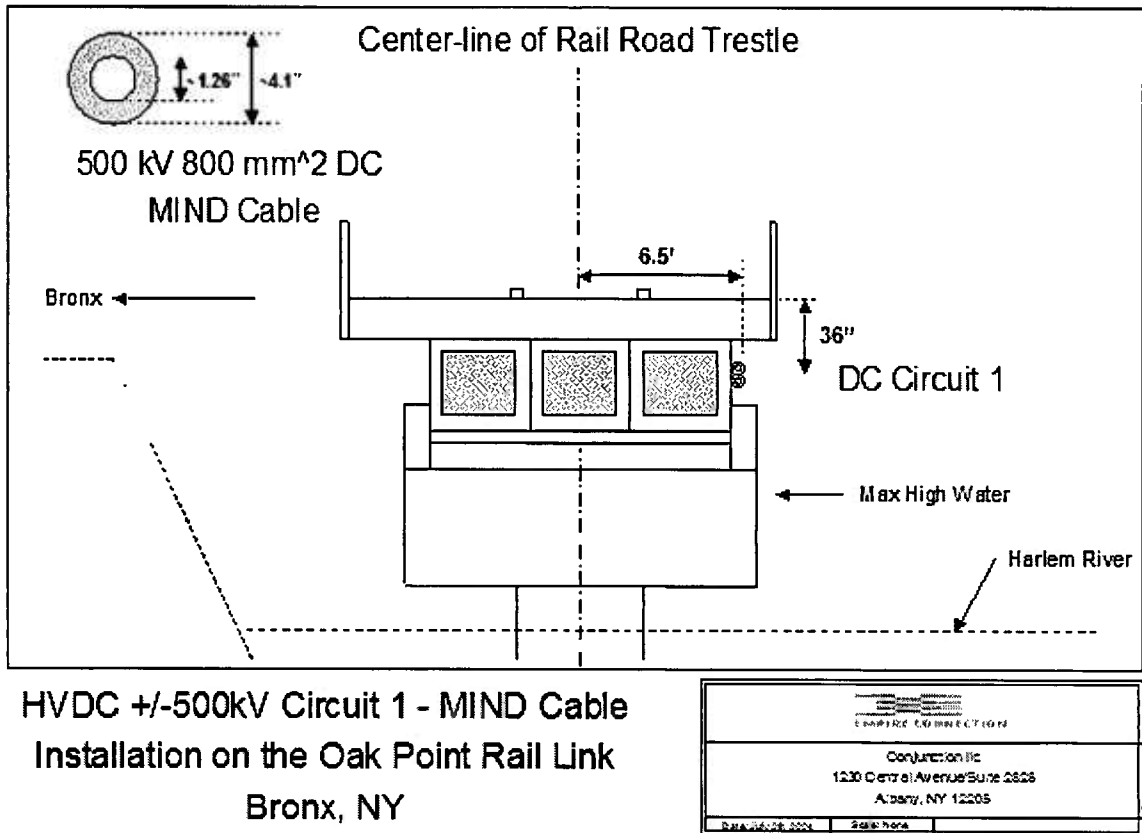


Figure 4. Rail Road Trestle for Oak Point Link. Location of dc Circuit 1 (1000 MW).

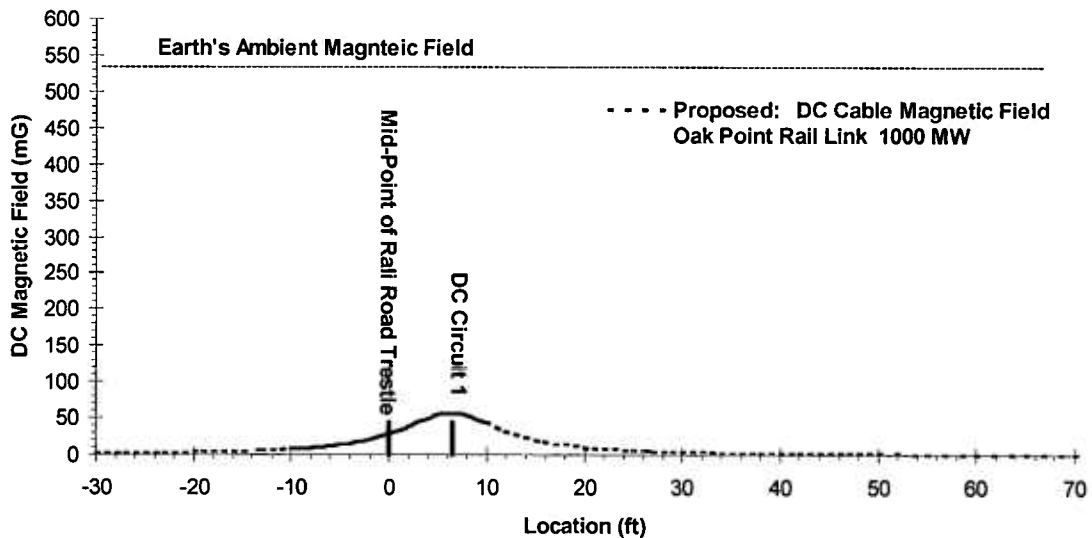


Figure 5. Magnetic field at standard height of 3.28 feet above the surface of the trestle from dc Circuit 1 located below railroad trestle (1000 MW).

The level of magnetic field from the dc cable encountered by traffic on the Tappan Zee Bridge or the Oak Point railroad trestle is less than what might be encountered due to magnetized sections of the rail or bridge and is sufficiently small that it should not adversely affect handheld analog or digital compasses. Satellite-based GPS navigation systems, which do not rely on the earth's magnetic field for direction, would not be affected. The effect of the proposed dc circuit on the magnetic field is too weak to produce any environmental or health effects based on Table 1.

6.2 AC Magnetic Field

The sources of ac magnetic fields associated with the project are the underground ac power cables that connect the southern converter station to the Consolidated Edison system in Queens. Magnetic fields were evaluated for four new sections of the ac cable route; a railroad trestle crossing on the Oak Point Link in the Bronx, a roadway installation at Randall's Island; a river crossing at Hell Gate; and a roadway installation in Queens.

The ac circuit will consist of two sets of three cables and each set will carry 500 MW. To estimate the highest ac magnetic field level, the phasing of the cables that produced the maximum magnetic field was assumed and it was assumed that each set of cables will carry the full 500 MW load. The field was also plotted for the case of a more optimal phasing between the cables.

6.2.1 Oak Point Link

From the southern converter station at the 145th Street Bridge, Circuit 1 to the north shore of the Bronx Kill Circuit 1 is configured as two sets of parallel ac cables. These cables will be installed underneath the railroad trestle along the Oak Point Link for a distance of 1.4 miles as shown in Figure 6. The magnetic field at a standard height of 3.28 feet above ground level is shown in Figure 7 for cable phasings associated with the maximum magnetic field and also for an optimal phasing of the cables. A maximum ac magnetic field of 67.1 mG is calculated for a full loading of 500 MW on each set of cables. Lower fields will result for other choices of cable phasing or lower loading levels.

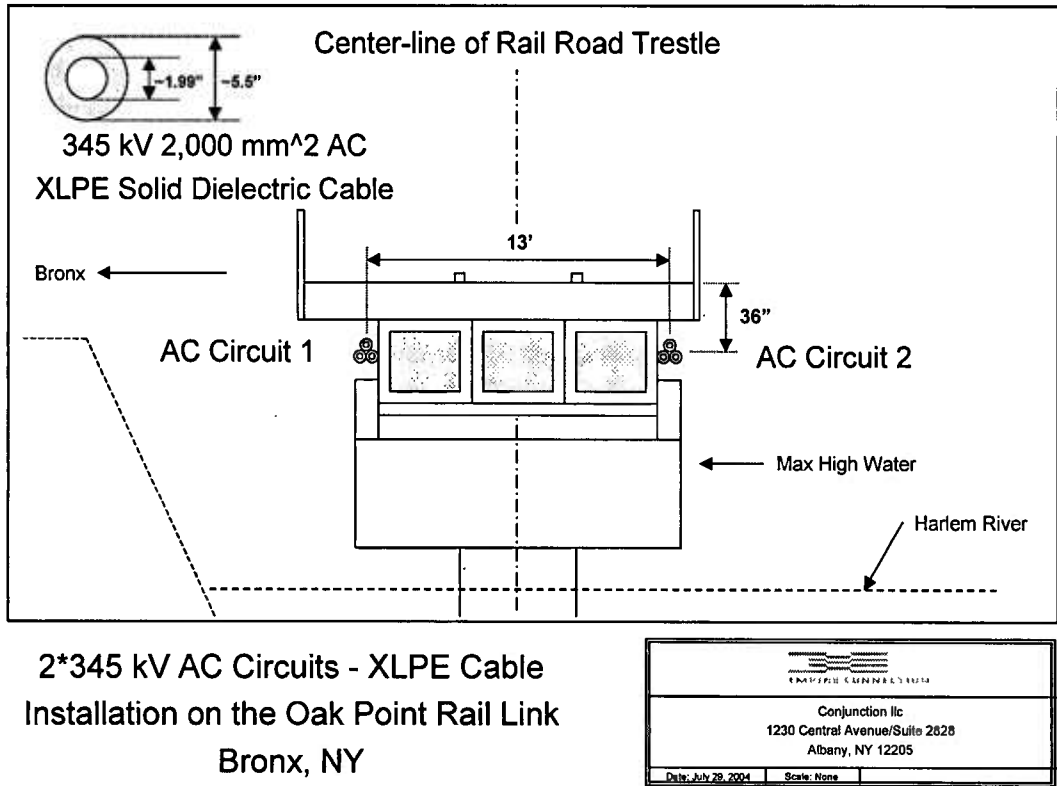


Figure 6. AC cable configuration at a trestle crossing along the Oak Point Link.

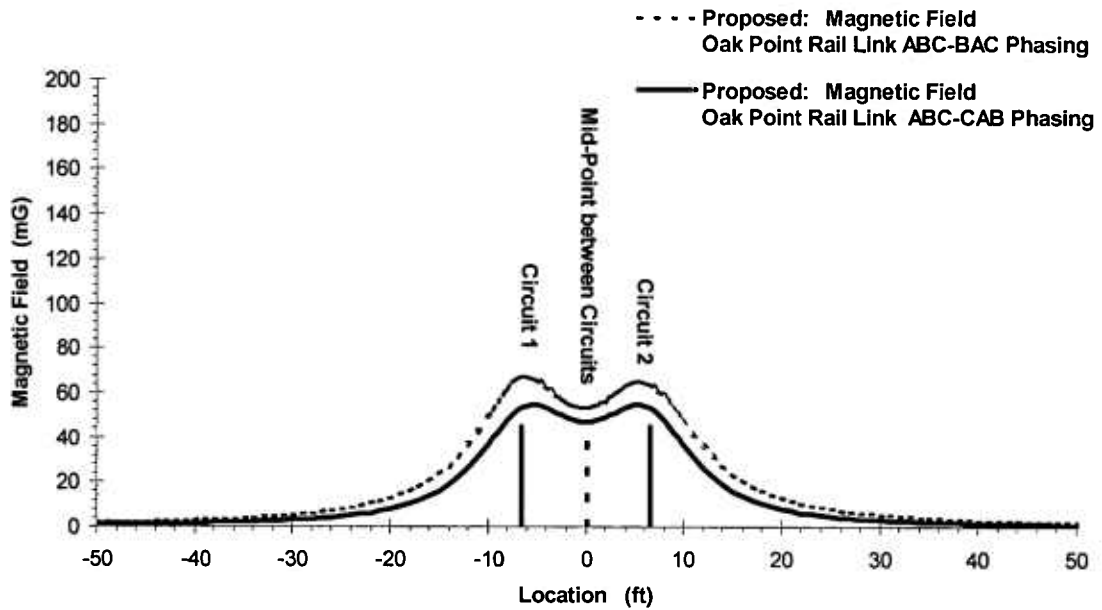


Figure 7. AC magnetic field from parallel ac cable sets on a railroad trestle along the Oak Point Link. (1000 MW total – each set of cables carrying 500MW). Magnetic fields plotted for both maximum and a more optimal cable phasing.

6.2.2 Randall's Island

Figure 8 shows the configuration of the ac cables to be installed in trenches underneath a roadway on Randall's Island. The centers of the two ac cable sets are separated by 15 feet or more and are buried 3 feet below the roadway surface. The magnetic field for a phasing of the cables that produces the highest magnetic field above ground is plotted in Figure 9.

For this phasing of the cables with both sets of cable carrying their maximum loading of 500 MW, the highest magnetic field is 249 mG and occurs over the inner edge of each set of cables (+/- 6.5 feet from roadway center). It decreases to below 200 mG within a few feet beyond the center-line of each set of cables (+/- 10 feet of the roadway center). In order to assure that the magnetic field would always be below 200 mG at a standard measurement height above the roadway for any cable phasing order would require that the top of the cables be buried 46.5 inches below the surface of the roadway.

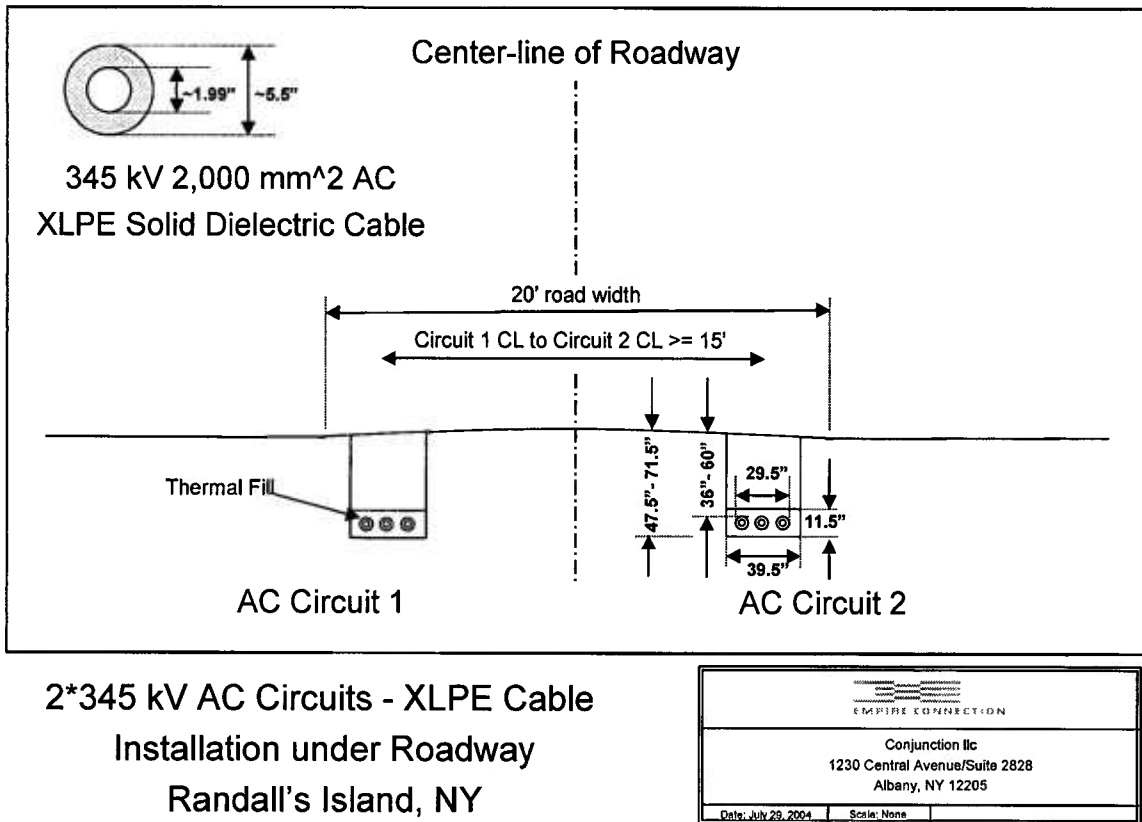


Figure 8. AC cable configuration for the underground route on Randall's Island.

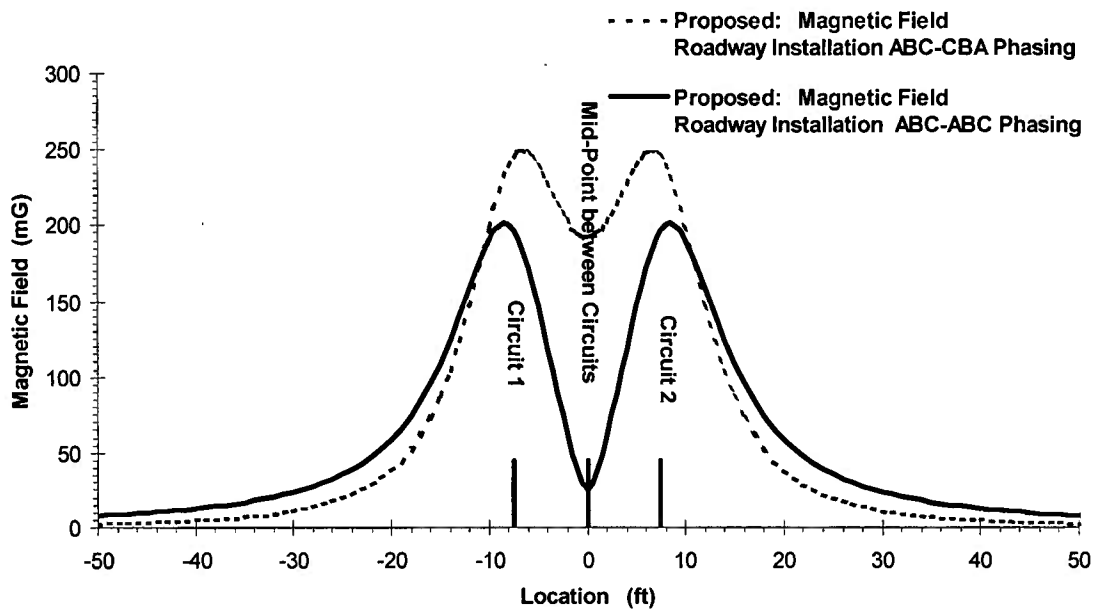


Figure 9. AC magnetic field for two phasing arrangements at Randall's Island. Each set of cables is carrying 500 MW of load.

6.2.3 Boring Under East River

Between the south shore of Randall's Island and Hallett's Point in Queens, Circuit 1 will pass beneath the East River at Hell Gate in bored holes. The cable configurations for the borings under the river at Hell Gate are shown in Figure 10. The magnetic fields at the surface of the river for two phase-configurations are shown in Figure 9. Full loading of 500 MW for each cable set is assumed. The maximum magnetic field at the surface of the river is 60.2 mG.

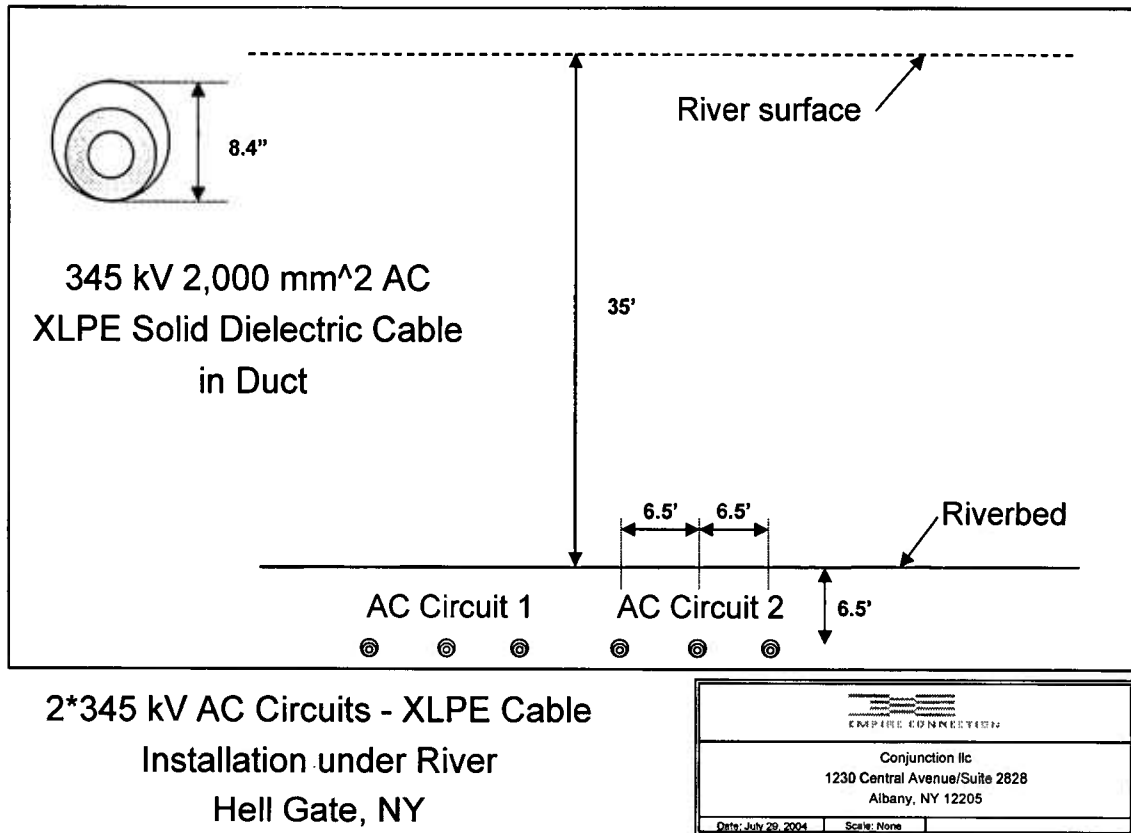


Figure 10. Cable configurations below the bed of the East River at Hell Gate.

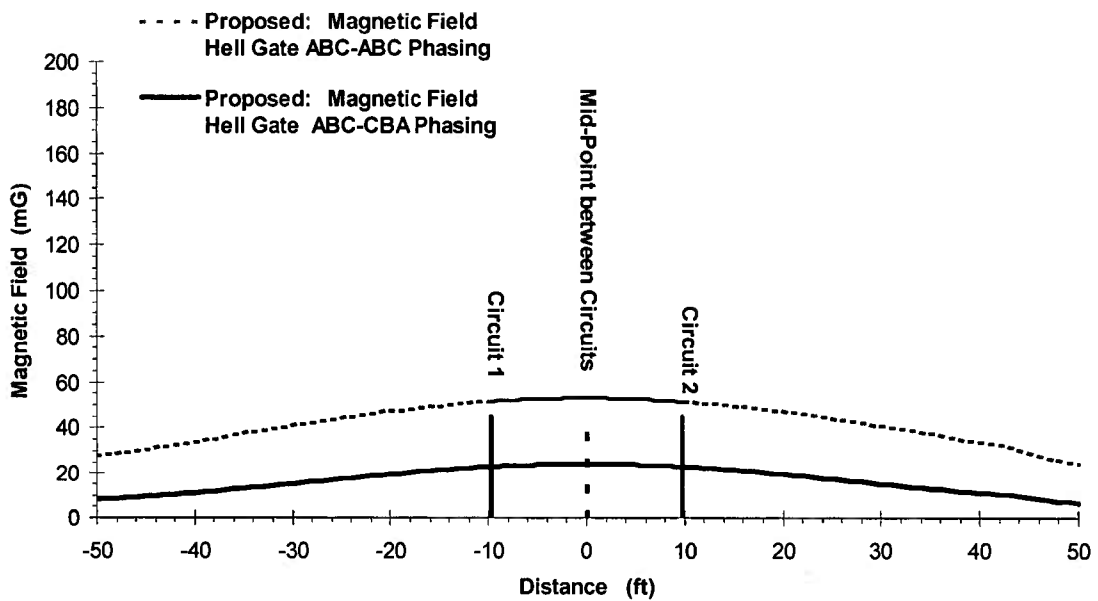
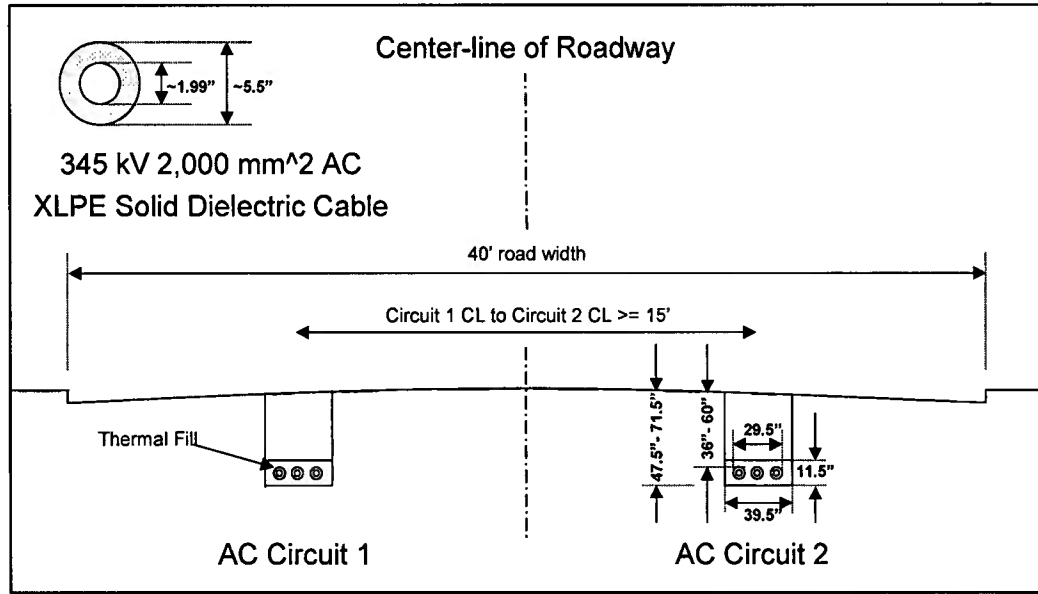


Figure 11. Magnetic field at surface of the river at Hell Gate, NY, with ac cable sets buried 6.5 feet below the riverbed. River surface is 35' above the seabed. Maximum field will occur for ABC-ABC phasing of the two adjacent cable sets and the full load of 1000 MW from the converter station (500 MW on each ac circuit). The field profile for a more optimal phasing of the two circuits is also plotted.

6.2.4 Under Streets in Queens

The cable configurations to be used for a roadway installation in Queens are shown in Figure 12. The resulting fields and distances are similar to the roadway installation for Randall's Island and are plotted in Figure 13.



2*345 kV AC Circuits - XLPE Cable
Installation under Roadway
Queens, NY

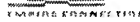
 CONJUNCTION LLC 1230 Central Avenue/Suite 2828 Albany, NY 12205	
Date: July 29, 2004	Scale: None

Figure 12. Sketch of the cable configurations used for a roadway installation in Queens.

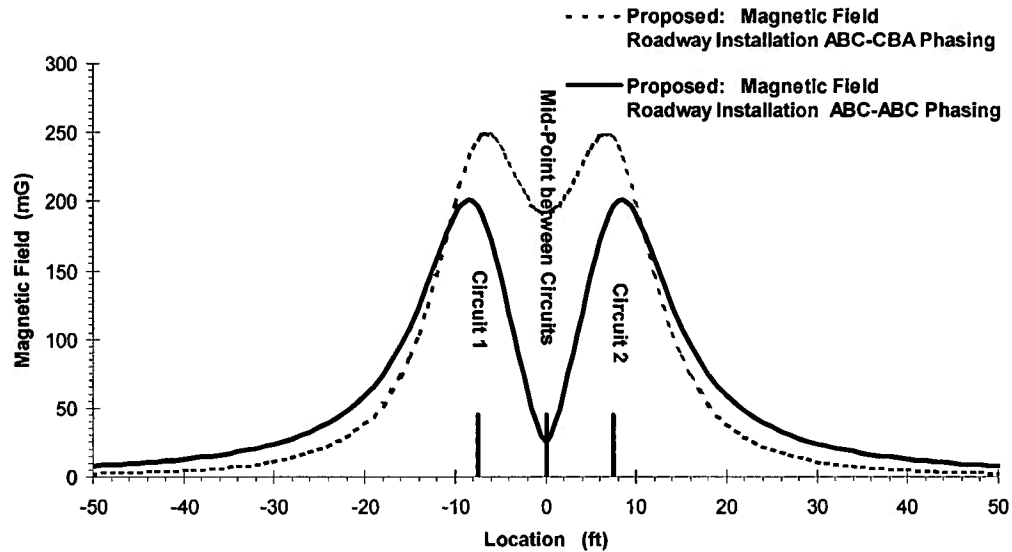


Figure 13. AC magnetic field for the installation in Queens underneath the road way with a cable phasing that produces the maximum magnetic field. The magnetic field for a more optimal phasing of the cables is also plotted. Each set of cables is carrying 500 MW of load.

The maximum magnetic field calculated for the new configurations of the ac cable sets along the route from the southern converter station to Rainey Substation does not exceed the 200 mG limit at the edge of publicly accessible rights-of-way. The routing of the ac cables will not result in any increase to the long-term exposure of persons in residences. Any exposures to the ac magnetic fields would also fall far below the health-based exposure limits recommended by international standards organizations (Table 1). The projected ac magnetic fields would not adversely affect handheld analog or digital compasses, or satellite-based GPS navigation systems.

6.3 Electric Field and Audible Noise

No ac electric field, dc electric field or audible noise will be produced outside the cable systems.

7 Interference to Radio and Communications

The proposed underground dc and ac circuits will not interfere with AM radio, citizens band radio, television signals, long-range radio navigation (LORAN) systems, radar or wireless telephone use above ground. Investigations will be performed during a later design phase of the project to insure that potential interference by induction or conduction to underground communication cables will be minimized by adequate clearances or other appropriate measures as dictated by the National Electrical Safety Code (IEEE, 2002). The proposed design and location of these components is such that there would be no adverse electrical or environmental effects from The Empire Connection project.

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Final Report

System Reliability Impact Study for Conjunction LLC's 2000 MW Empire Connection HVDC Project

Prepared for

Conjunction LLC

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Appendix EE Inertial File Used with INFLEE-1

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Executive Summary

Conjunction LLC is involved in the development of the interconnection of its 2,000 MW HVDC Empire Connection Project, between upstate New York and New York City (NYC). Shaw Power Technologies, Inc. (PTI) was contracted by Conjunction LLC to provide a System Reliability Impact Study (SRIS) for review by the New York Independent System Operator (NYISO) Transmission Planning Advisory Subcommittee (TPAS) and approval by the NYISO Operating Committee (OC).

The results of the SRIS show that the performance of the New York Bulk Power System (NYBPS) is not degraded by the interconnection of Conjunction LLC's 2,000 MW HVDC Empire Connection Project (Empire Connection Project):

1. For the transfer analysis the results show that the thermal transfer limits for the intra NY State interfaces under study were substantially increased with the Empire Connection Project in service. The transfer limits of the NY-PJM and the NY-NE interfaces (both directions) are not substantially affected by the Empire Connection Project.
2. For the PV voltage transfer analysis the results show that the voltage-constrained transfer limits for all the interfaces under study (Central East, Total East, UPNY-ConEd and NYC Cable Interface) were substantially increased with the Empire Connection Project in service.
3. For the stability transfer analysis for the summer case, the simulation was run for the same set of interfaces used for the voltage transfer analysis. The interfaces were loaded to test levels which represent ten percent above the more restrictive of the emergency thermal or voltage limits. The results show that with the Empire Connection Project in service the dynamic performance of the NYBPS was not degraded and for the set of contingencies used to test the interfaces the system response was stable and positively damped.
4. For the steady state extreme contingency analysis the results show that the Empire Connection Project does not degrade the system's response under these extreme contingencies. Similarly, the results of the dynamic simulations under extreme contingency conditions also indicate that the Empire Connection Project does not degrade the dynamic response of the system due to these tested extreme contingencies.
5. For the light load dynamic simulation the results show that the Empire Connection Project does not degrade the dynamic response of the NYBPS for the contingencies tested under light load conditions.
6. The short circuit calculation indicates that for unbalanced fault currents the Empire Connection Project causes an increase in the total short circuit currents of some of the stations reported. However, none of the stations (where breaker ratings are available) are over-dutied compared to the lowest breaker ratings. Three phase short circuit currents were not affected, since the HVDC delta-wye-grounded converter transformers only affect unbalanced faults. Therefore the Project has no negative impact on the station duties in the system under study.

7. For the contingency analysis conducted for Central Hudson and Con Edison local transmission systems the analysis indicates that the Empire Connection Project does not have any adverse impact on Central Hudson and ConEd's local transmission systems.

8. Study results (Addendum Report "AC Contingency Analysis for National Grid Central 115 kV System", dated March 11, 2004) indicate overloading of some local 115 kV lines in Niagara Mohawk's system for certain conditions both pre and post Empire Connection project, as a function of local generation dispatch. These concerns must be addressed prior to completion of interconnection studies for the Empire Connection project.

9. Finally, critical clearing time calculations were conducted for substations in NYPA, Niagara Mohawk and ConEd systems. The results of the critical clearing time show no adverse impact of the Empire Connection Project on existing settings at those substations.

All analysis conducted throughout this SRIS was conducted with the Empire Connection Project transferring power only from Upstate New York to NYC. Nevertheless, the Project has the capability to transfer power in the opposite direction as well. Studies will be required prior to utilizing the project to transfer power from south to north should such operation be desired in the future.

No Special Protection Systems were required by the project to mitigate impacts on the bulk power system.

Interconnection studies will address system measures required to mitigate any adverse harmonic effects introduced by the converters.

A summary of results is shown in the following table.

Summer NY Intra Interfaces Normal Transfer Limit (MW) Analysis⁽³⁾

LF #	Case Description	NYC Cable	UPNY-Con Ed (O/C) ⁴	Central East	Total East
1	Summer Base Case (Empire O/S)	4,414 ⁽¹⁾	4,073 ⁽²⁾ / 5,603	2,308 ⁽²⁾	4,072 ⁽²⁾
2	Summer Base (Empire I/S)	5,864 ⁽¹⁾	6,596 ⁽²⁾ / 8,125	3,038 ⁽²⁾	5,078 ⁽²⁾

1. Voltage Constrained (Table 5.2)
2. Thermally Constrained (Table 4.1)
3. No Interface was Stability Constrained
4. (O/C) Open/Closed

It is noted that the NYC Cable Interface is not presently voltage constrained but was in this case due to Poletti and IP#3 being uncommitted in the base case and for the case with the Project in service. A sensitivity analysis with those units committed showed that the NYC Cable Interface reverted to being thermally constrained.

Introduction

Conjunction LLC contracted Shaw Power Technologies, Inc (PTI) to evaluate the impact of connecting its 2000 MW HVDC Empire Connection project between upstate New York and NYC on the NYBPS. The Project is anticipated to be operational by summer 2006. A project description can be found at <http://www.empireconnection.com>.

According to the "Scope of Work Interconnection Study for the Conjunction LLC's 2,000 MW HVDC Empire Connection", the SRIS technical analyses include a transfer analysis to determine the impact of the Empire Connection Project on the thermal, voltage and stability transfer limits for the intra New York (NY) State interfaces. For the thermal transfer analysis the following interfaces were considered, Total East, Central East, UPNY-ConEd, UPNY-SENY, and the NYC Cable Interface. For the voltage and stability transfer analysis the interfaces considered were Total East, Central East, UPNY-ConEd and NYC Cable Interface. Thermal transfer analysis was also conducted for the NY-NE and NY-PJM interfaces.

Additionally, the SRIS analyses include: extreme contingency assessment; dynamic simulations under light load conditions; short circuit calculation of Con Edison, Niagara Mohawk, Central Hudson, NYPA and NYSEG major substations; contingency analysis for Central Hudson and ConEd local transmission systems; and critical clearing time analysis for some Niagara Mohawk, NYPA and ConEd substations. As indicated above, throughout the conduct of this study the primary objective was to assess the impact of the Empire Connection Project on the NYBPS.

The results of the thermal, voltage and stability transfer analysis, extreme contingency and dynamic simulations under light load conditions, short circuit analysis, contingency analysis for Central Hudson and ConEd local transmission systems, and the critical clearing time analysis can be found in Sections 4 through 10 of this report.

Scope Of Study

2.1 Objective

The objective of this study is to assess the impact of interconnecting Conjunction LLC's 2,000 MW HVDC Empire Connection Project between upstate New York and NYC, on the NYBPS per the NYISO Scope of Work approved September 10, 2003. The Project is anticipated to be operational by summer 2006. The information provided in this report demonstrates that the proposed facility can be designed and operated according to all applicable North American Electric Reliability Council (NERC), Northeast Power Coordinating Council (NPCC), New York State Reliability Council (NYSRC) and NYISO criteria.

2.2 Methodology

2.2.1 Interconnection Plan

The study considered 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.

Figure 2.1 shows a basic one-line interconnection diagram of the Empire Connection Project to the NYBPS. Breaker diagrams corresponding to Circuits #1 and #2 of the Project are included in Appendix O. Breaker diagrams corresponding to the interconnecting substations are included in Section 6.3.

2.2.2 Thermal and Voltage Transfer Analysis

Thermal and voltage transfer analysis was undertaken to evaluate the impact of the Empire Connection Project on the transfer capability of the NYBPS. The thermal analysis was conducted using PTI's MUST linearized techniques with and without the Empire Connection Project in service. The voltage transfer analysis was conducted with the NYISO Voltage Contingency Analysis Procedure (VCAP) which uses load flows solved with PTI's Power System Simulator (PSS/E) non-linear AC power flow analysis techniques, with and without the Empire Connection Project in service. Results of the thermal and PV voltage analysis are included in Sections 4 and 5 of this report, respectively.

2.2.3 Stability Transfer Analysis

Stability transfer analysis was performed in accordance with the NYISO Transmission Planning Guideline #3 to confirm that key interfaces' power transfer levels are not restricted by a stability constraint due to the addition of the Empire Connection Project. The transfer analysis was conducted with the project in and out of service. Results of this analysis are included in Section 6 of this report.

2.2.4 Extreme Contingency Analysis

The purpose of this analysis is to assess the impact of the Empire Connection Project between upstate New York and NYC on the NYBPS under extreme contingency conditions. The assessment was conducted following the NYISO SRIS Criteria and Procedures by comparing the results with and without the Empire Connection Project in service for extreme contingencies specified according to NYSRC's Reliability Rule BR4 entitled "Extreme Contingency Assessment". Results of this analysis are included in Section 7 of this report.

2.2.5 Light Load Dynamic Simulation Analysis

The purpose of this analysis is to evaluate the impact of the Empire Connection Project on the NYBPS under light load conditions. The analysis was conducted following the NYISO SRIS Criteria and Procedures by comparing the results with and without the Empire Connection Project. Results of this analysis are included in Section 8 of this report.

2.2.6 Short Circuit Analysis

A short circuit analysis was performed for the summer peak load case to assess the impact of the Empire Connection Project on the adequacy of existing circuit breakers. This analysis included 3 phase, 2phase to ground, and single line to ground faults for all major 69 kV, 138 kV and 345 kV buses in the Con Edison system, for 115 kV and 345 kV buses in the Niagara Mohawk system near the Empire Connection Project, for NYPA 115 and 345 kV buses, for 115 kV and 345 kV buses in the Central Hudson Gas and Electric system, and for NYSEG's Wynantskill 115 kV bus. Results of this analysis are included in Section 9 of this report.

2.2.7 Contingency Analysis for Central Hudson and ConEd Local Systems

A contingency analysis was conducted for Central Hudson and Con Edison local transmission systems. The ConEd analysis includes thermal and voltage analysis for W49th St and the In-City pockets and Phase Angle Regulator range verification using AC load flow models. The Central Hudson analysis includes the loss of each circuit of the Empire Connection Project and the loss of their 345/115 kV transformers. Results of the Central Hudson analysis are included in Section 4.5 of this report and those of ConEd analysis are included in Section 10.

2.2.8 Critical Clearing Time

Critical clearing time calculations were conducted for substations in Niagara Mohawk, NYPA and ConEd systems. For the ConEd substations (Rainey and W49th St 345 kV) the case with the Empire Connection Project in service was utilized. For Niagara Mohawk and NYPA

substations (Leeds, New Scotland and Gilboa 345 kV) both the base case and the case with the Empire Connection Project were used for the critical clearing time calculation. Results of this analysis are included in Section 6 of this report.

2.2.9 Study Year

Although the Empire Connection Project is expected to become operational in the summer of 2006, the data bases readily available at the NYISO correspond to the projected New York State transmission system for the year 2008. The NYISO provided the raw data for the conditions mentioned above for the SRIS.

2.2.10 Future Generation Projects

In addition to the existing generation facilities, the study also considered new queued interconnection projects as defined in the list included in Appendix A of "Scope of Work Interconnection Study for the Conjunction LLC Empire Connection" approved by TPAS on September 10, 2003. The proposed interconnection projects are listed in Table 2.1.

Table 2.1 Generators Listed in Scope of Work

Source	Capacity (MW)
1. Athens Generation (PG&E)	1,080
2. Bethlehem Energy Center	350
3. CT-LI DC Tie-Line	330
4. KeySpan Ravenswood (In-City)	270
5. Poletti Expansion (In-City)	500
6. East River Repowering (In-City)	288
7. Bowline Point Unit 3	750
8. Astoria Energy (SCS) (In-City)	1,000
9. Brookhaven Energy (ANP)	580
10. NYC Kent Avenue	79.9
11. Glenville Energy Park	540
12. PP&L Global Kings Park	300
13. BesiCorp Empire State	660
14. Fortistar VP	79.9
15. Fortistar VAN	79.9
16 Calpine Eastern JFK	45.0
17. Calpine Wawayanda	500
18. Reliant Astoria Repowering	546
19. Neptune PJM-NYC DC	600
20. PSEG Cross Hudson Project	550
21 Spagnoli Road Comb. Cycle	250
22. Liberty Radial Inter. To NYC	400
23. TransGas Energy	1,000

2.2.11 Load Flow Cases

Load flow cases were developed for the summer and winter peak conditions for thermal analysis and summer peak conditions for the PV voltage analysis and dynamic simulations.

Additionally, extreme and light load base cases were developed for dynamic simulations. All the cases correspond to the year 2008, and are based on the raw data provided by the NYISO including all the proposed generation in Table 2.1. Each power flow case was developed to represent the given conditions, as shown in Table 2.2.

Table 2.2 Power Flow Cases and Scenarios

Case	Condition
Summer Base Case for Thermal Analysis	Summer peak of 2008 including all the proposed projects listed in Table 2.1.
Winter Base Case for Thermal Analysis	Winter peak of 2008 including all the proposed projects listed in Table 2.1.
Summer Base Case for PV Voltage Analysis	Summer peak of 2008 including all the proposed projects listed in Table 2.1.
Summer Base Case for Stability	Summer peak stability case of 2008 including all the proposed projects listed in Table 2.1.
Extreme Contingency Case	Extreme Contingency stability case of 2008 including all the proposed projects listed in Table 2.1.
Light Load Base Case for Stability	Light Load stability case of 2008 including all the proposed projects listed in Table 2.1.

2.2.12 Dynamic Data Base

The NYISO provided a dynamic data base with the model of all existing machines and of those listed in Table 2.1. This data base was modified to include the dynamic model of the Empire Connection Project. The NYISO also provided the CONEC and CONET files, which include the user models for the Northeast Power Coordinating Council's (NPCC) HVDC systems and other special machine models. These files were tested for the initial stability simulations.

2.2.13 Re-dispatching of Generation

The summer peak load flow case provided by the NYISO did not include generation projects 11, 12, 13, 21, 22 and 23 in Table 2.1. In order to comply with the Scope of Work for the Interconnection Study for the Empire Connection Project approved by TPAS on September 10, 2003, generation was re-dispatched to accommodate the above listed generation projects as follows:

1. Generation projects 11 and 13 in Table 2.1 were dispatched against Unit #5 in Oswego Generation complex and Dunkirk Units;
2. Generation projects 12 and 21 in Table 2.1 were dispatched against local generators in LI; and
3. Generation project 22 in Table 2.1 was dispatched against Unit 3 at Arthur Kill.
4. Generation project 23 in Table 2.1 (TransGas Energy) was not dispatched because its SRIS report does not indicate the form of its fault mitigation plan for overduetied circuit breakers at Rainey and Farragut.

Changes were introduced to the original dispatch of SCS Astoria and Astoria Reliant for the summer and winter peak load base cases used in the thermal and voltage analysis. The Astoria SCS generation was dispatched at 500 MW; 206 MW lower than the dispatch level in the original cases provided by the NYISO; the Astoria Reliant generation was dispatched at 546 MW; 525 MW lower than the dispatch level in the original cases provided by the NYISO; and the generation re-dispatch to compensate for the generation dispatch changes described above was done for plants within NYC at Arthur Kill 2 and 3 and Ravenswood 1, 2 and 3.

For the base cases described in the previous paragraph, with the Empire Connection Project in service, the exported generation from upstate NY to NYC was increased by 1123 MW by re-dispatching generating units at Sithe and Oswego. Accordingly, generation within NYC was reduced by 1123 MW by turning off the Neptune HVDC line (614 MW) and re-dispatching units at Arthur Kill 3 and Ravenswood 1, 2 and 3.

For the load flow base cases used in the dynamic simulations with the Empire Connection Project in service, i.e. summer peak, light load and extreme contingencies, the Neptune HVDC line was turned off and generation in NYC was decreased accordingly.

2.2.14 Modeling of Control Devices

Phase angle regulators (PARs), switched shunts and LTC transformers were modeled as regulating facilities under pre-contingency conditions, and as non-regulating facilities under post-transient contingency conditions.

Database Development

3.1 Power Flow Model

NYISO provided two base cases for the 2008 summer and winter peak conditions. The base cases include the proposed projects as defined in Appendix A of the "Scope of Work for the Interconnection Study for the Conjunction LLC Empire Connection", though four of the proposed projects were not dispatched in the cases. The following modifications were implemented for the 2008 Summer Peak base case:

1. The Astoria SCS generation was dispatched at 500 MW; 206 MW lower than the dispatch level in the original case;
2. The Astoria Reliant generation was dispatched at 546 MW; 525 MW lower than the dispatch level in the original case; and
3. Generation re-dispatch for plants within NYC at Arthur Kill 2 and 3 and Ravenswood 1, 2 and 3 was done to pick up the difference (731 MW).
4. Generation was redispatched to include all the proposed projects listed in Table 2.1 per Section 2.2.13 of this report.

NYISO's modified 2008 summer peak base case, including all the proposed projects listed in Table 2.1 served as a reference case for developing the study case that reflects the Empire Connection Project in service according to the following interconnection plan:

1. 1000 MW, +/- 500 kV-bipole interconnection from Albany, a new 345 kV-substation. The new 345 kV-substation, Albany, is created by looping into the 345 kV line between New Scotland 345 kV and Alps 345 kV.
2. 1000 MW, +/- 500 kV-bipole interconnection from Greene, a new 345kV-substation. The new 345 kV-substation, Greene, is created by looping into the 345 kV line between Leeds 345 kV and Gilboa 345 kV.
3. The two HVDC lines from Albany and Greene are connected to Con Edison's Cable System at two 345 kV substations, West 49th Street and Rainey. Circuit 1 connects the new Greene 345 kV substation to the Rainey 345 kV substation while Circuit 2 connects the new Albany 345 kV substation to the West 49th Street substation.

4. The converters of both circuits of the Empire Connection Project will be designed to operate nominally at unity power factor under normal conditions across the entire range of converter loading levels. The southern and northern converters were modeled with 650 Mvar and 550 Mvar of filter compensation, respectively.

5. The exported generation from upstate NY to NYC increased by 1123 MW by re-dispatching generating units at Sithe and Oswego. Accordingly, generation within NYC was reduced by 1123 MW by turning off the Neptune HVDC line (614 MW) and re-dispatching units at Arthur Kill 3, Ravenswood 1, 2 and 3.

More details of the generation dispatch in NYC and in upstate NY are listed in Appendices A and B of this report.

The one-line diagrams for the base case as well as for the case with the Conjunction LLC's 2000 MW HVDC Empire Connection Project in service are shown in Appendices C and D respectively.

3.2 Voltage Stability Power Flow Models

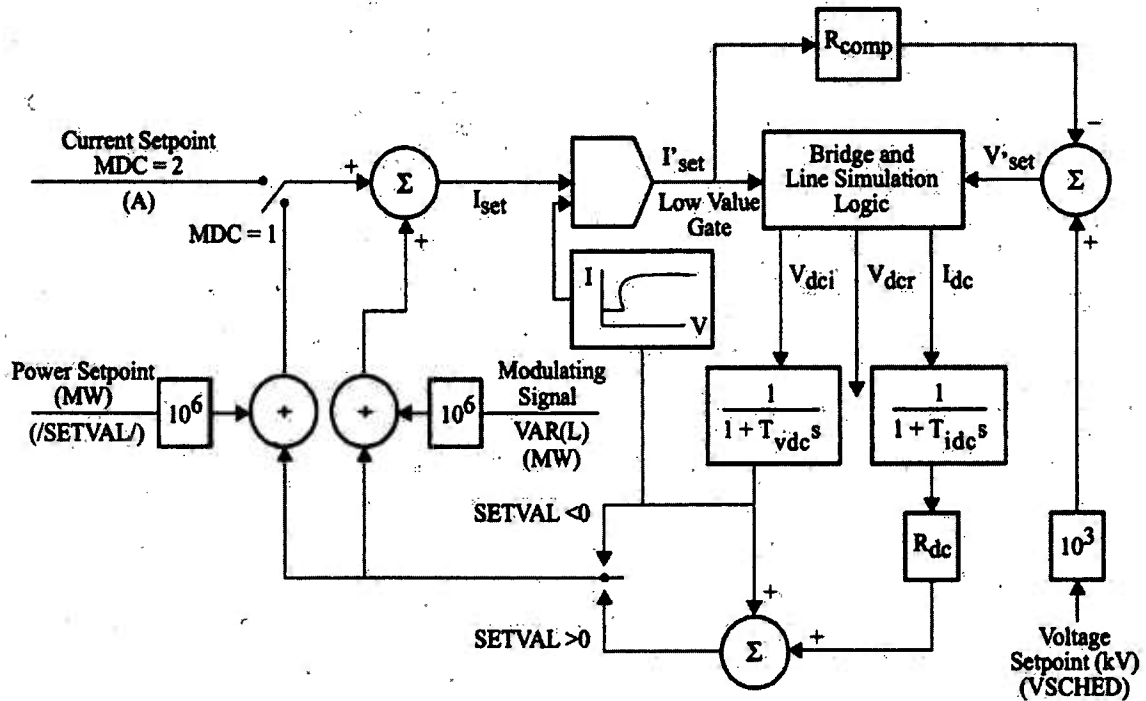
Voltage stability analysis was conducted for 2008 Summer Peak base case. The original load flow case was provided by the NYISO. However, the base case was modified according to the changes described in Section 3.1. A set of power flows with increasing transfer levels was created from the modified 2008 Summer Peak Load case with and without the Empire Connection Project. The generation shifts used to maximize the flow through the interfaces were very similar to those used for the transfer analysis according to the specifications defined in section 7.C of the "Scope of Work for the Interconnection Study for the Conjunction LLC Empire Connection" with some modifications particular to each of the interfaces studied. The list of the interfaces used for the voltage analysis is provided in Table 5.1 in Section 5.

In this analysis, the load is modeled as constant power in all areas except NYC for both the pre-contingency and post-contingency power flows. The Con Edison voltage-varying load model is used to model the NYC load in all cases.

Tap settings of phase angle regulators and autotransformers are adjusted (within their capabilities) to regulate power flow and voltage, respectively in the pre-contingency power flows but are fixed at their corresponding pre-contingency settings in the post-contingency power flows. Similar, switched shunt capacitors and reactors are switched at pre-determined voltage levels in the pre-contingency power flows but are held at their corresponding pre-contingency position in the post-contingency power flows. Nevertheless the reactive power of generators is regulated, within the reactive capabilities of the units, to hold scheduled voltage in both the pre-contingency and post-contingency power flows.

In accordance with the NYISO operating practice, SVCs are held at or near zero output in the pre-contingency power flows, but are allowed to regulate voltage, within their capabilities, in the post-contingency power flow. Inertial pickup is assumed for contingencies involving a loss of generation.

Figure 3.1 The Block Diagram of the CDC4 DC Transmission Control Arrangements



3.3 Dynamic Simulation Models

The NYISO provided a dynamic data base with the model of all existing machines and of those listed in Table 2.1. This data base was modified to include the dynamic model of the Empire Connection Project. The model used for the Empire Connection Project is CDC4 which is a standard two terminal DC model available from the model library of PSS/E. Figure 3.1 shows the block diagram for CDC4. The data for this model is shown in Table 3-1. This data is also included in Appendix O.

This model was set to block/unblock with the following characteristics:

1. Rectifier AC blocking voltage of 0.8 pu
2. Rectifier AC unblocking voltage of 0.83 pu
3. Inverter DC bypassing voltage 425 kV
4. Inverter AC unbypassing voltage 0.9 pu

The minimum blocking time for the rectifier and the minimum bypassing time for the inverter is 0.1 sec.

Table 3-1 Dynamic Data for the Empire Connection Project

Variable Description	Parameter Value
ALFDY, minimum alpha for dynamics (degrees)	3.0
GAMDY, minimum gamma for dynamics (degrees)	12.0
TVDC, dc voltage transducer time constant (sec)	0.05
TIDC, dc voltage transducer time constant (sec)	0.05
VBLOCK, rectifier ac blocking voltage (pu)	0.8
VUNBL, rectifier ac unblocking voltage (pu)	0.83
TBLOCK, minimum blocking time (sec)	0.1
VBYPAS, inverter dc bypassing voltage (kV)	425.0
VUNBY, inverter ac unbypassing voltage (pu)	0.9
TBYPAS, minimum bypassing voltage time (sec)	0.1
RSVOLT, minimum dc voltage following block (kV)	100.0
RSCUR, minimum dc voltage current following block (amps)	200.0
VRAMP, voltage recovery rate (pu/sec)	5.0
CRAMP, current recovery rate (pu/sec)	5.0
C0, minimum current demand (amps)	200.0
V1, voltage limit point 1 (kV)	300.0
C1, Current limit point 1 (amps)	500.0
V2, voltage limit point 2 (kV)	400.0
C2, Current limit point 2 (amps)	800.0
V3, voltage limit point 3 (kV)	500.0
C3, Current limit point 3 (amps)	1200.0
TCMODE, minimum time stays in switched mode (sec)	0.1

The NYISO also provided the CONEC and CONET files, which include the user models for NPCC's HVDC systems and other special machine models. These files were tested for the initial stability simulations.

The real power load models used for different areas are according to the following Categories:

1. Category 1: Constant Current where power varies with the voltage magnitude. This category is used for Hydro Quebec, New Brunswick, MAAC, and ECAR.
2. Category 2: Constant Impedance where power varies with the square of the voltage magnitude. This category is used for New York and New England.
3. Category 3: 50% constant current and 50% constant impedance. This category is used for Ontario and Nova Scotia.

As for reactive loads, they are modeled as constant impedance for all areas except Hydro Quebec where a 13% constant current and an 87% constant impedance model are used.

3.4 Short Circuit Model

The NYISO provided the short circuit database (referred to as "Class 2002 ATRA case") in the ASPEN¹ format (**Class 2002 ATRA-3% Reactors.oir**) which includes positive, negative and zero sequence parameters of the New York State power system and surrounding transmission networks.

The NYISO confirmed that this database already includes the models of sixteen future projects specified in Appendix A of the "Scope of Work Interconnection Study for the Conjunction LLC Empire Connection". They are:

1. Athens Generation (PG&E) 1,080 MW
2. Bethlehem Energy Center 350 MW
3. CT-LI DC Tie-line 330 MW
4. KeySpan Ravenswood (In-City) 270 MW
5. Poletti Expansion (In-City) 500 MW
6. East River Repowering (In-City) 288 MW
7. Astoria Energy (SCS) (In-City) 1,000 MW
8. Brookhaven Energy (ANP) 580 MW
9. NYC Energy Kent Avenue 79.9 MW
10. Fortistar VP 79.9 MW
11. Fortistar VAN 79.9 MW
12. Calpine Eastern JFK Expansion 45 MW
13. Calpine Wawayanda 500 MW
14. Reliant Astoria Repowering 546 MW
15. Neptune PJM-NYC DC 600 MW
16. PSEG Cross Hudson Project 550 MW

The remaining future projects are:

1. Bowline Point Unit 3 750 MW
2. Glenville Energy Park 540 MW
3. PP&L Global Kings Park 300 MW
4. BesiCorp Empire State Newsprint 660 MW
5. Spagnoli Road Combined Cycle 250 MW
6. Liberty Radial Interconnection to NYC 400 MW
7. TransGas Energy 1,000 MW

¹ Advanced Systems for Power Engineering

These projects were added to the NYISO short circuit database using the data from their study reports posted in the NYISO website or typical generator and step-up transformer parameters when such data was unavailable. The TransGas Energy project was not modeled because its SRIS report does not indicate the form of its fault mitigation plan for overdutied circuit breakers at Rainey and Farragut. The Developer will rely on the development of a practical fault mitigation plan for the interconnection of the TransGas Energy project. The cost responsibility of the Empire Connection Project toward system upgrades identified by the TransGas Energy fault mitigation plan will be determined in accordance with cost allocation procedures that have been filed by the NYISO with FERC.

The Empire Connection project was integrated into the three-sequence networks as four generators for each circuit, with each generator connected to the new Albany 345 kV substation, new Greene 345 kV substation, West 49th Street 345 kV substation, and Rainey 345 kV substation, respectively, as described in the power flow model in section 3.1. These generators were assumed to have infinite internal impedance values as the Empire Connection project includes conventional HVDC links. The HVDC converter transformers were modeled as regular transformers (delta-wye grounded connection). The transformer parameters are the same as those in the power flow model.

For short circuit current calculations, the ASPEN Program was used. The Program was used to calculate three-phase-to-ground, double-phase-to-ground and single-line-to-ground fault currents for all major 69 kV, 138 kV and 345 kV buses in the Con Edison system, for 115 kV and 345 kV buses in the Niagara Mohawk system near the Empire Connection Project, for NYPA 115 and 345 kV buses, for 115 kV and 345 kV buses in the Central Hudson Gas and Electric system, and for NYSEG's Wynantskill 115 kV bus.

3.5 Operating Criteria

All study work was performed in accordance with the "NPCC Basic Criteria for the Design and Operation of Interconnected Power System", the NYSRC Reliability Rules and the "NYISO SRIS Criteria and Procedures". Specific Criteria and guidelines are noted in each section.

3.5.1 Short Circuit Criteria

The Con Edison substation breaker nominal ratings, as shown in Table 3-2, were applied to the short-circuit assessment. Several stations have breakers that have different capabilities as shown in the table. The Niagara Mohawk substation breaker nominal ratings were obtained from the study reports posted at the NYISO website

Table 3-2 Breaker Nominal Ratings (kA) at Con Edison Stations

345 kV Station	Breaker Nominal Ratings (kA)	
BUCHANAN N	63	40
BUCHANAN S	40	
DUNWODIE	63	
EAST FISHKILL	63	
FARRAGUT	63	
FRESH KILLS	63	
GOETHALS	63	40
GOWANUS N	40	
GOWANUS S	40	
LADENTOWN	63	
MILLWOOD	63	
PL VALLEY	63	
PL STVILLE-1	63	
PL STVILLE-2	63	
POLETTI	80	
RAINEY	63	
RAMAPO	63	40
SPRN BROOK	63	
WEST 49 ST	63	
138 kV Station	Breaker Nominal Ratings (kA)	
ASTORIA EAST	63	40
ASTORIA WEST	63	45
BUCHANAN	63	40
CORONA	63	45
DUN. NORTH	40	
DUN. SOUTH	63	40
EASTVIEW	63	
E. 13TH ST	63	
E. 179TH ST	63	
FOX HILS	63	40
FRESH KILLS	63	45
GREENWOOD	63	45
H. GATE 5 & 6	40	
HUDSON AVE. E.	63	45
JAMAICA	63	45
MILLWOOD	40	20
QUEENSBRIDGE	45	
SH. CREEK	63	
SB. TR S6	63	
SB. TR N6	63	
TREMONT 11	63	
TREMONT 12	63	
VERNON E	40	
VERNON W	63	40
69 kV Station	Breaker Nominal Rating (kA)	
E. RIVER	63	50

Table 3-3 Breaker Nominal Ratings (kA) at Niagara Mohawk

345 kV Station	Breaker Nominal Ratings (kA)
EDIC	37
ALPS	40
ATHENS	40
LEEDS	37
NEW SCOTLAND	37
115 kV Station	Breaker Nominal Ratings (kA)
NEW SCOTLAND T33	40

Table 3-4 Breaker Nominal Ratings (kA) at NYPA

BULK POWER SUBSTATIONS	Breaker Nominal Ratings (kA) *
345 kV Stations	
42(34-4E)	
DVNPT NK	
E.G.C.-1	
E.G.C.-2	
EGC PAR	
FITZPATRICK	
GILBOA 345	
HMP HRBR	
IP-3	
MARCY 345	
MIDDLETN TAP	
POLETTI	
SPBY49SR	
230 kV Stations	
CB408	
CB438	
MASN TR1 230	
MASN TR2 230	
MW-WP1TAP BT	
MW-WP1TAP230	
MW-WP2TAP BT	
MW-WP2TAP230	
WILLIS 230	
138 kV Stations	
FLYNN	
PATHG1MD	
PATHG4MD	
PATVRNMD	
115 kV Stations	
ALCOA NO 115	
ALCOA SO 115	
CB318	
CB328	
CB338	
CB348	
CB368	
CUMBHD TERM	
GEN MOT1 115	
GEN MOT2 115	
GORDLG TERM	
GRSRVRT1 115	
GRSRVRT2 115	
PMLD STL #1	
PMLD STL #2	
PMLD STL #3	
PMLD#2 115BT	
PMLD#2TAP115	
REYNLD#1 115	
REYNLD#2 115	
REYNLD#3 115	
SARANAC NYPA	
ST LAWRN 115	
STA #02 115	
STA #25 115	

WILLIS 115	
X612 TAP 1	
X612 TAP 2	

* Information Not Available from Public Sources

Table 3-5 Breaker Nominal Ratings (kA) at CHG&E

BULK POWER SUBSTATIONS	Breaker Nominal Ratings (kA) *
345 kV Stations	
FSHKLTERM345	
HURLEY AVE.	
ROCK TAVERN	
ROSETON	
RSTWNTER345	
115 kV Stations	
BARNEGAT	
BETH ROAD	
CHADWIK LAKE	
COLDEHAM	
DANSKAMMER	
E FISHKILL	
E KNGTN	
E WALDEN	
FISH PL	
FORGEBROOK	
HIGHLAND	
HURLEY AVE.	
INWOOD AVE.	
KNAPPS	
LINCOLN PARK	
MANCHESTER	
MARLBORO	
MILAN	
MODENA	
N CATSKILL	
N CHELSEA	
NYCDWR-CHL	
NYCDWR-TAP	
OHIOVILLE	
PLEASANT VAL	
REY HILL	
RHINEBECK	
ROCK TAVERN	
SAND DK	
SHEN	
SUGARLOAF	
TIORONDA	
TODD HILL	
UNION AVE	
W. BALMVILLE	
WICOPEE	

* Information Not Available from Public Sources

Table 3-6 Breaker Nominal Ratings (kA) at NYSEG

BULK POWER SUBSTATIONS	Breaker Nominal Ratings (kA) *
115 kV Station	
WYNANSKILL	

* Information Not Available from Public Sources

Thermal Transfer Analysis

4.1 Methodology

A comprehensive analysis of the impact of the Empire Connection Project for 2008 summer and winter base cases was conducted. Normal and emergency thermal limitations on transfers on the intra NY State interfaces were performed with regard to Long-Term Emergency Rating (LTE) as well as Short-Term Emergency Rating (STE) (for the NYC Cable Interface) for the 2008 summer peak base case. The analysis also includes two inter-area interfaces in both directions: NYISO-PJM and NYISO- ISONE for normal summer peak conditions. Normal thermal limitations on transfers on the intra NY State interfaces were performed with regard to Long-Term Emergency Rating (LTE) as well as Short-Term Emergency Rating (STE) (for the NYC Cable Interface) for the 2008 Winter base case.

This analysis compares the thermal transfer limits of the summer base case and the case with the Empire Connection Project in service according to the interconnection plan described in Section 3. Generation shifts used for the transfer analysis were implemented according to the specifications defined in section 7.C in the Scope of Work.

Under normal criteria, an interface is found to be limited to the transfer level at which:

- a. A branch has reached its Normal Rating for pre-contingency system, or
- b. A branch has reached its LTE Rating following a contingency.

Under emergency criteria, an interface is found to be limited to the transfer level at which:

- c. A branch has reached its Normal Rating for pre-contingency system, or
- d. A branch has reached its STE Rating following a contingency.

However, the New York in-City cable system is allowed to operate up to the STE Rating for post-contingency normal conditions.

Several contingencies were added to reflect the changes in the topology because of the presence of the Empire Connection Project. These contingencies are:

1. The loss of the 345 kV line from New Scotland to the new 345 kV substation, Albany;
2. The loss of the 345 kV line from Leeds to the new 345 kV substation, Greene;
3. The loss of the 345 kV line from the new 345 kV substation, Albany, to Alps;

4. The loss of the 345 kV line from the new 345 kV substation, Greene, to Gilboa;
5. The loss of 1,000 MW, +/- 500 kV bipole from Albany to W49St of the Empire Connection Project;
6. The loss of 1,000 MW, +/- 500 kV bipole from Greene to Rainey of the Empire Connection Project; and
7. Modified set of contingencies at W49ST and Rainey, 345kV-substations. The modified set of contingencies is generated because of the new configurations made to the two substations to accommodate the Empire Connection project. The new configurations of the two substations showing the new arrangements of the breakers are shown in Section 6.3.

A summary of the summer analysis results for normal and emergency thermal transfer limits is tabulated in Table 4.1 and Table 4.2. A summary of the winter analysis results for normal thermal transfer limits is tabulated in Table 4.3 while a summary of the results for the summer normal thermal transfer limit analysis for inter-area interfaces (NY ISO-PJM ISO and NY ISO-NE ISO) is tabulated in Table 4.4. The detailed results (electronic version) are available upon request.

4.2 Summer Transfer Analysis

The intra NY State interfaces transfer limit analysis includes five interfaces: NYC Cable, UPNY-Con Ed, UPNY-SENY, Central East and Total East. From Table 4.1, the following findings are observed:

4.2.1 New York Cable

The summer base case transfer limit for this interface was approximately 3,838 MW in the base case received from the NYISO and is 4,897 MW after the base case re-dispatch described in section 2. The same value is obtained under Normal and Emergency Transfer Criteria, as the limiting element involves the New York cables that can be loaded up to STE.

The normal and emergency transfer limits are increased approximately by 1,625 MW when the Empire Connection Project is in service.

4.2.2 UPNY-Con Ed

The summer base case transfer limits for UPNY-Con Ed interface (open and closed) are approximately 4,073 MW and 5,603 MW respectively under Normal Transfer Criteria. Under Emergency Transfer Criteria, the base case transfer limits for UPNY-Con Ed interface (open and closed) are approximately 4,729 MW and 6,258 MW respectively. With the Empire Project in service, there is an increase of approximately 2,523 MW and 2,522 MW in the transfer limits for UPNY-Con Ed (open and closed) respectively under Normal Transfer Criteria while under Emergency Criteria there is an increase of 2,648 MW for both UPNY-Con Ed interfaces (open and closed).

4.2.3 UPNY-SENY

The summer base case transfer limits for UPNY-SENY interface (Open and Closed) are approximately 4,328 MW and 4,418 MW respectively under Normal Transfer Criteria. Under Emergency Transfer Criteria, the base case transfer limits for UPNY-SENY interface (open and closed) are approximately 4,984 MW and 5,074 MW respectively. With the Empire Connection Project in service, there is an increase of approximately 2,606 MW and 2,605 MW in the transfer limits for UPNY-SENY (open and closed) respectively under Normal Transfer Criteria. Under Emergency Criteria there is an increase of 2,158 MW and 2,157 MW for UPNY-SENY interface (open and closed) respectively.

4.2.4 Total East & Central East

The summer base case transfer limits for Total East and Central East interfaces are approximately 4,072 MW and 2,308 MW respectively under Normal Transfer Criteria. Under Emergency Transfer Criteria, the base case transfer limits for Total East and Central East are approximately 4,361 MW and 2,626 MW respectively. With the Empire Connection Project in service, there is an increase of approximately 1,006 MW and 730 MW in the transfer limits of Total East and Central East respectively under Normal Transfer Criteria. Under Emergency Criteria, there is an increase of 730 MW and 685 MW for Total East and Central East respectively.

Table 4.1 Summer NY Intra Interfaces Normal Transfer Limit (MW) Analysis

LF #	Case Description	NYC Cable	UPNY-Con Ed (O/C) ¹⁰	UPNY-SENY (O/C) ¹⁰	Central East	Total East
1	Summer Base Case (Empire O/S)	4,897 ⁽¹⁾	4,073 ⁽²⁾ / 5,603	4,328 ⁽²⁾ / 4,418	2,308 ⁽³⁾¹	4,072 ⁽⁴⁾
2	Summer Base (Empire I/S)	6,522 ⁽⁸⁾	6,596 ⁽⁵⁾ / 8,125	6,934 ⁽⁶⁾ / 7,023	3,038 ⁽⁷⁾	5,078 ⁽⁹⁾

- (1) Limited by Rainey – Reac71 345 kV (@ Normal: 715 MW) Pre-Contingency Loading
- (2) Limited by Pleasant Valley- Leeds 345 kV (@LTE: 1,538 MW) for loss of Pleasant Valley- Athens 345 kV
- (3) Limited by Leeds 3-New Scotland 77 345 kV (@LTE: 1,538 MW) for loss of Leeds -New Scotland 99 345 kV
- (4) Limited by Rock Tavern - Calpine 345 kV Ckt 2 (@LTE: 1,793 MW) for loss of Rock Tavern – Shoemaker Tap 345 kV, Shoemaker Tap -Coopers Corners 345 kV and Roseton – Rock Tavern 345 kV (SB: Rock_345).
- (5) Limited by Roseton -Fishkill 345 kV (@LTE: 2,677 MW) for loss of Rock Tavern – Ramapo 345 kV, Rock Tavern – Sugarloaf 115 kV and Shoemaker – Shoemaker Tap 138 kV (SIN:440/Shov).
- (6) Limited by Pleasant Valley - Athens Ckt2 345 kV (@ LTE: 1,538 MW) for loss of Leeds – Pleasant Valley 345 kV and Leeds – New Scotland 77 345 kV (SB:Leeds_345).
- (7) Limited by Edic – New Scotland 77 345 kV Ckt1 (@LTE: 1,528 MW) for the loss of Marcy T1 – New Scotland99 345 kV, Ingms-CD – Ingham-E 115 kV and Porter 1 – Valley 115 kV (SIN:170).

¹ This Limit was 3,013 MW in the case with Glenville and BesiCorp off-line.

- (8) Limited by E15St 45 – W49 St 345 kV Ckt1 (@STE: 1,291 MW) for the loss of E15ST 46345- FARRAGUT 345 kV, E15ST 46345-W 49 ST 345 kV, E15ST 46345-E13 ST 138kV, and E15ST 46345-T13MPT 138 kV (E13TH46 BUS).
- (9) Limited by Rock Tavern - Calpine 345 kV (@LTE: 1,793 MW) for loss of Fraser-Coopers Corner 345 kV, and Coopers Corner 345/115 kV Transformer (SB: Coop_345).
- (10) (O/C) Open/Closed

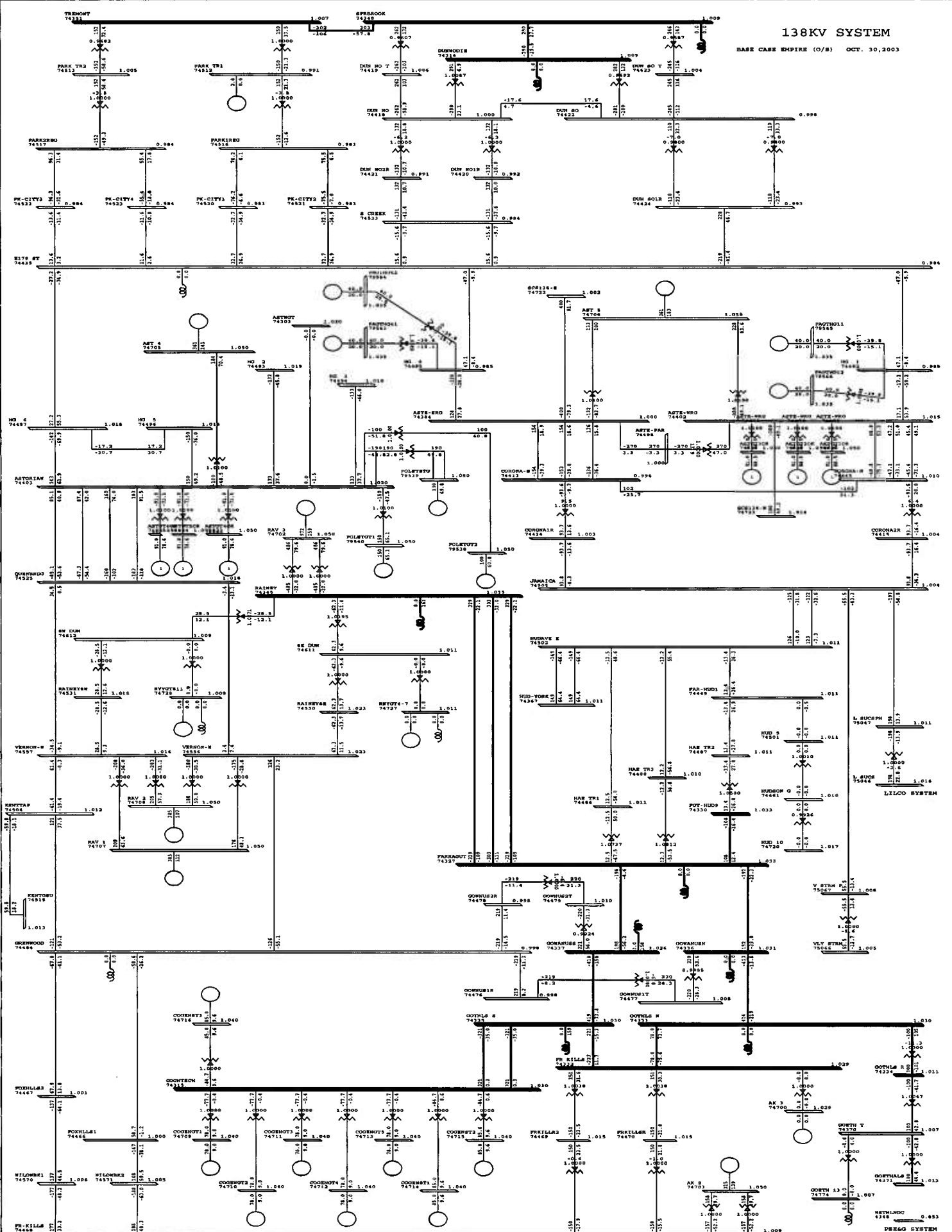
Table 4.2 Summer NY Intra Interfaces Emergency Transfer Limit (MW) Analysis

LF #	Case Description	NYC Cable	UPNY-Con Ed (O/C) ⁸	UPNY-SENY (O/C) ⁸	Central East	Total East
1	Summer Base Case (Empire O/S)	4,897 ⁽¹⁾	4,729 ⁽²⁾ / 6,258	4,984 ⁽²⁾ / 5,074	2,626 ⁽³⁾	4,361 ⁽⁴⁾
2	Summer Base (Empire I/S)	6,522 ⁽⁷⁾	7,377 ⁽²⁾ / 8,906	7,142 ⁽⁵⁾ / 7,231	3,311 ⁽⁶⁾	5,091 ⁽⁵⁾

- (1) Limited by Rainey – Reac 71 345 kV (@ Normal: 715 MW) Pre-Contingency Loading.
- (2) Limited by Pleasant Valley- Leeds 345 kV (@STE: 1,724 MW) for loss of Pleasant Valley- Athens 345 kV.
- (3) Limited by Leeds – New Scotland 77 345 kV (@STE: 1,724 MW) for the loss of Leeds – New Scotland 99 345 kV.
- (4) Limited by Cooper Corners – Shoemaker Tap 345 kV (@STE: 1,793 MW) for the loss of Rock Tavern – Calpine 345 kV.
- (5) Limited by Rock Tavern – Calpine 345 kV Ckt 2 (@STE: 1,793 MW) for the loss of Cooper Corners – Shoemaker 345 kV and Shoemaker – Rock Tavern 345 kV.
- (6) Limited by Marcy – New Scotland 99 345 kV (@STE: 1,792 MW) for the loss of Edic – Fraser 345 kV and Marcy T1 – Cooper Corners 345 kV (TWR: 40&41).
- (7) Limited by E15 St 45 – W 49 St 345 kV (@STE: 1,291) for the loss of E15St 46345 – Farragut 345 kV, E15St 46345 – W49 St 345 kV, E15St 46345 – E13 St 138 kV and E15St 46345 – T13 MPT 138 kV(E13TH46 BUS).
- (8) (O/C) Open/Closed

For the summer base case without the Empire Connection Project, Figures 4.1a and 4.1b show the one line diagrams for the 138 kV-system in NYC and the 345 kV-system in NY State. For the summer base case with the Empire Connection Project, Figures 4.2a and 4.2b show the one line diagrams for the 138 kV-system in NYC and the 345 kV-system in NY State. Detailed MUST output for the transfer analysis for the summer base case is provided in Appendix E. Appendix F presents a detailed MUST output for the summer transfer analysis with Empire Connection Project in service.

Figure 4.1 (a) One Line Diagram for 138 kV System in NYC for the Summer Base Case



138KV SYSTEM
BASE CASE EMPIRE (O/S) OCT. 30,2003

Figure 4.1 (b) One Line Diagram for 345 kV System in NYS for the Summer Base Case

345KV MW/MVAR FLOWS

BASE CASE EMPIRE O/S OCT. 30, 2000

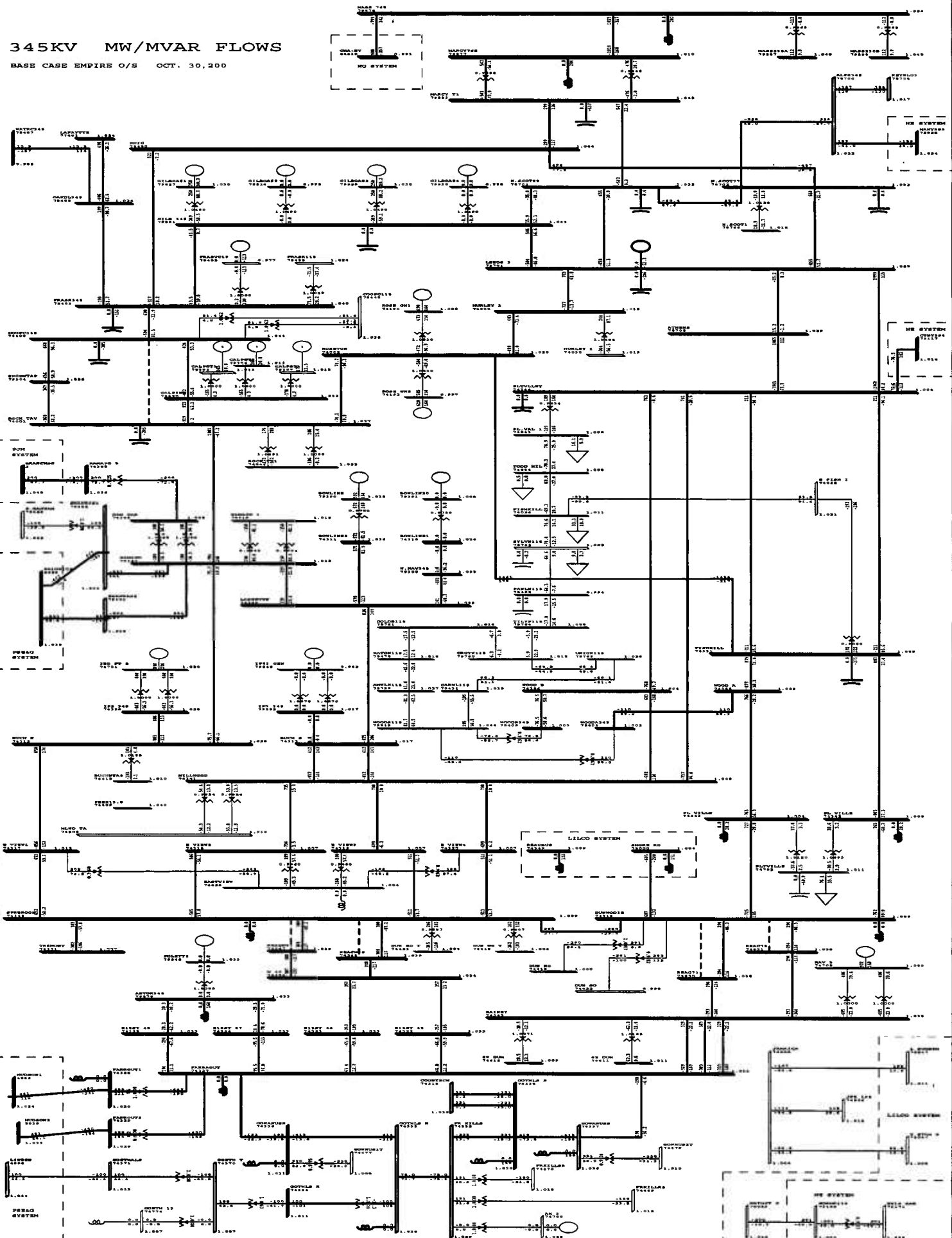
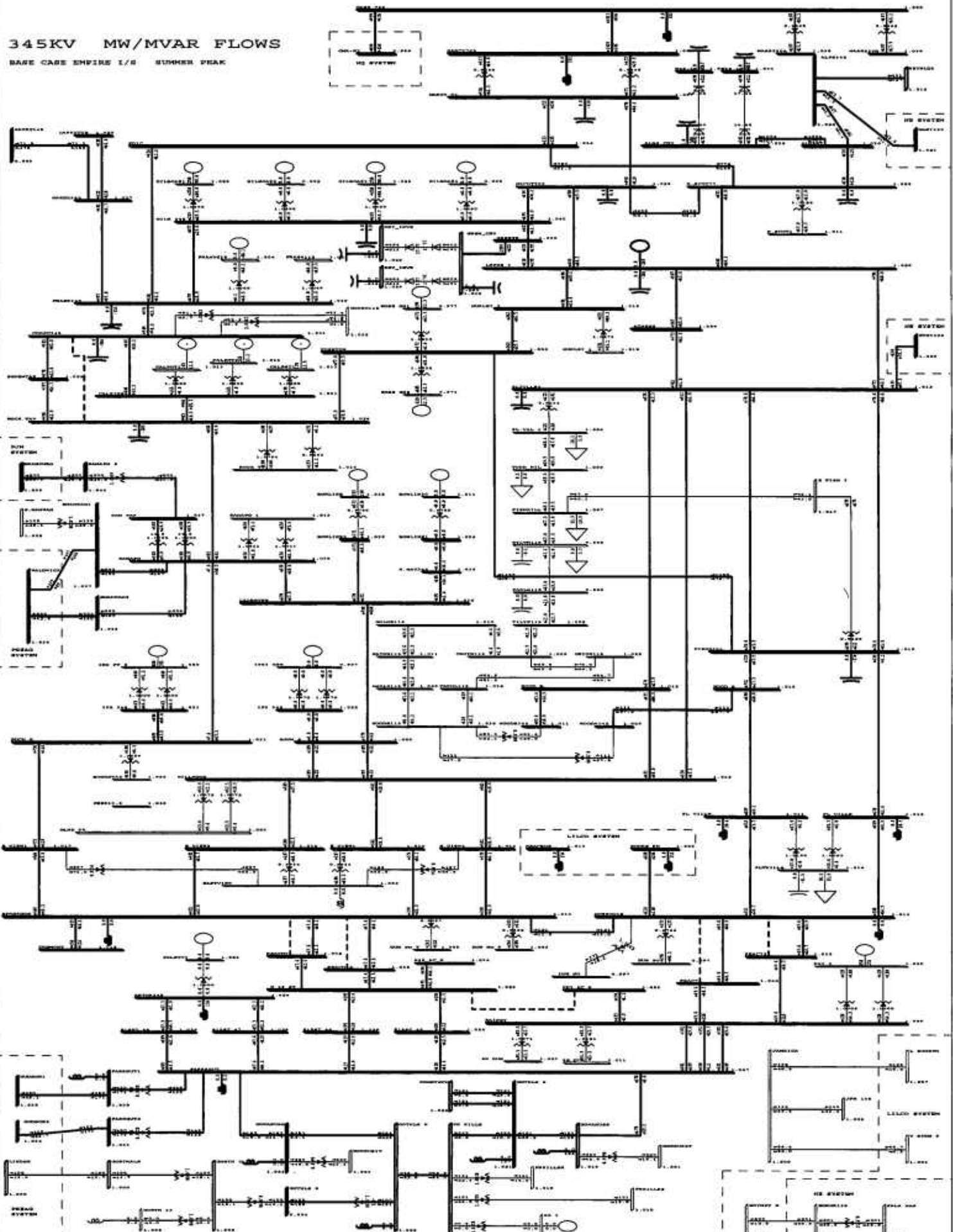


Figure 4.2 (b) One Line Diagram for 345kV System in NYS for the Summer Base Case Empire I/S

345KV MW/MVAR FLOWS

BASE CASE EMPIRE I/S SUMMER PEAK



4.3 Winter Transfer Analysis

4.3.1 NYC Cable

For the winter base case, the transfer limit for the NYC Cable interface is about 5,155 MW after the base case was re-dispatched as described in the previous section. With the addition of the Empire Connection Project, the transfer limit is increased by approximately 1,409 MW to 6,564 MW.

4.3.2 UPNY-ConEd

At the UPNY – ConEd interface (Open and closed) under Normal Transfer Criteria, the winter base case transfer limits with the re-dispatch are approximately 5,143 MW and 6,673 MW, respectively. This interface will see an increase in transfer limits of about 2,147 MW with the Empire Connection Project in operation for the open and closed interfaces.

4.3.3 UPNY-SENY

The transfer limits for the UPNY-SENY interface (open and closed) in the winter base case with re-dispatch are 5,584 MW and 5,833 MW, respectively. With the Empire Connection Project in service, there will be an increase of approximately 1,701 MW and 1,801 MW, respectively in the transfer limits for the UPNY-SENY interface (open and closed).

4.3.4 Central East and Total East

The winter base case transfer limit for the Central East interface is about 2,949 MW under normal transfer criteria. For the Total East interface, the transfer limit is approximately 5,959 MW. With the addition of the Empire Connection Project, there would be an increase in the transfer limit for the Central East interface of about 161 MW and an increase of 98 MW for the Total East interface.

Table 4.3 – Winter Interface Normal MW Transfer Limit Results

Load Flow	Case Description	NYC Cable	UPNY-ConEd (O/C) ⁶	UPNY-SENY (O/C) ⁶	Central East	Total East
1	Winter Base Case (Empire O/S)	5,155 ⁽¹⁾	5,143 ^{(2)/} 6,673	5,584 ^{(2)/} 5,833	2,949 ⁽³⁾	5,959 ⁽³⁾
2	Winter Case (Empire I/S)	6,564 ⁽¹⁾	7,290 ^{(3)/} 8,820	7,285 ^{(4)/} 7,634	3,110 ⁽³⁾	6,057 ⁽³⁾

- (1) Limited by E15 St 45 – W 49 St 345 kV (@ STE: 1,312 MW) for the loss of E15St 46345 – Farragut 345 kV, E15St 46345 – W49 St 345 kV, E15St 46345 – E13 St 138 kV and E15St 46345 – T13 MPT 138 kV (E13TH46 BUS).
- (2) Limited by Pleasant Valley - Leeds 345 kV (@ LTE: 1,783 MW) for loss of Pleasant Valley – Athens 345 kV
- (3) Limited by Edic – Porter 2 345/230 kV transformer (@ LTE: 626 MW) for the loss of Marcy – Edic 345 kV and Marcy T1 – Volney 345 kV (SB:MARC_345).

- (4) Limited by Cooper Corners - Marcy 345 kV (@ LTE: 1,345 MW) loss of Cooper Corners – Fraser 345 and Fraser – Oakdale 345 kV (SB:FRAS_345).
- (5) Limited by Roseton -Fishkill 345 kV (@LTE: 2,773 MW) for the loss of Rock Tavern – Ramapo 345 kV, Rock Tavern – Sugarloaf 115 kV and Shoemaker – Shoemaker Tap 138 kV (SIN:440/Shov).
- (6) (O/C) Open/Closed

Detailed MUST output for the transfer analysis for the summer base case is provided in Appendix G. Appendix H presents a detailed MUST output for the summer transfer analysis with Empire Connection Project in service.

4.4 Inter-Area Transfer Analysis

Table 4.4 shows the summer inter-pool normal transfer limits.

4.4.1 NYISO-PJM & PJM-NYISO

For summer peak conditions under Normal Transfer Criteria, the transfer limits on the NY-PJM interface (both directions) are not substantially affected by the Empire Connection Project. For the base condition, the transfer limit for the NY-PJM interface was 946 MW and was 1,976 MW for the PJM-NY interface. With the Empire Connection Project in service, the transfer limits for the NY-PJM interface was 916 MW and was 1,931 MW for the PJM-NY interface.

4.4.2 ISO NE-NYISO & NYISO-ISO NE

For summer peak conditions under Normal Transfer Criteria, the transfer limits on the NYISO-ISO NE interface (both directions) are not substantially affected by the Empire Connection Project. For the base condition, the transfer limit for the NYISO-ISO NE interface was 807 MW² and was 1,270 MW for the ISO NE-NYISO interface. With the Empire Connection Project in service, the transfer limit for the NYISO-ISO NE interface was 881 MW and was 1,173 MW for the ISO NE-NYISO interface.

² The generation shift defined in the Scope of Work for the NYISO-ISO NE testing (50% Ontario/50% Quebec) did not result in a feasible solution in the base case due to increased generation in the Capital District. Therefore, generation in the Capital District was redispatched in the base case and a different shift pattern was applied (27.5% Ontario/27.5% Quebec/45% Downstate NY) to the base case. The same generation shift pattern was applied to the case with the Empire Connection Project in service.

Table 4.4 Summer Inter-Pool Normal Transfer Limit (MW) Analysis

LF #	Case Description	NY ISO-PJM ISO	PJM ISO-NY ISO	NY ISO-NE ISO	NE ISO-NY ISO	NE ISO-CAPNM
1	Summer Base Case (EMPIRE O/S)	946 ⁽¹⁾	1,976 ⁽²⁾	807 ⁽³⁾	1,270 ⁽⁴⁾	859 ⁽⁵⁾
2	Summer Base Case (EMPIRE I/S)	916 ⁽¹⁾	1,931 ⁽²⁾	881 ⁽³⁾	1,173 ⁽⁴⁾	883 ⁽⁵⁾

- (1) Limited by Erie E – S Ripley 230 kV (@ Normal: 499 MW) Pre-Contingency Loading
- (2) Limited by Homer City – Water Cure 345 kV (@ Normal: 755 MW) Pre-Contingency
- (3) Limited by Pleasant Valley – Long Mountain 345 kV. (@ LTE: 1317 MW) for loss of Millstone – Southington 345 kV, Meriden – Beseck 345 kV, Millstone – Beseck 345 kV, Millstone # 3
- (4) Limited by Northport -Northport P138 kV (@ LTE: 352 MW) for loss of Pleasant Valley - Fish kill 345 kV, Pleasant Valley – Long Mountain 345 kV.
- (5) Limited by Bliss Ville – White Hall 115 kV (@ LTE: 197 MW) for loss of North Field – Berkshire 345 kV, NorthField – VT Yank 345 kV, and Berkshire 345/115 kV transformer.

Detailed MUST output for the transfer analysis for the summer base case is provided in Appendix I. Appendix J presents a detailed MUST output for the summer transfer analysis with the Empire Connection Project in service.

4.5 AC Contingency Analysis for the 115 kV System Parallel to UPNY-SENY

According to section 5 of the scope of work for the Conjunction LLC Empire Connection Project approved by TPAS on September 10, 2003, the 115 kV system in Central Hudson (CH) parallel to the UPNY-SENY Interface should be examined for thermal and voltage constraints with and without the Empire Connection Project in service. In this regard, two load flow cases were created with and without the Empire Connection Project; the UPNY-SENY Interface in each of the base cases was loaded up to the appropriate thermal limit reported in Table 4.1. At these loading levels, AC contingency analysis was conducted where the outages of all of the 345/115 kV transformers in Central Hudson service area were examined. These outages included the 345/115 kV transformers at Pleasant Valley, Rock Tavern (ckt 1 and ckt 3), E. Fish, and Hurley. For the base case with the Empire Connection Project, two additional contingencies were tested which included the non-simultaneous outage of each circuit of the Empire Connection Project.

The 115 kV system parallel to UPNY-SENY in Central Hudson was monitored for thermal and voltage violations in pre and post contingency conditions. To identify thermal violations, flows in the 115 kV system in Central Hudson were monitored against normal and LTE ratings for pre and post contingency conditions respectively. For bus voltage violations, the

criteria that Central Hudson uses to identify bus voltage violations at the 115 kV level are as follow:

1. For pre-contingency condition, the voltage of the 115 kV buses should be around 1.0 P.U; and
2. For post-contingency condition, the voltage of the 115 kV buses should be around 0.9 P.U

For thermal violations the following conclusions can be made:

1. No thermal violations were found (pre-contingency) for the two base cases with and without the Conjunction LLC Empire Project;
2. For post contingency conditions, Table 4.5 provides a list of the thermal violations. For the base case without the Empire Connection Project and with the outage of the Hurley 345/115 kV transformer, the 115 kV circuit from N. Cat to Boc is overloaded. The percentage loading is 112.4 % compared to 96.8% with the case with the Empire Connection Project in service. The non-simultaneous outage of the HVDC circuits resulted in overloads of 108.2% and 101.9% on the same 115 kV circuit from N. Cat to Boc for the outage of 1,000 MW, +/- 500 kV bipole from Albany to W49St and 1,000 MW, +/- 500 kV bipole from Greene to Rainey, respectively.

Since the same element is in violation in both cases, it is expected that remedies applied in the base case will also be effective in the case with the Empire Connection in service.

Table 4.5 Post Contingency Thermal Violations for the 115 kV System in CH

Monitored Element	Post Contingency Flow		LTE	% loading	% loading
	(MVA)		Rating	% loading	% loading
	BC1*	BC2**	(MVA)	BC1	BC2
74040* N.CAT. 78757 BOC 2T ⁽¹⁾	134.9	116.1	120.0	112.4	96.8
74040* N.CAT. 78757 BOC 2T ⁽²⁾	N/A	129.8	120.0	N/A	108.2
74040* N.CAT. 78757 BOC 2T ⁽³⁾	N/A	122.3	120.3	N/A	101.9

*: Base case without the Empire Connection Project

** : Base case with the Empire Connection Project

1. For the loss of Hurley 345/115 kV Transformer
2. For the loss of 1,000 MW, +/- 500 kV bipole from Albany to W49St of the Empire Connection Project.
3. For the loss of 1,000 MW, +/- 500 kV bipole from Greene to Rainey of the Empire Connection Project.

For bus voltage violations the following conclusions can be made:

1. For pre-contingency conditions, several voltage violations in the 115 kV system in Central Hudson were found in the base cases, with and without the Empire Connection Project. Bus voltages are 0.9602 P.U and .9816 at N. CAT1 with and without the Project, respectively.
2. For post-contingency conditions, there were no violations encountered following any of the studied contingencies in the base case without the Empire Connection Project. With the Project in service, insignificant voltage violations were encountered with the outage of the 345/115 kV transformer at E. Fish. Bus voltages are 0.8976 P.U and 0.9027 at TIORANDA with and without the Project, respectively.

Detailed results are shown in Appendix AA and BB for the base cases with and without the Conjunction LLC Project Respectively.

Voltage Transfer Analysis

5.1 Methodology

The voltage transfer analysis was conducted using PTI's PSS/E Version 28 software in conjunction with the NYISO VCAP program. VCAP incorporates the OP-1 criteria, which specifies minimum and maximum voltage limits at key bulk power system buses. The required post-contingency voltage is typically within 5% of nominal. A set of power flows with increasing transfer levels was created from the 2008 Summer Peak Load case with and without the Empire Connection Project. Initial generation dispatch for both cases (with and without the Empire Connection Project) is the same as the ones used for the thermal analysis according to Section 4.

Generation shifts were used to obtain an increase in transfers across the particular interface being studied for the impact of the HVDC lines. The VCAP program was run for each interface to evaluate its voltage stability limit with the appropriate contingencies and generation shift for that interface. The voltage-constrained transfer limits for the following transmission interfaces, shown in Table 5.1, were determined with and without the Empire Connection Project. The different sets of contingencies used to study each of the interfaces listed in Table 5.1 were obtained from the NYISO. Six additional contingencies were added to reflect the changes in the topology because of the presence of the Empire Connection Project. These contingencies are:

1. The loss of the 345 kV line from New Scotland to the new 345 kV substation, Albany;
2. The loss of the 345 kV line from Leeds to the new 345 kV substation, Greene;
3. The loss of the 345 kV line from the new 345 kV substation, Albany, to Alps;
4. The loss of the 345 kV line from the new 345 kV substation, Greene, to Gilboa;
5. The loss of 1,000 MW, +/- 500 kV bipole from Albany to W49St of the Empire Connection Project; and
6. The loss of 1,000 MW, +/- 500 kV bipole from Greene to Rainey of the Empire Connection Project.

Table 5.1 List of Interfaces Studied for Voltage Analysis

No.	Interface
1	Central East
2	Total East
3	UPNY-Con Ed (Open)
4	UPNY-Con Ed (Closed)
5	NYC Cable

In this analysis, the load is modeled as constant power in all areas except NYC for both the pre-contingency and post-contingency power flows. The Con Edison voltage-varying load model is used to model the NYC load in all cases.

Tap settings of phase angle regulators and autotransformers are adjusted (within their capabilities) to regulate power flow and voltage, respectively in the pre-contingency power flows but are fixed at their corresponding pre-contingency settings in the post-contingency power flows. Similar, switched shunt capacitors and reactors are switched at pre-determined voltage levels in the pre-contingency power flows but are held at their corresponding pre-contingency position in the post-contingency power flows. Nevertheless the reactive power of generators is regulated, within the reactive capabilities of the units, to hold scheduled voltage in both the pre-contingency and post-contingency power flows.

In accordance with the NYISO operating practice, SVCs are held at or near zero output in the pre-contingency power flows, but are allowed to regulate voltage, within their capabilities, in the post-contingency power flow. Inertial pickup is assumed for contingencies involving a loss of generation.

The voltage-constrained transfer limits of the various transmission interfaces are determined in accordance with the NYISO Transmission Planning Guideline #2-0. As the transfer across an interface is increased, the voltage-constrained transfer limit is determined in NYISO VCAP program as the lesser of (a) the pre-contingency power flow at which the post contingency voltage falls below the OP-1 post-contingency limit, or (b) 95% of the pre-contingency power flow at the "nose" of the post-contingency voltage vs. pre-contingency flow curve. The "nose" is the point at which the slope of the curve become infinite (vertical) and reaches the point of voltage collapse. This operating point occurs when the reactive capability supporting the power transfers become exhausted. The region near the "nose of the curve" is generally referred to as the region of "voltage instability". Therefore, the voltage-constrained transfer limit is intended to ensure adequate post-contingency voltage and to avoid operating within this region of voltage instability.

According to the NYISO, this methodology is used to model a worst case steady-state voltage response, recognizing the automatic response of the system following the contingency, but before system operator's actions are undertaken. This represents a time frame of approximately 30-60 seconds after the contingency occurs. The NYISO uses the traditional constant power model for load to conservatively represent the restoration of load to its pre-contingency state 60 seconds after the contingency occurs.

5.2 Results

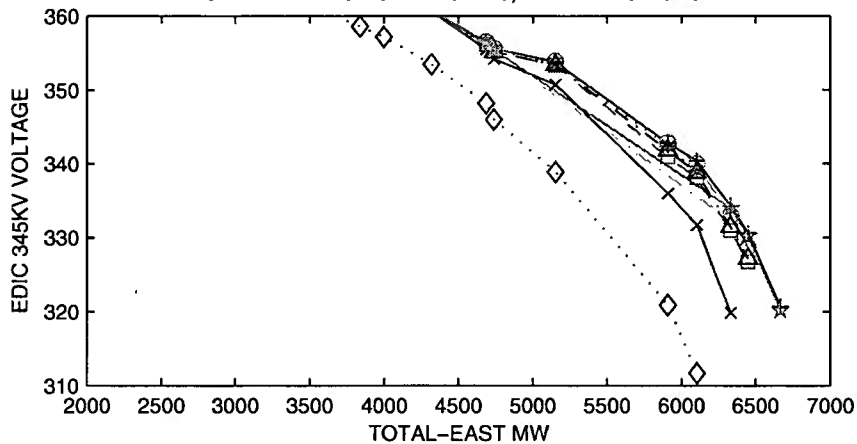
Voltage analysis was conducted to evaluate the impact of the Empire Connection Project on the voltage-constrained transfer limits of the various transmission interfaces.

For the Total East Interface, Figure 5.1 shows the P-V curves for selected monitored 345 kV substations for different contingencies for the summer base case without the Empire Connection Project.

For the same interface, Figure 5.2 shows the P-V curves for selected monitored 345 kV substations for different contingencies for the summer base case with the Empire Connection Project in service.

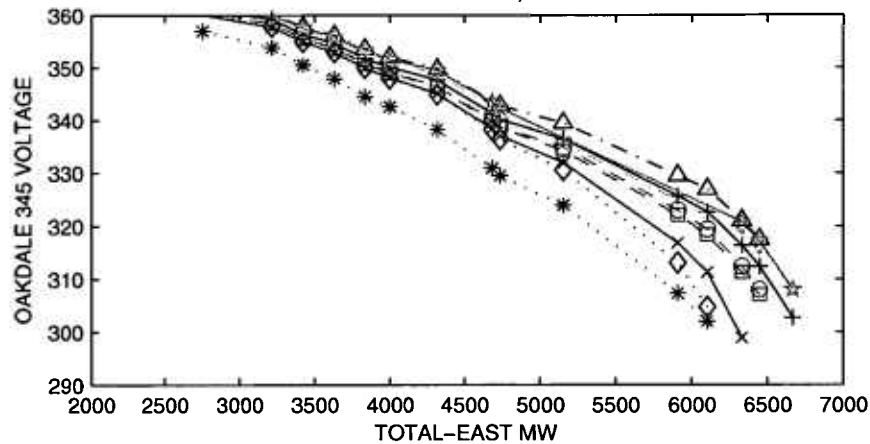
Figure 5.1 V-V Curves for Selected 345 kV Substations for the Summer Base Case (Empire O&G)

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



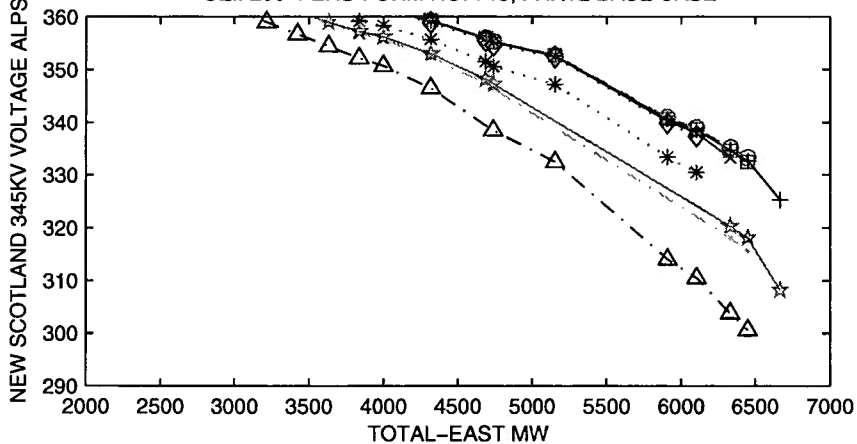
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|---|---------------------|---|---------------------|---|---------------------|
| + | PRE-FAULT | ○ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | □ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



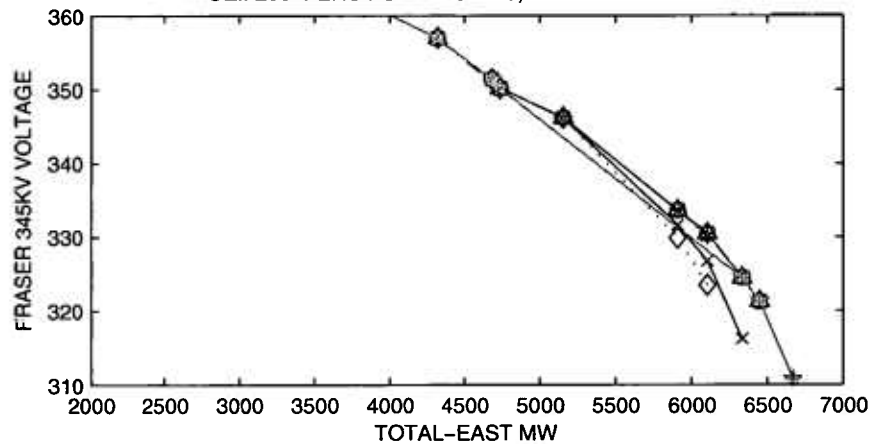
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|---|---------------------|---|---------------------|---|---------------------|
| + | PRE-FAULT | ○ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | □ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



- | | | | | | |
|---|---------------------|---|---------------------|---|---------------------|
| + | PRE-FAULT | ○ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | □ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

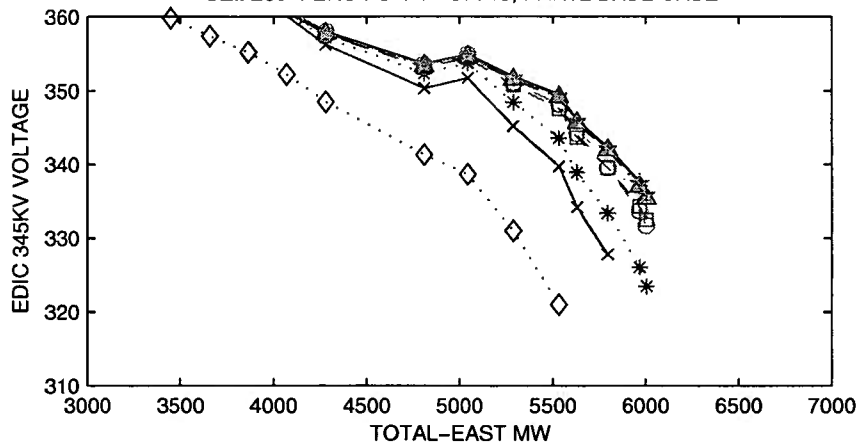
CEII 200 FERC FORM NO. 715, PART2 BASE CASE



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|---|---------------------|---|---------------------|---|---------------------|
| + | PRE-FAULT | ○ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | □ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

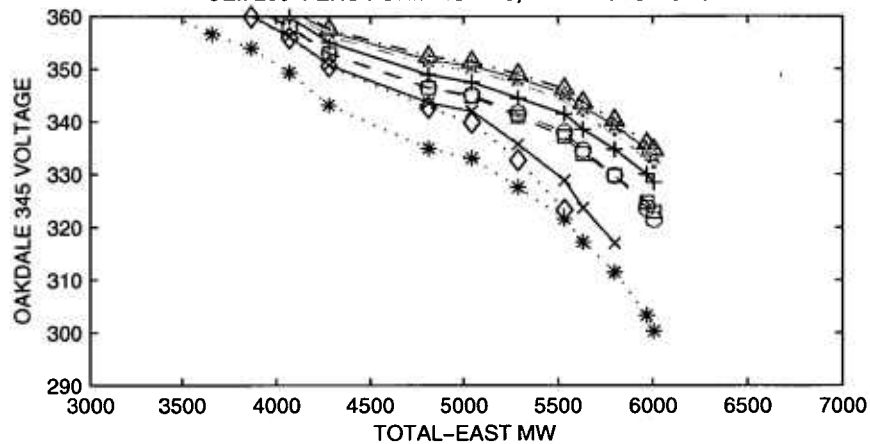
Figure 5.2 P-V Curves for Selected 345 kV Substations for the Summer Base Case (Empire I/S)

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



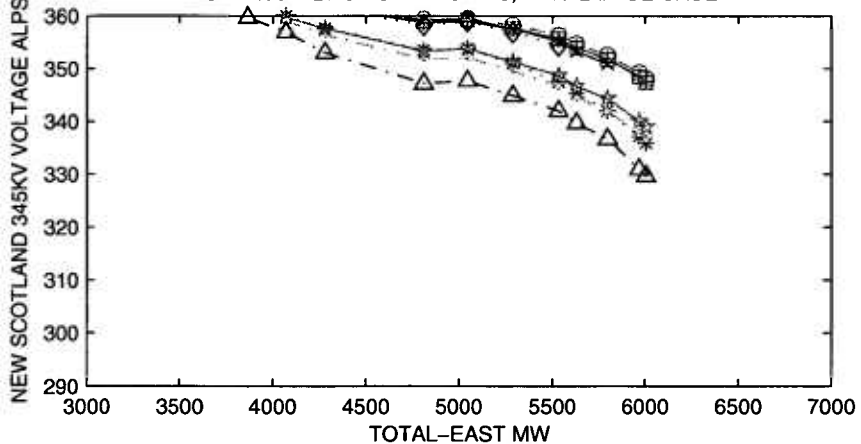
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| + | PRE-FAULT | ⊖ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | ⊖ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



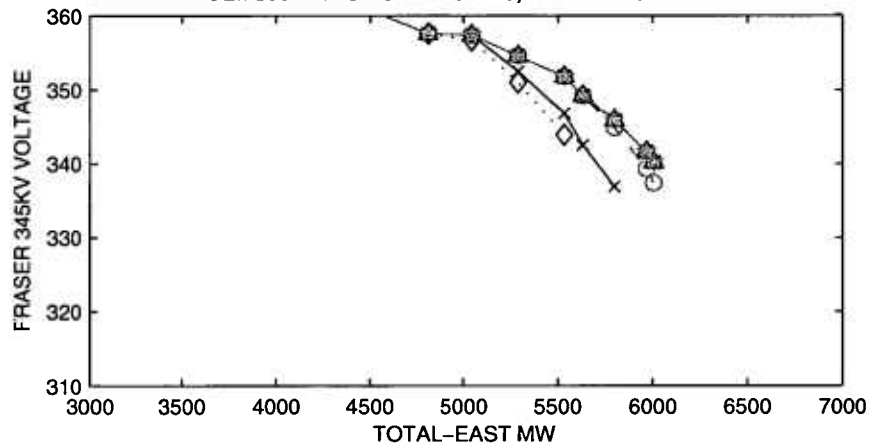
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| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | ⊖ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



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|---|---------------------|---|---------------------|---|---------------------|
| + | PRE-FAULT | ⊖ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | ⊖ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

CEII 200 FERC FORM NO. 715, PART2 BASE CASE



- | | | | | | |
|---|---------------------|---|---------------------|---|---------------------|
| + | PRE-FAULT | ⊖ | L/O EDIC-N.SCOT 345 | * | L/O M-SOUTH N. |
| · | L/O M-SOUTH S. | × | L/O FITZ-EDIC-N.S. | ⊖ | VOLNEY-MARCY(VU-19) |
| ◇ | STK MARCY R3108 BKR | △ | L/O TWR 34/42 S. | ☆ | L/O TWR 34/42 N. |

The voltage-constrained transfer limits results are summarized in Table 5.2. The detailed results for all the interfaces considered in the study with and without the Empire Connection Project are shown in Appendices K and L respectively.

Table 5.2 Summary Table on Voltage Constrained Transfer Limits

Interface	Base Case	Voltage Limit (MW)	Limiting Substation Name & KV	Limiting Contingency
Central East	BC-1*	2,585	New Scotland 99 345 kV	TWR 34/42 S.
	BC-2**	3,072	Edic 345 kV	STK MARCY R3108 BKR
Total East	BC-1*	4,623	Ramapo 500 kV	Branchburg – Ramapo 345 kV
	BC-2**	5,367	Edic 345 kV	STK MARCY R3108 BKR
UPNY-ConED (Open)	BC-1*	5,228	Millwood 345 kV	Pre-Fault
	BC-2**	7,115	Millwood 345 kV	Pre-Fault
UPNY-ConEd(Closed)	BC-1*	7,274	Millwood 345 kV	Pre-Fault
	BC-2**	8,666	Millwood 345 kV	Pre-Fault
NYC Cable	BC-1*	4,414	Dunwoodie 345 kV	Pre-Fault
	BC-2**	5,864	Dunwoodie 345 kV	Pre-Fault

*: Base Case with the Conjunction Empires (O/S)

** : Base Case with the Conjunction Empires (I/S)

The following conclusions can be made based on Table 5.2:

- a. The voltage-constrained transfer limits for all the interfaces are increased with the Empire Connection Project in service;
- b. For Central East and Total East interfaces there is an increase of the voltage transfer limits of 487 MW and 744 MW, respectively.
- c. For UPNY-ConEd (open and closed) interfaces, there is an increase of the voltage transfer limits of 1,887 MW and 1,392 MW, respectively; and
- d. For NYC Cable Interface, there is an increase of the voltage transfer limits of 1,450 MW.

It is noted that the NYC Cable Interface is not presently voltage constrained but was in this case due to Poletti and IP#3 being uncommitted in the base case and for the case with the Project in service. A sensitivity analysis with those units committed showed that the NYC Cable Interface reverted to being thermally constrained.

Results of Transfer Analysis for Stability

6.1 Methodology

This section presents the results of the transient stability analysis required under Section 5.1.C of the "Scope of Work Interconnection Study for the Conjunction LLC Empire Connection". The assessments are performed in order to evaluate the dynamic response of the system with and without the Empire Connection Project in service for 2008 summer peak loading conditions. For this purpose, the system was tested for Design Criteria Contingencies in accordance to the NYISO Transmission Planning Guideline #3.

Four interfaces were considered for the stability analysis. These interfaces are Central East, Total East, UPNY-ConEd and NYC Cable Interface. The interfaces were loaded at test levels which represent 110% of the more restrictive of the emergency thermal or voltage limits for these interfaces as shown in Tables 4.1 and 5.2 in Sections 4 and 5 of this report.

The dynamic representation used in the analysis as well as the set of contingencies used for the simulations was provided by the NYISO from the 2002 NPCC BCD library. The real power load models used for different areas are according to the following Categories:

1. Category 1: Constant Current where power varies linearly with the voltage magnitude. This category is used for Hydro Quebec, New Brunswick, MAAC, and ECAR.
2. Category 2: Constant Impedance where power varies with the square of the voltage magnitude. This category is used for New York and New England.
3. Category 3: 50% constant current and 50% constant impedance. This category is used for Ontario and Nova Scotia.

As for reactive loads, they are modeled as constant impedance for all areas except Hydro Quebec where a 13% constant current and an 87% constant impedance model are used.

Section 3.3 gives details of the HVDC converters blocking and unblocking characteristics under AC system fault conditions.

The list of the contingencies tested for each of the interfaces is included in Appendix M and the detailed transient stability analysis results are included in Appendices P and Q of this report. The original set of contingencies used to study each of the interfaces was modified to include the following contingencies:

1. The loss of the bipole circuit from Greene to Rainey 345 kV of the Empire Connection Project (1000 MW)

3. The loss of the 345 kV line from New Scotland 345 kV to Albany 345 kV for a three phase fault at Albany 345 kV.
4. The loss of the 345 kV line from Alps 345 kV to Albany 345 kV for a three phase fault at Albany 345 kV.
5. SLG fault on the Leeds to Greene 345 kV line with stuck breaker at Leeds 345 kV
6. SLG fault on the Gilboa to Greene 345 kV line with a stuck breaker at Gilboa 345 kV

PTI's PSS/E software Version 28.0 was used to conduct the stability analysis.

6.2 Transfer Limit Stability Evaluation

Appendix P contains all the stability plots illustrating system response to the contingencies described in Appendix M without the Empire Connection Project. Appendix Q contains stability plots illustrating system response to the applied contingencies with the Empire Connection Project in service.

For the Total East Interface, Figures 6.1a and 6.1b show the stability plots for contingency TE32, a three phase fault at New Scotland 345 kV substation for the base case without the Empire Connection Project. Figures 6.2a and 6.2b show the stability plots for the same contingency as for the base case but with the Empire Connection Project in service. These plots show voltage and rotor angle responses. Comparing the plots in the figures, shows that the system response is stable and positively damped.

For all the interfaces studied and for the list of contingencies analyzed, the system response is stable and positively damped both with and without the project.

6.3 Critical Clearing Time Evaluation

This section describes the critical clearing time (CCT) analysis performed per section 5.1c of the Scope of Work. The objective was to check that the Project does not have an adverse impact on CCTs at Rainey, West 49th Street, New Scotland, Leeds and Gilboa 345 kV substations. The method employed was to apply selected stuck breaker faults at those substations with delayed clearing while monitoring the stability performance on new and existing units in the vicinity of the Project. The system response was stable and well damped for all cases examined.

6.3.1 Rainey 345 kV Substation

The Rainey CCT analysis examined the impact of the Project for existing delayed clearing times and for existing plus 2 cycles delayed clearing times for the faults shown in Table 6.1. The NYC Cable Interface transfer level was set at 5,000 MW for this analysis. Figure 6.3a shows the one-line diagram of the Rainey substation with the Project interconnected and identifies all the elements involved in the analysis.

Table 6.1 shows four cases with existing delayed clearing times. These cases were repeated with the existing plus 2 cycles delayed clearing times, making eight cases in total. Appendix

Y shows the angle plots for all eight cases for the monitored plants at Ravenswood 3, KeySpan and Bergen. All cases were stable and positively damped.

Table 6.1 Stuck Circuit Breakers at Rainey Substation 345 kV

CB Stuck	3 Phase Fault	Normal Clearing	Delay clearing
4W	To 3W Transformer	4.5~@ Rainey (3W) 7~ @ E.75 St.	12~ @ Rainey (6W) 14~ @ Conjunction Fdr.
4E	To Farragut	4.5~@ Rainey (3E) 4.5~ @ Farragut	12~ @ Rainey (5E) 14~ @ Ravenswood 3
11E	To Conjunction HVDC (Pole 1)	4.5~@ Rainey (6E) 4.5~ @ Conjunction Fdr.	12~@Rainey (5E)
6W	To Conjunction HVDC (Pole 2)	4.5~@ Rainey (4W) 4.5~ @ Conjunction Fdr.	12~@Rainey (5W)

6.3.2 West 49th Street 345 kV Substation

The West 49th Street CCT analysis examined the impact of the Project for existing delayed clearing times and for existing plus 2 cycles delayed clearing times for the faults shown in Table 6.2. The NYC Cable Interface transfer level was set at 5,000 MW for this analysis. Figure 6.3b shows the one-line diagram of the West 49th Street substation with the Project interconnected and identifies all the elements involved in the analysis.

Table 6.2 shows three cases with existing delayed clearing times. These cases were repeated with the existing plus 2 cycles delayed clearing times, making six cases in total. Appendix Y shows the angle plots for all six cases for the monitored plants at Ravenswood 3, KeySpan and Bergen. All cases were stable and positively damped.

Table 6.2 Stuck Circuit Breakers at West 49th Street Substation 345 kV

CB Stuck	3 Phase Fault	Normal Clearing	Delay clearing
10	To PSEG Power	4.5~@ West 49 St. (8) 6.5~ @ PSEG	12~ @ West 49 St. (12) 14~ @ Farragut 15~ @ E13th St.
1	To TR2 Transformer	4.5~@ West 49 St. (3) 5.5~ @ Remote Substation	12~ @ West 49 St. (11+BTS) 14.5~ @ Conjunction Fdr.
4	To TR4 Transformer	4.5~@ West 49 St. (3) 5.5~ @ Remote Substation	12~ @ West 49 St. (6) 14.5~ @ Conjunction Fdr.

6.3.3 New Scotland 345 kV Substation

The New Scotland CCT analysis examined delayed clearing times without and with the Project for the fault shown in Table 6.3. Figure 6.3c shows the one-line diagram of the New Scotland substation and identifies all the elements involved in the analysis.

Table 6.3 shows one case with existing delayed clearing times. The CCT in this case is greater than 23.5 cycles, without and with the Project. Appendix X shows the angle plots for both cases for the monitored plants at Gilboa, Athens and Bethlehem. All cases were stable and positively damped.

Table 6.3 Stuck Circuit Breakers at New Scotland Substation 345 kV

CB Stuck	3 Phase Fault	Normal Clearing	Delay clearing
R2	Fault to Alps or Albany	3.5~@ Alps or Albany	4.5~ @ N.S. 99 Bus

6.3.4 Leeds 345 kV Substation

The Leeds CCT analysis examined delayed clearing times without and with the Project for the faults shown in Table 6.4. Figure 6.3d shows the one-line diagram of the Leeds substation and identifies all the elements involved in the analysis.

Table 6.4 shows two cases with existing delayed clearing times. The CCT in these cases is greater than 40 cycles, without and with the Project. Appendix X shows the angle plots for all cases for the monitored plants at Gilboa, Athens and Bethlehem. All cases were stable and positively damped.

Table 6.4 Stuck Circuit Breakers at Leeds Substation 345 kV

CB Stuck	SLG Fault	Normal Clearing	Delay clearing
R9293	SLG Fault to Pleasant Valley	4.0~@ Leeds (R92) 4.0~ @ Pleasant Valley	9~ @ Leeds (R93) 12~ @ New Scotland 77
R391	SLG Fault to Greene or Gilboa	5.0~@ Leeds (R3) 5.0~ @ Greene or Gilboa	10~ @ Leeds (R91) 12~ @ Athens

6.3.5 Gilboa 345 kV Substation

The Gilboa CCT analysis examined delayed clearing times without and with the Project for the faults shown in Table 6.5. Figure 6.3e shows the one-line diagram of the Gilboa substation and identifies all the elements involved in the analysis.

Table 6.5 shows two cases with existing delayed clearing times. The CCT in these cases is greater than 40 cycles, without and with the Project. Appendix X shows the angle plots for all cases for the monitored plants at Gilboa, Athens and Bethlehem. All cases were stable and positively damped.

Table 6.5 Stuck Circuit Breakers at Gilboa Substation 345 kV

CB Stuck	SLG Fault	Normal Clearing	Delay clearing
3308	SLG Fault to New Scotland 99	5.5~@ Gilboa (3314) 5.5~ @ New Scotland 99	10.5~ @ Gilboa(3302) 10.5~ @ Pumps 3/4
3208	SLG Fault to Leeds or Green	5.5~@ Gilboa (3214) 5.5~ @ Leeds or Green	10.5~ @ Gilboa(3202) 10.5~ @ Pumps 1/2

6.4 Dynamic Simulation for Three Phase Faults at Rainey and W49 St

Table 6.6 summarizes the result of the system stability impact on a potential momentary shutdown of both HVDC terminals, due to severe voltage dips caused by a three-phase-to-ground fault at the West 49th Street and Rainey 345 kV Substations. The NYC Cable Interface was stressed to 10% above the more restrictive of its emergency thermal or voltage limits. The stability plots in Appendix Q show that the system is stable and positively damped after the aforementioned events.

Table 6.6 Description of Faults for Momentary Shutdown of Both HVDC Terminals

Fault Location	Fault Type	Clearing Time	Description	Results
345 kV Rainey Substation	3 ϕ	4.5 cycles	HVDC #40 & 41 temporarily (4.5 cycle) shutdown during the fault	Stable
345 kV West 49 th Street Substation	3 ϕ	4.5 cycles	HVDC #42 & 43 temporarily (4.5 cycle) shutdown during the fault	Stable

The converters performance for the West 49th Street stuck breaker fault (Section 6.3.2) is also plotted in Figures 6.4a and 6.4b. The AC voltage, DC voltage, DC power and local frequency is shown for the West 49th Street and Rainey Converters. The blocking and unblocking of both converters is demonstrated. The case is stable and positively damped.

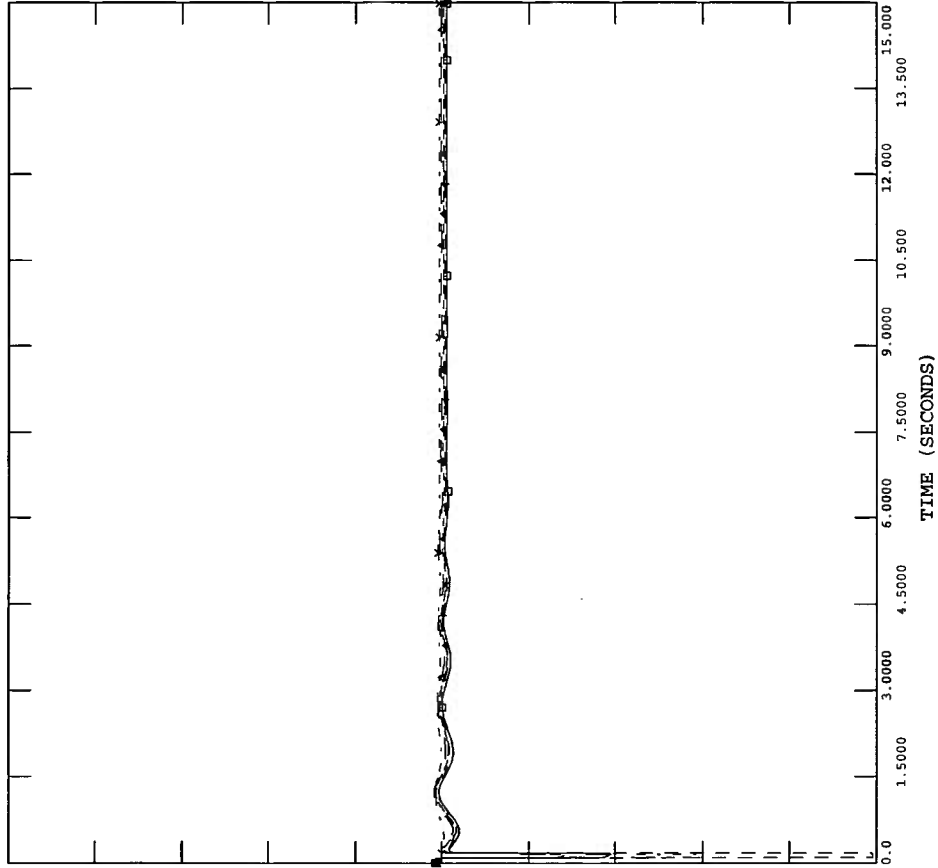
Figure 6.1 (a) Stability Plots for Bus Voltages for TE32 for the Summer Base Case with the Empire O/S



2003 FERC-715 SUMMER 2008 PEAK
W/ 2002 NPCC BCD DYNAMICS

FILE: C:\stab-te\output\TE32\TE32.out
CHNL# 1069: [VOLT 78701 [LEEDS 3 345.00]]

2.0000	CHNL# 1076: [VOLT 79583 [MARCY T1345.00]]	0.0
2.0000	CHNL# 1070: [VOLT 78703 [N.SCOT99345.00]]	0.0
2.0000	CHNL# 1066: [VOLT 78450 [EDIC 345.00]]	0.0
2.0000	CHNL# 1071: [VOLT 79577 [MARCY765765.00]]	0.0
2.0000	CHNL# 1063: [VOLT 75403 [FRASR345345.00]]	0.0



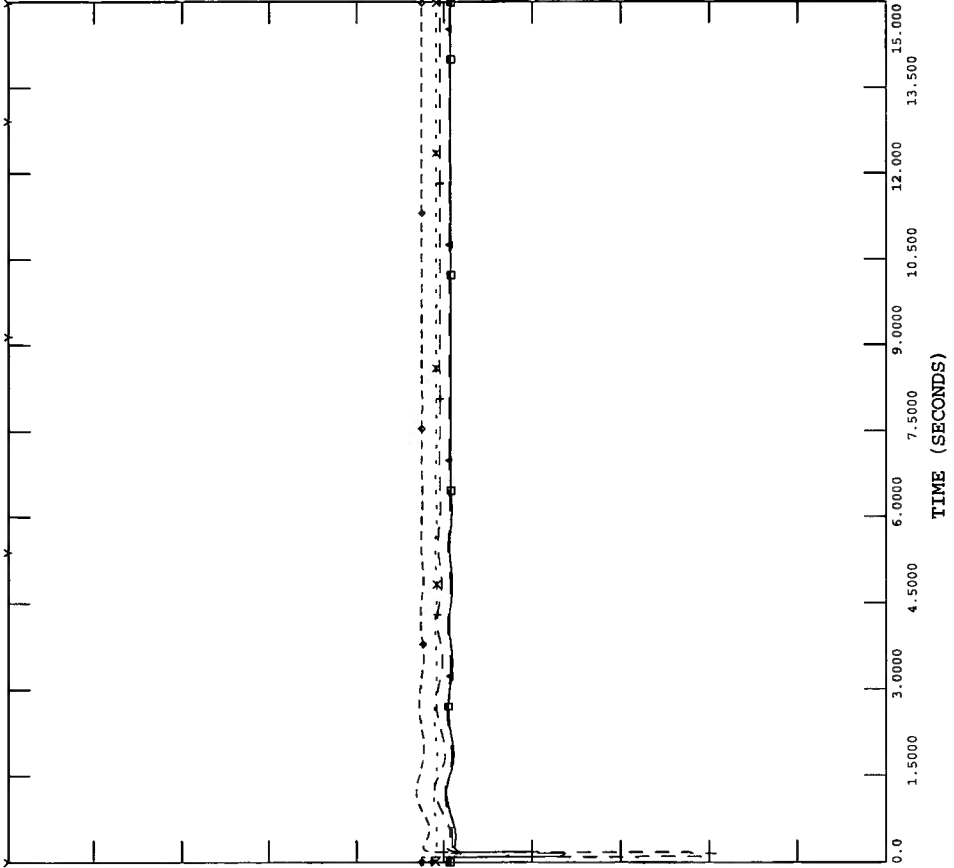
WED, JAN 21 2004 16:44
VOLTAGES



2003 FERC-715 SUMMER 2008 PEAK
W/ 2002 NPCC BCD DYNAMICS

FILE: C:\stab-te\output\TE32\TE32.out
CHNL# 1732: [POWR 42 [LIMERCK222.000] [1]]

2.0000	CHNL# 1722: [W49-VOLT]	0.0
2.0000	CHNL# 1075: [VOLT 79581 [GILB 345345.00]]	0.0
2.0000	CHNL# 1068: [VOLT 77951 [9M PT 1G23.000]]	0.0
2.0000	CHNL# 1056: [VOLT 74341 [MILLWOOD345.00]]	0.0
2.0000	CHNL# 1058: [VOLT 74344 [PLTVLLEY345.00]]	0.0



WED, JAN 21 2004 16:44
VOLTAGES

Figure 6.1 (b) Stability Plots for Rotor Angles for TE32 for the Summer Base Case with the Empire O/S

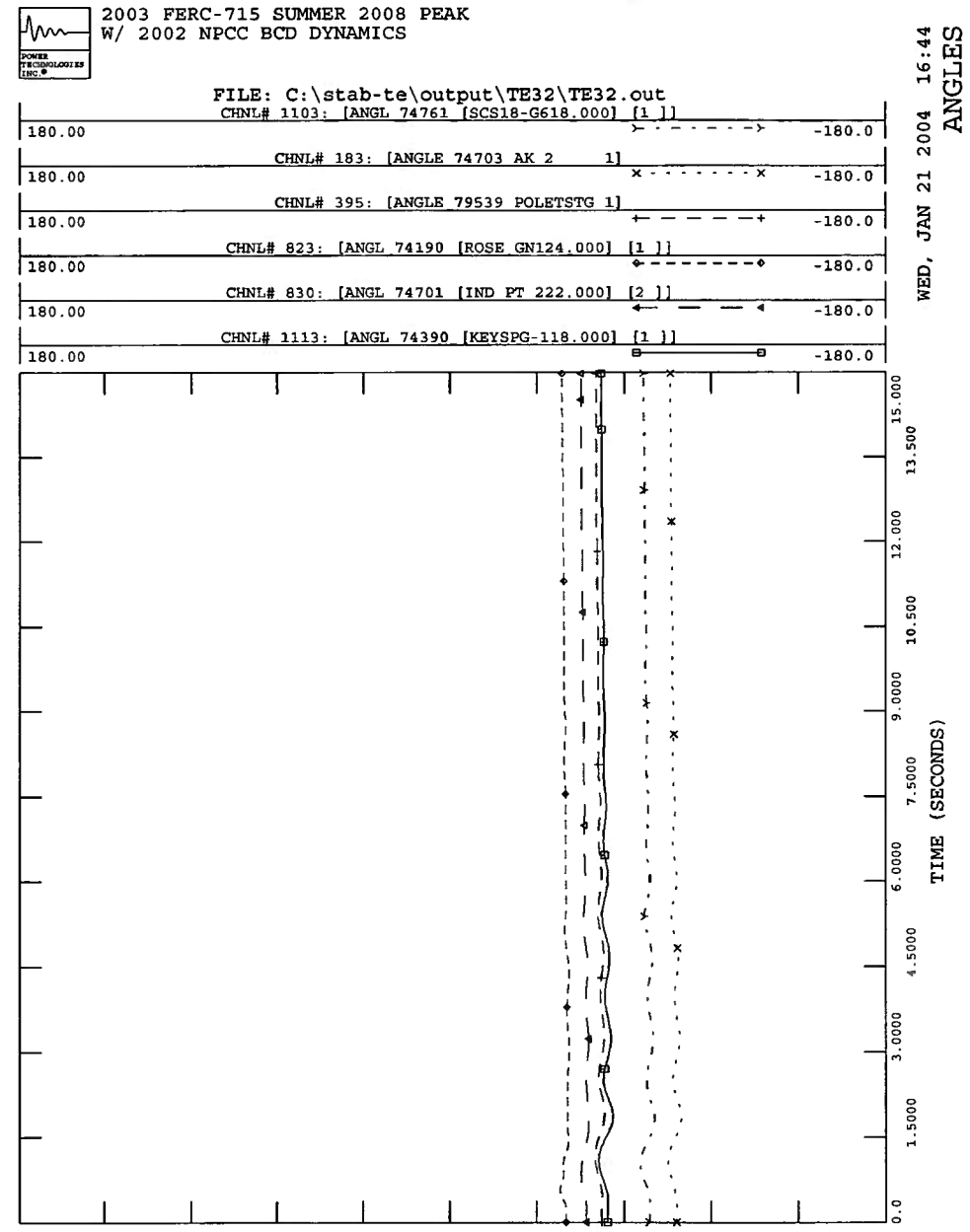
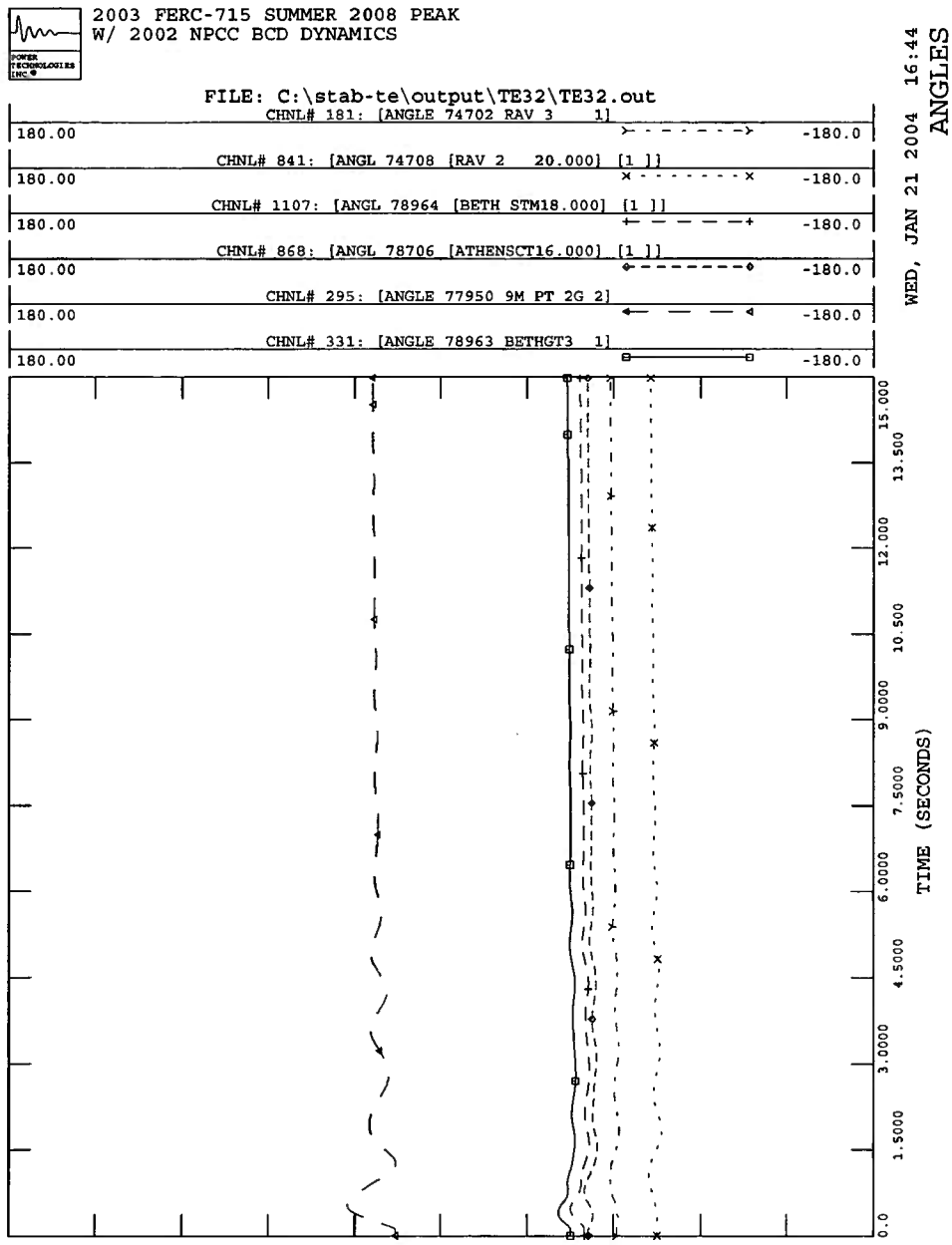


Figure 6.2 (a) Stability Plots for Bus Voltages for TE32 for the Summer Base Case with the Empire I/S

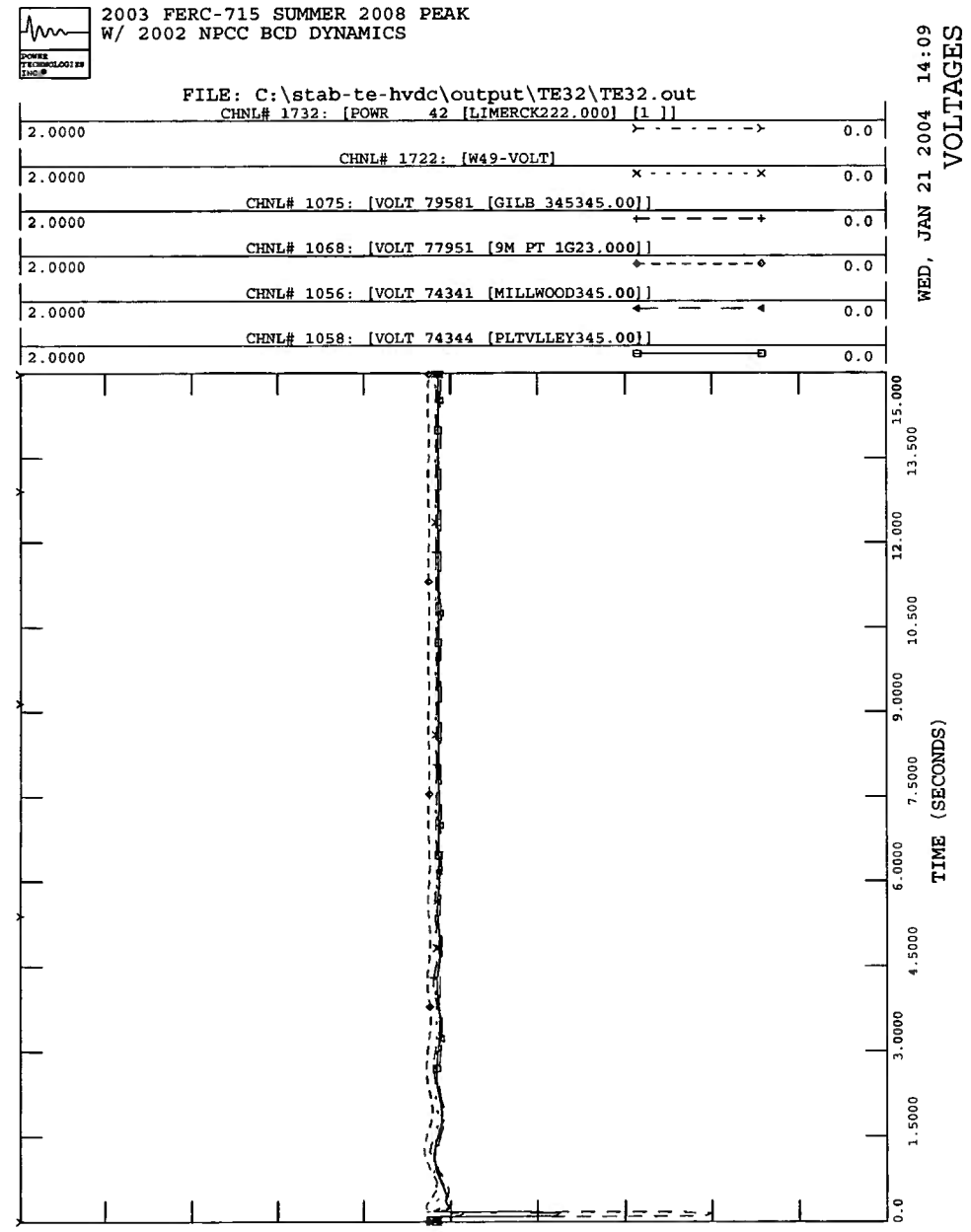
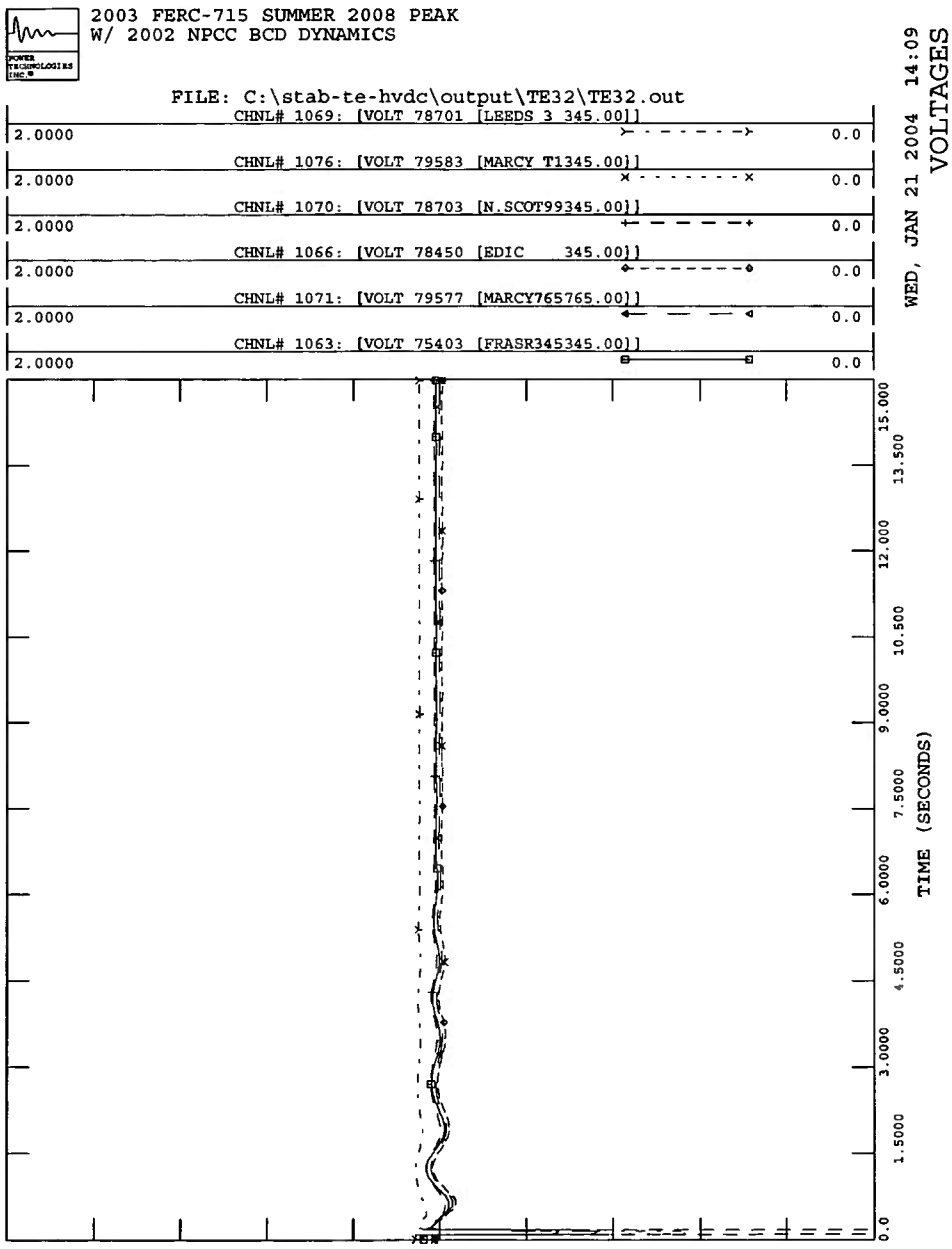


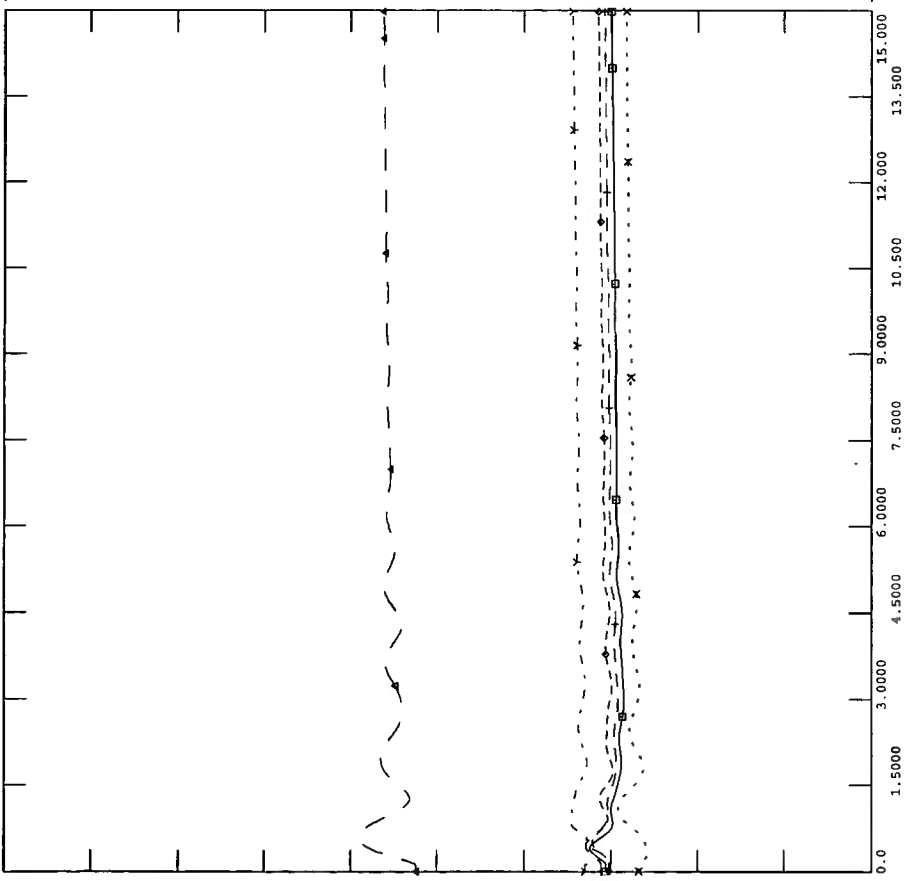
Figure 6.2 (b) Stability Plots for Rotor Angles for TE32 for the Summer Base Case with the Empire I/S



2003 FERC-715 SUMMER 2008 PEAK
W/ 2002 NPCC BCD DYNAMICS

FILE: C:\stab-te-hvdc\output\TE32\TE32.out

180.00	CHNL# 181: [ANGLE 74702 RAV 3 1]	-180.00
180.00	CHNL# 841: [ANGL 74708 [RAV 2 20.000] [1]]	-180.00
180.00	CHNL# 1107: [ANGL 78964 [BETH STM18.000] [1]]	-180.00
180.00	CHNL# 868: [ANGL 78706 [ATHENSCT16.000] [1]]	-180.00
180.00	CHNL# 295: [ANGLE 77950 9M PT 2G 2]	-180.00
180.00	CHNL# 331: [ANGLE 78963 BETHGT3 1]	-180.00



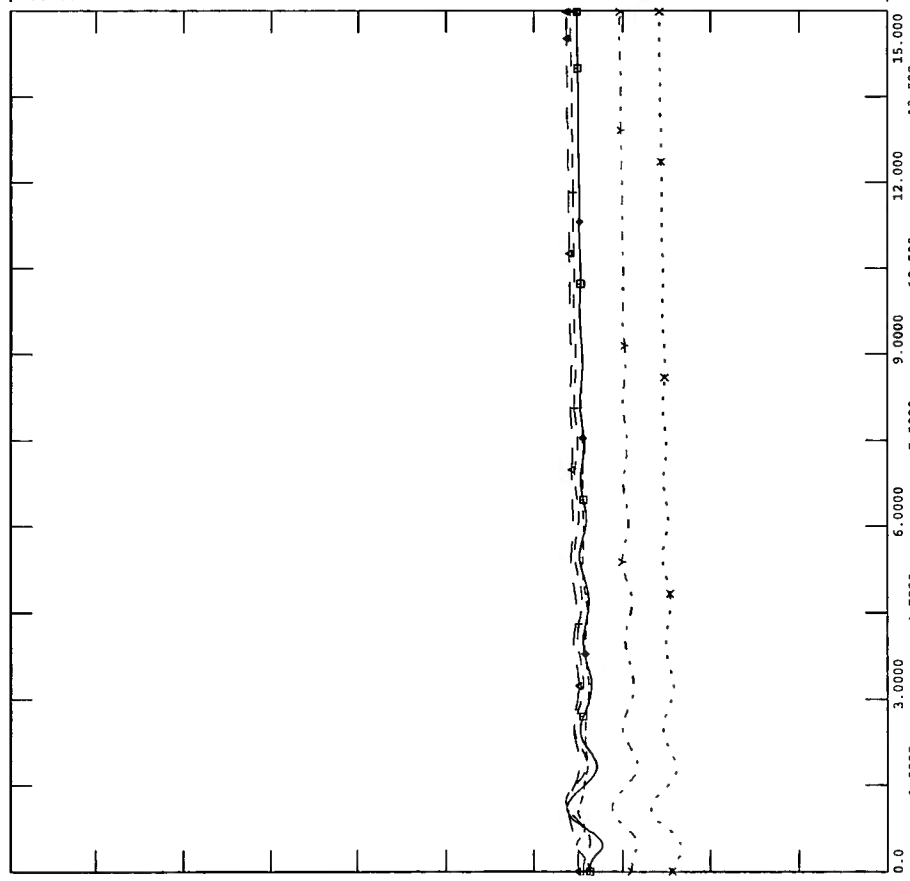
WED, JAN 21 2004 14:09
ANGLES



2003 FERC-715 SUMMER 2008 PEAK
W/ 2002 NPCC BCD DYNAMICS

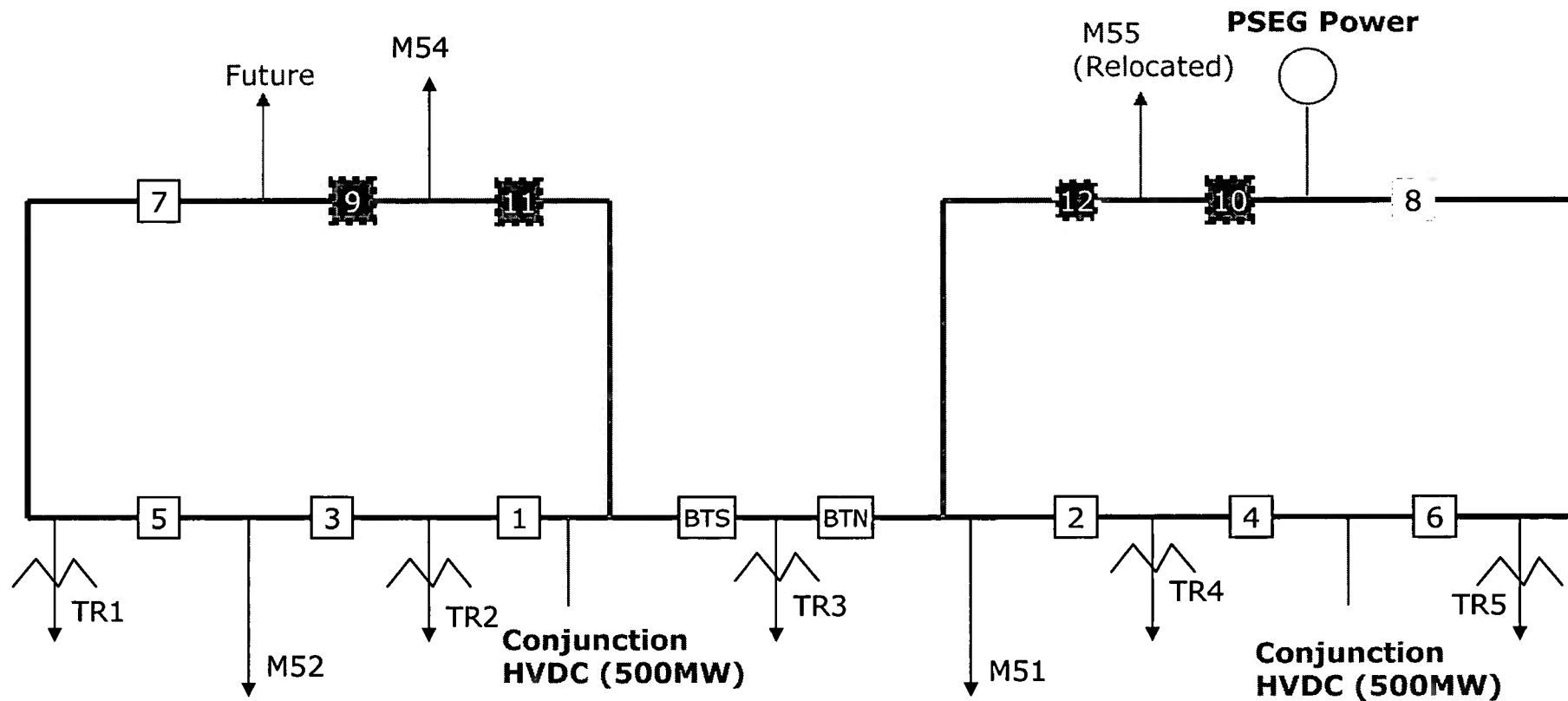
FILE: C:\stab-te-hvdc\output\TE32\TE32.out

180.00	CHNL# 1103: [ANGL 74761 [SCS18-G618.000] [1]]	-180.00
180.00	CHNL# 183: [ANGLE 74703 AK 2 1]	-180.00
180.00	CHNL# 395: [ANGLE 79539 POLETSTG 1]	-180.00
180.00	CHNL# 823: [ANGL 74190 [ROSE GN124.000] [1]]	-180.00
180.00	CHNL# 830: [ANGL 74701 [IND PT 222.000] [2]]	-180.00
180.00	CHNL# 1113: [ANGL 74390 [KEYSPG-118.000] [1]]	-180.00



WED, JAN 21 2004 14:09
ANGLES

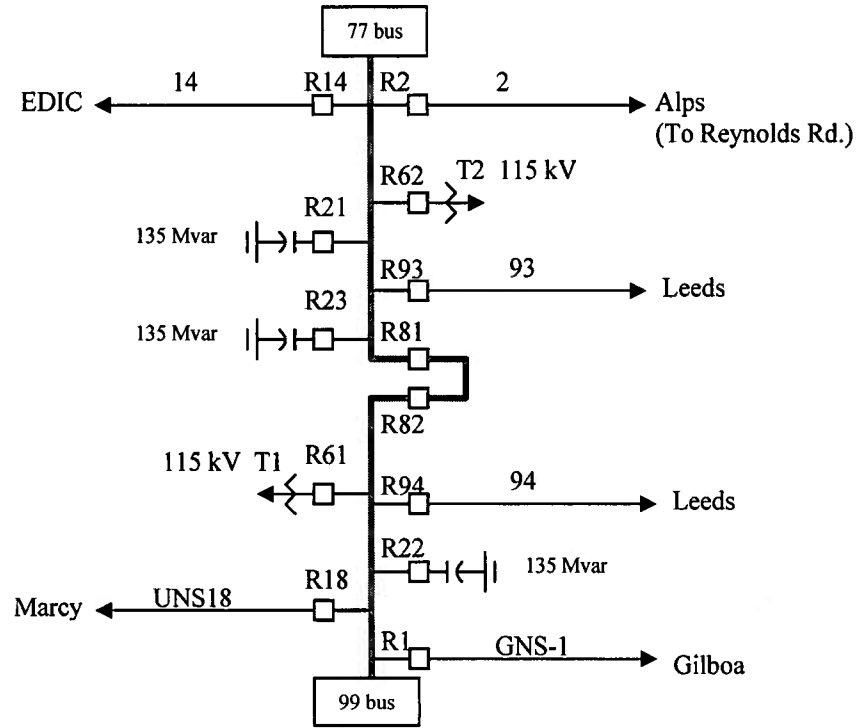
Figure 6.3 (b) Proposed West 49th Street Substation



New Circuit Breaker

Figure 6.3 (C) New Scotland 345 kV Substation Breaker Diagram

New Scotland 345 kV

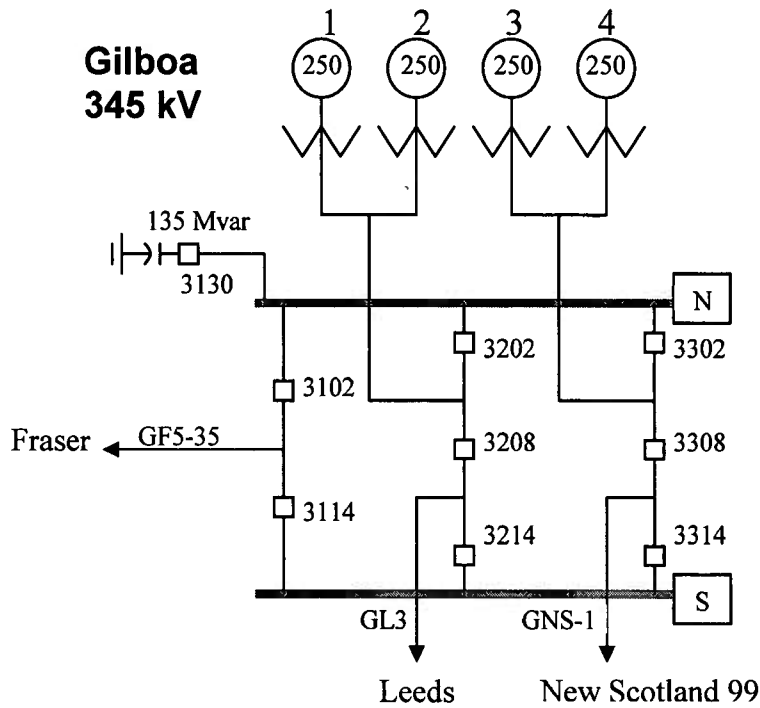


- A – Underground / Water Ckt
- B – Wood Structure Single Ckt
- C – Wood Structure Double Ckt
- D – Steel Structure Single Ckt
- E – Steel Structure Double Ckt
- F – Steel Structure Quadruple Ckt

To 77	Line No.	Voltage (kV)	Length (mi)	# of Circuits	Type of Conductor	Summer Thermal Rating (amps)	Winter Thermal Rating (amps)	Principal Structure	Ckts Common ROW
Leeds	93	345	25.75	1	2-795 ACSR	2015	2568	D	4,2
EDIC	14	345	83.24	1	2-795 ACSR	2228	2400	D	1
Alps	2	345	12.50	1	3-1590 ACSR	2015	2140	B	1
		345	18.31	1	2-1192.5 ACSR			B	

To 99	Line No.	Voltage (kV)	Length (mi)	# of Circuits	Type of Conductor	Summer Thermal Rating (amps)	Winter Thermal Rating (amps)	Principal Structure	Ckts Common ROW
Leeds	94	345	25.85	1	2-795 ACSR	2228	2568	D	4,2
Marcy	UNS18	345	82.64	1	4-1351.5 ACSR	2400	2400	D	2
		345	.35	1	2-1192.5 ACSR	2796	3416	D	2
		345	1.35	1	2-1351.5 ACSR	3016	3688	D	2
Gilboa	GNS-1	345	31.82	1	2-954 ACSR	2389	2924	D	1

Figure 6.3 (e) Gilboa 345 kV Substation Breaker Diagram

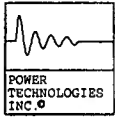


- A – Underground/water ckt
- B – Wooden Structure Single ckt
- C – Wooden Structure Double ckt
- D – Steel Structure Single ckt
- E – Steel Structure Double ckt
- F – Steel Structure Quadruple ckt

- 8 CB
- 3 CKTS
- 1 CAP
- 2 LINES WITH 2 TRANS & 2 GENS EACH
- (4 TRANS 4GENS)

To	Line No.	Voltage (kV)	Length (mi)	# of Circuits	Type of Conductor	Summer Thermal Rating (amps)	Winter Thermal Rating (amps)	Principal Structure	Ckts Common ROW
Fraser	GF5-35	345	33.62	1	2-954 ACSR	2389	2924	D	1
				1	3410 ACAR				
				1	2-1033.5 ACSR				
Leeds	GL3	345	36.9	1	2-1351.5 ACSR	2389	2949	D	1
				1	3410 ACAR				
New Scotland 99	GNS-1	345	31.82	1	2-954 ACSR	2389	2924	D	1
				1	3410 ACAR				

Figure 6.4a W 49th AC/DC Voltage and DC Power and Freq. for CB Stuck 4 for Summer Peak with Project (I/S)

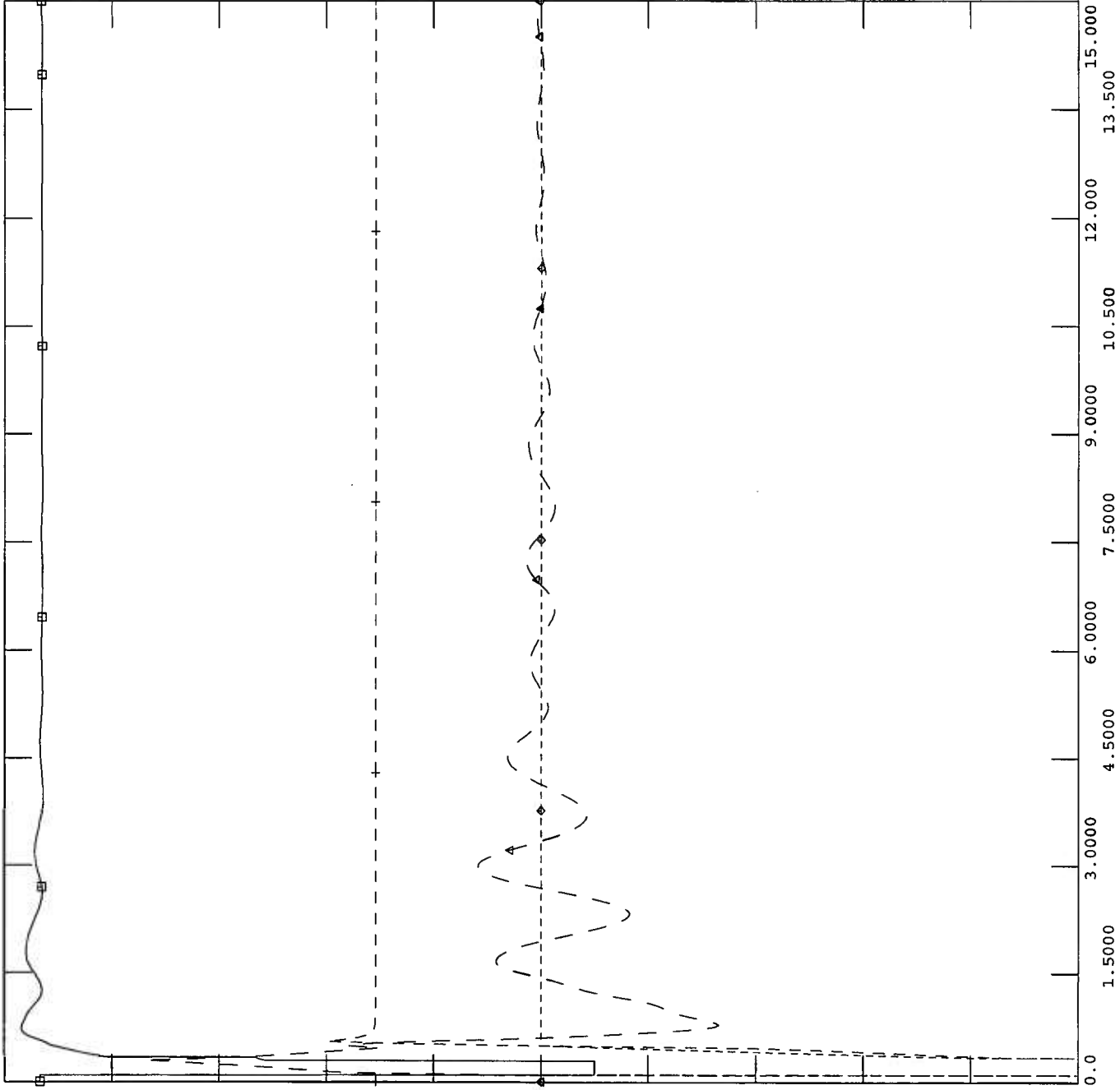


2003 FERC-715 SUMMER 2008 PEAK
W/ 2002 NPCC BCD DYNAMICS

FILE: C:\cct-coned-hvdc\OUTPUT\WEST49SB4-newchan.out

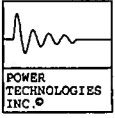
TUE, MAR 16 2004 11:17
DC MW/KV, ACKV/HZ AT W49

CHNL#'S 1809,1810: (-[PACI42,INVERT AC REAL POWER (PU)]-[PACI43,INVERT AC REAL P	+ - - - - +	0.0
1500.0		
CHNL# 1813: [VDCI42,INVERTER DC VOLTAGE (V)]/1000	◇ - - - - ◇	0.0
1000.0		
CHNL# 1801: [FREQ 74354 [W 49 ST 345.00]]*60+60	← - - - - →	59.500
60.500		
CHNL# 1784: [W49-VOLT-345]	□ - - - - □	-0.9000
1.1000		



TIME (SECONDS)

Figure 6.4b Rainey AC/DC Voltage and DC Power and Freq. for CB Stuck 4 for Summer Peak with Project (I/S)

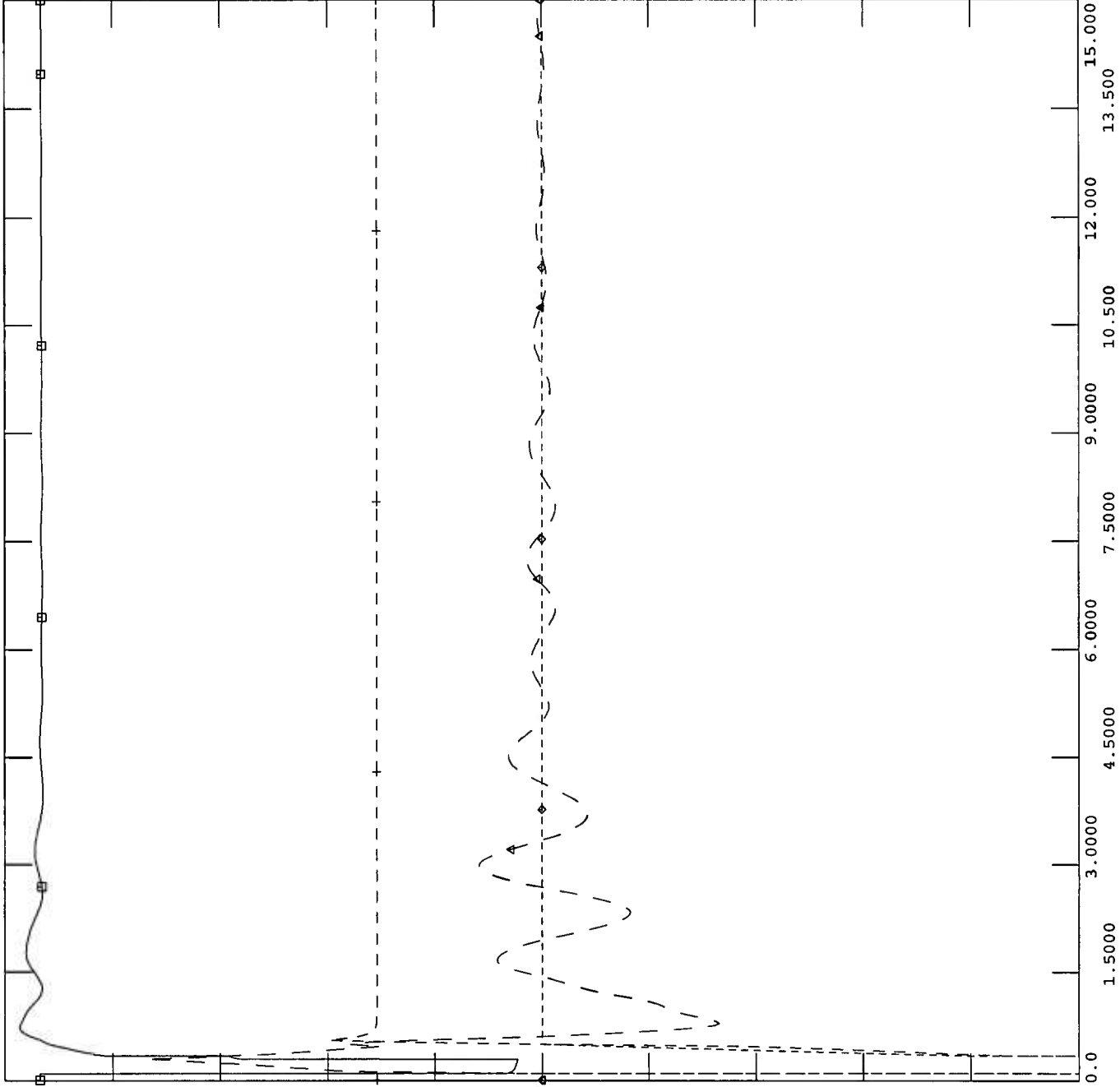


2003 FERC-715 SUMMER 2008 PEAK
W/ 2002 NPCC BCD DYNAMICS

FILE: C:\cct-coned-hvdc\OUTPUT\WEST49SB4-newchan.out

TUE, MAR 16 2004 11:18
DC MW/KV, ACKV AT RAINEY

CHNL#'S 1807,1808: (-[PACI40,INVERT AC REAL POWER (PU)]-[PACI41,INVERT AC REAL P	+-----+	0.0
1500.0		
CHNL# 1812: [VDCI41,INVERTER DC VOLTAGE (V)]/1000	-----◇	0.0
1000.0		
CHNL# 1801: [FREQ 74354 [W 49 ST 345.00]]*60+60	←-----△	59.500
60.500		
CHNL# 1785: [RAINEY-VOLT-345]	-----□	-0.9000
1.1000		



TIME (SECONDS)

Extreme Contingencies

7.1 Extreme Contingency Assessment

The purpose of this Extreme Contingency Analysis is to assess the impact of the Empire Connection Project between upstate New York and NYC on the NYBPS. The assessment is conducted following the NYISO SRIS Criteria and Procedures.

The conclusion of the assessment is that the Empire Connection Project does not degrade the system's response to these studied extreme contingencies when comparing the performances with and without the Project.

The Bulk Power System of North America's entire eastern interconnection is represented in the study. However, the analysis focus on the area of the bulk power system in proximity to, and most likely to be affected by the Project. This include the area of New York State from Utica east to and including the New York-New England interconnections, and from Utica, south to NYC, including the New York-PJM interconnections.

The assessment is carried out by comparing the results with and without the Empire Connection Project for extreme contingencies specified according to NYSRC's Reliability Rule B-R4 entitled "Extreme Contingency Assessment".

This Extreme Contingency Analysis (ECA) is divided in two sections: Load flow ECA and Stability ECA. Thirty extreme contingencies have been analyzed for transient stability. A brief description of them is summarized in Appendix N. Eight extreme contingencies of that set of thirty have been analyzed for load flow steady state or quasi-steady state conditions, namely, EC13, EC15, EC18, EC19, EC28, EC40, EC41, and EC42. The effect of these contingencies is discussed.

7.1.1 Load flow ECA

Appendices R and S show the voltage deviations and overloads with and without the Empire Connection Project, respectively, for the discussed extreme contingencies under steady state or quasi-steady state conditions. When a plant tripping is involved, the inertial load flow solution was used with lock tap changers and phase shifters in order to assess post-fault conditions up to 0.5 seconds. The overload is checked against rating "C".

Some bus voltages in excess of 1.05 pu were observed for all extreme contingencies in the base case without the Empire Connection Project. The Project caused an increase in

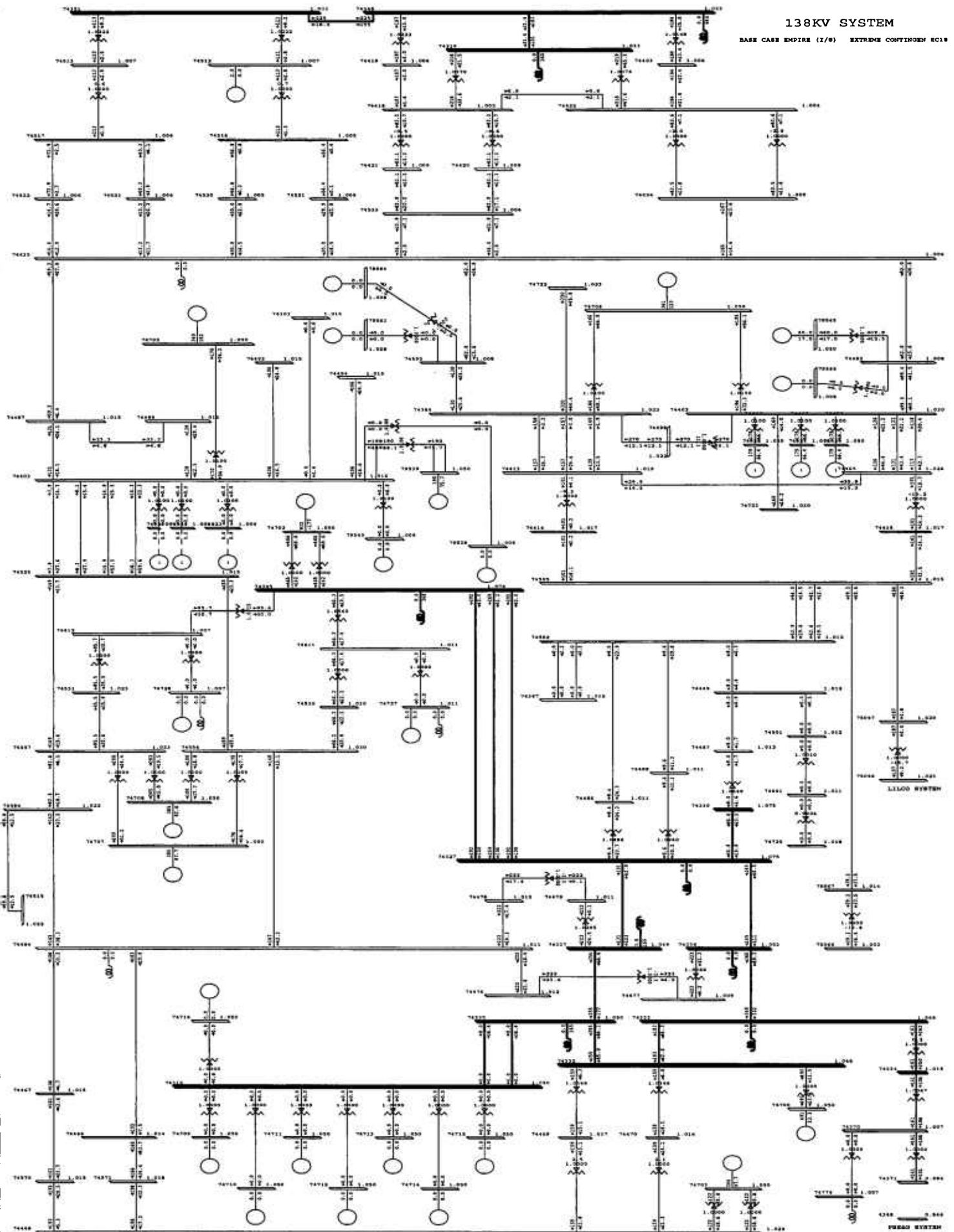
overvoltage levels for some buses in areas 6 (Capital), 9 (Dunwoodie) and 10 (NYC) for all extreme contingencies.

EC 40 (Loss of both Empire Connection HVDC lines) was added to simulate loss of both lines. This event is an extreme contingency similar to loss of all transmission circuits on a common right of way (NYSRC Reliability Rule B-R4). There were no new overloads noted for EC 40.

The most severe extreme contingency was EC18 (Loss of New Scotland 345 kV buses 77, 99 and New Scotland 115 kV). The Project caused an increase in overload levels in areas 4 (North) and 6 (Capital) for some 115 kV branches for EC18. Figures 7.1(a) and 7.1(b) show one-line diagrams for the 138 kV system under post-contingency conditions when EC 18 is applied with and without the Project, respectively.

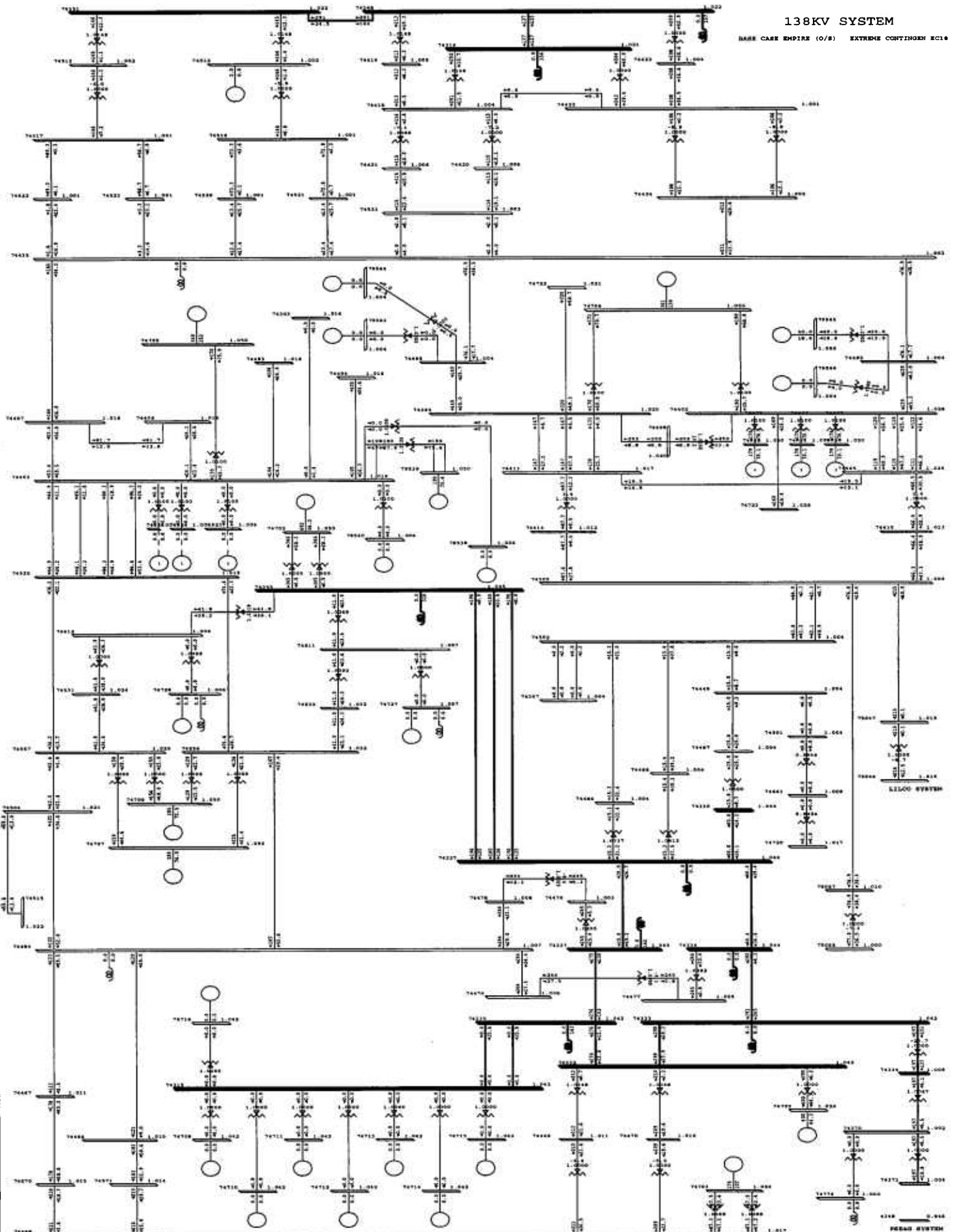
The Project caused a decrease in overload levels in areas 6 (Capital) and 7 (Hudson) for EC 19 (Loss of Leeds 345 kV substation).

Figure 7.1 (a) One Line Diagram for 138 kV System in NYC for EC18 (Empire I/S)



138KV SYSTEM
 BASE CASE EMPIRE (I/S) EXTREME CONTINGEN EC18

Figure 7.1 (b) One Line Diagram for 138 kV System in NYS for EC18 (Empire O/S)



7.1.2 Stability ECA

Appendices T and U show system transient performance with and without the Empire Connection Project, respectively, for the studied extreme contingencies, showing the effect of extreme contingencies on the system. The plots show, besides some NYISO machine parameters, two machines in New England, MILL #3 and Seabrook. Additionally, Nanticoke plots for Ontario Hydro, and Limerick and Salem for PJM have been also included.

No significant adverse system effects are observed in all tested cases. The rotor angles and bus voltages returned to steady state values. System remains stable. The Empire Connection Project does not degrade system performance under the tested extreme contingencies.

Figures 7.2 (a) through 7.2(e) show transient stability plots for the extreme contingency (EC40), when the two bi-pole DC lines trip without a fault. These plots show voltage and rotor angle responses. This case was stable and well damped.

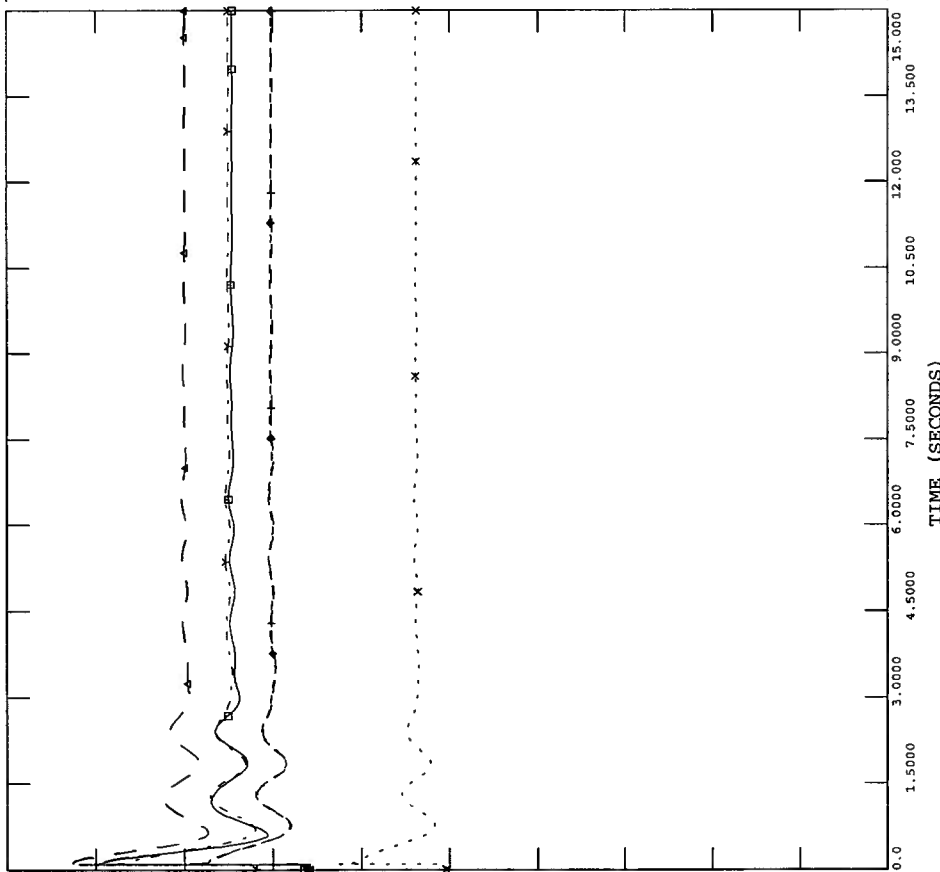
Figure 7.2 (a) Stability Plots for Bus Voltages for EC40 for the Summer Base Case with the Empire Connection (I/S)



EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out
CHNL# 341: [VOLT 75403 [FRASR345345.00]]

1.1000	CHNL# 349: [VOLT 79577 [MARCY765765.00]]	0.90000
1.1000	CHNL# 354: [VOLT 79583 [MARCY T1345.00]]	0.90000
1.1000	CHNL# 344: [VOLT 78450 [EDIC 345.00]]	0.90000
1.1000	CHNL# 348: [VOLT 78703 [N.SCOT99345.00]]	0.90000
1.1000	CHNL# 347: [VOLT 78701 [LEEDS 3 345.00]]	0.90000



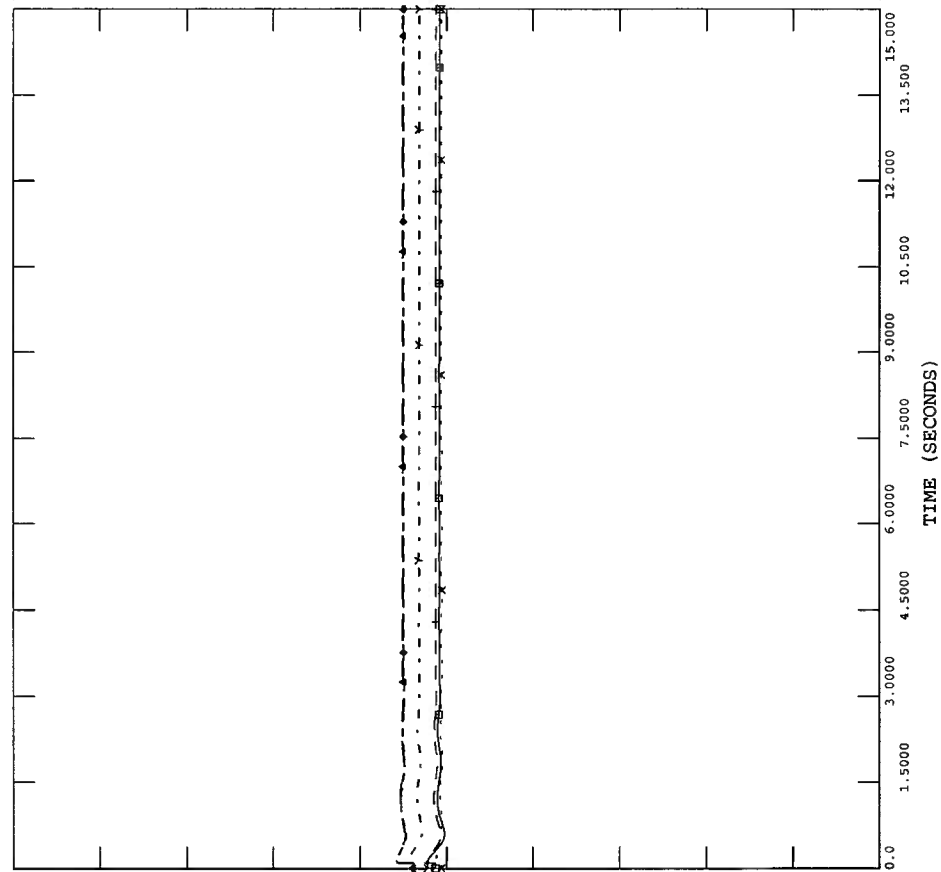
MON, NOV 10 2003 9:46
VOLTAGES



EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out
CHNL# 353: [VOLT 79581 [GILB 345345.00]]

2.0000	CHNL# 346: [VOLT 77951 [9M PT 1G23.000]]	0.0
2.0000	CHNL# 334: [VOLT 74341 [MILLWOOD345.00]]	0.0
2.0000	CHNL# 1063: [RAINEY-VOLT-345]	0.0
2.0000	CHNL# 1062: [W49-VOLT-345]	0.0
2.0000	CHNL# 336: [VOLT 74344 [PLTVLLEY345.00]]	0.0



MON, NOV 10 2003 9:46
VOLTAGES

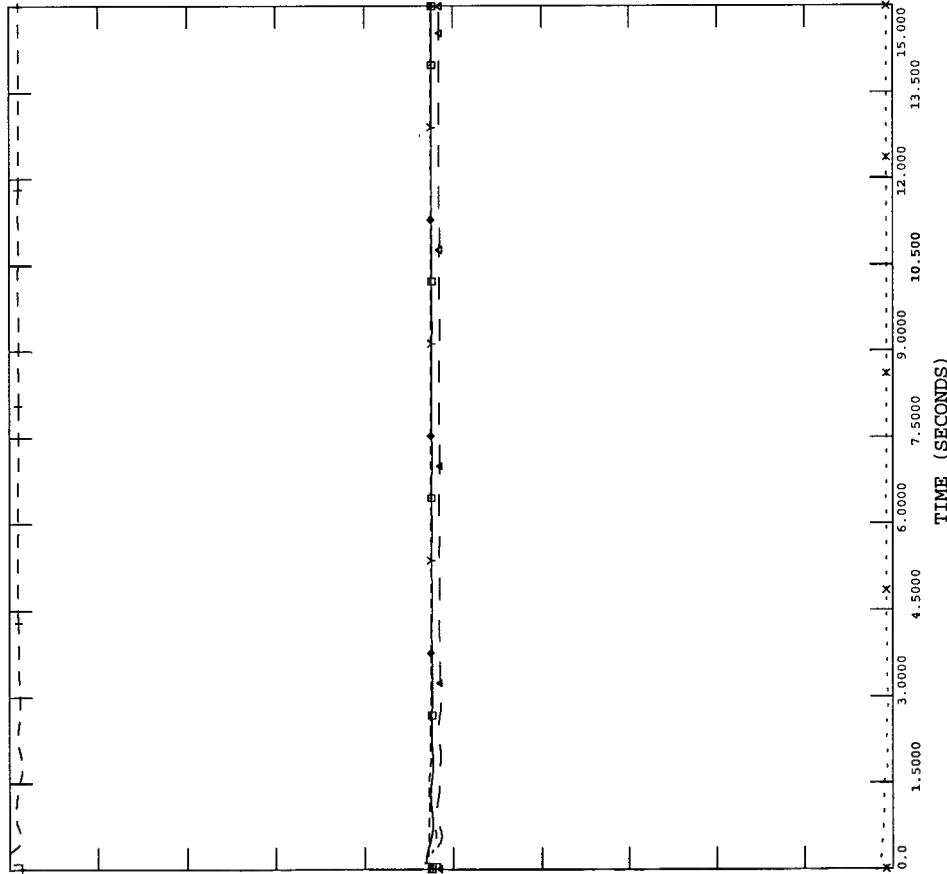
Figure 7.2 (b) Stability Plots for Terminal Voltages for EC40 for the Summer Base Case with the Empire Connection (I/S).



EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out
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1.0650	CHNL# 1055: [ETRM 74708 [RAV 2 20.000] [1]]	0.0
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2.0000	CHNL# 239: [ETRM 77950 [9M PT 2G25.000] [2]]	0.0



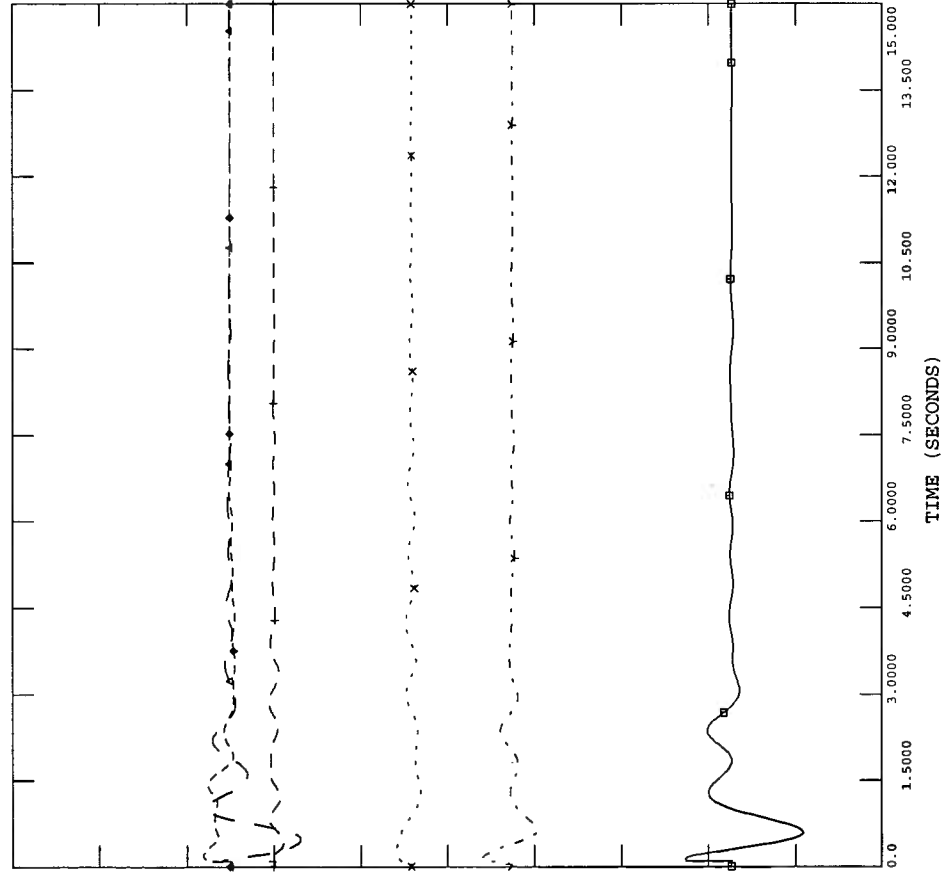
MON, NOV 10 2003 9:46
ETERM



EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out
CHNL# 1019: [ETRM 73563 [MILL#3 24.000] [3]]

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1.1000	CHNL# 1020: [ETRM 74761 [SCS18-G618.000] [1]]	0.90000
1.1000	CHNL# 1053: [ETRM 74703 [AK 2 20.000] [1]]	0.90000
1.1000	CHNL# 1059: [ETRM 79539 [POLETSTG18.000] [1]]	0.90000
1.1000	CHNL# 233: [ETRM 74190 [ROSE GN124.000] [1]]	0.90000



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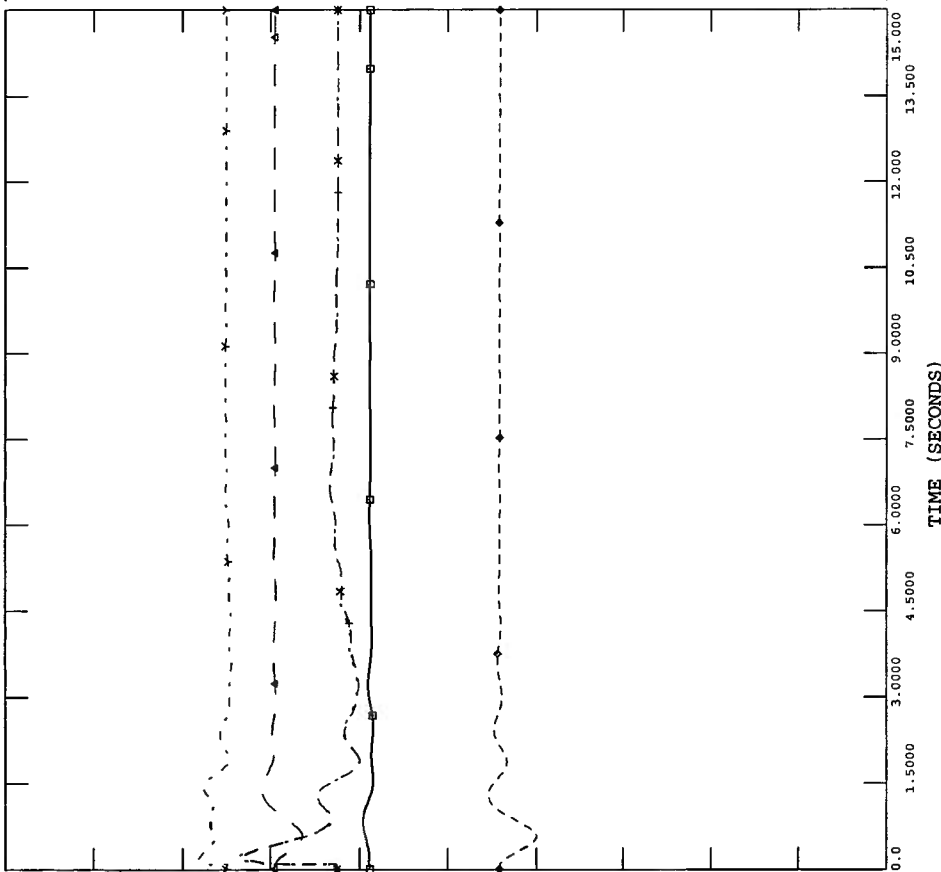
Figure 7.2 (c) Stability Plots for Terminal Voltages for EC40 for the Summer Base Case with the Empire Connection (I/S).



EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out

1.1000	CHNL# 1054: [ETRM 74703 [AK 2 20.000] [2]]	0.90000
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1.1000	CHNL# 957: [ETRM 42 [LIMERCK222.000] [1]]	0.90000
1.1000	CHNL# 956: [ETRM 37 [SALEM-G222.000] [1]]	0.90000
1.1000	CHNL# 1022: [ETRM 81768 [NANTICG322.000] [1]]	0.90000



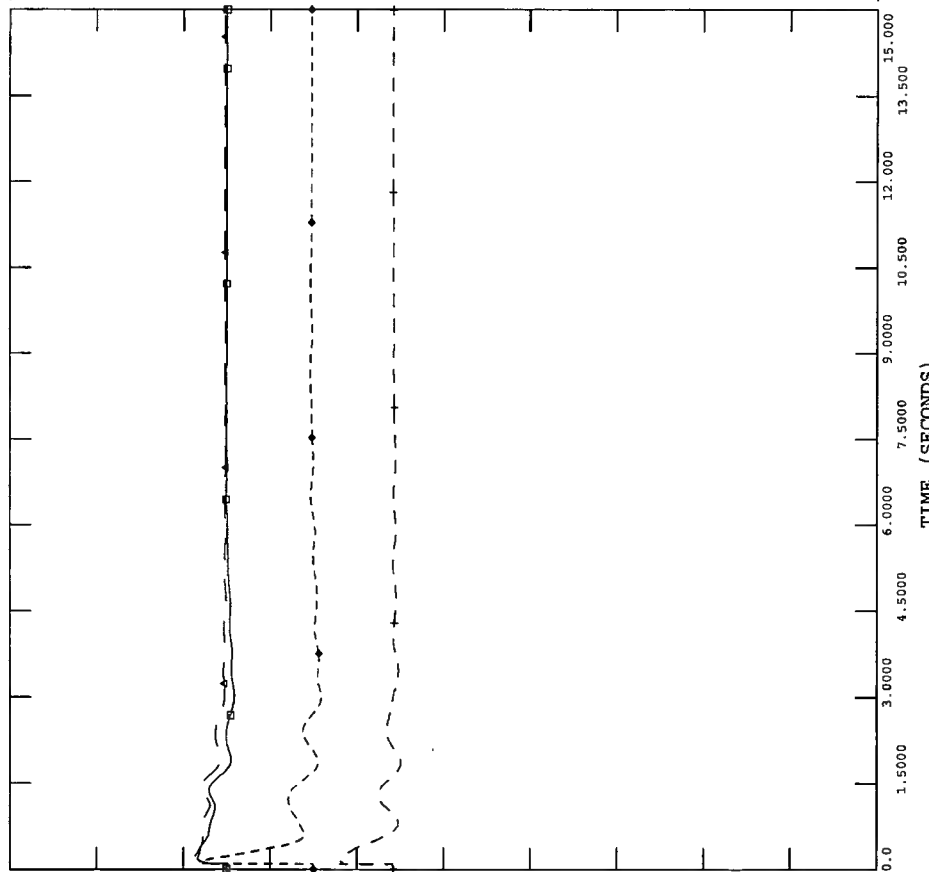
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EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out

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1.1000	CHNL# 1056: [ETRM 74708 [RAV 2 20.000] [2]]	0.90000
1.1000	CHNL# 1051: [ETRM 74391 [KEYSPST118.000] [1]]	0.90000



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Figure 7.2 (d) Stability Plots for Rotor Angles for EC40 for the Summer Base Case with the Empire Connection (I/S).

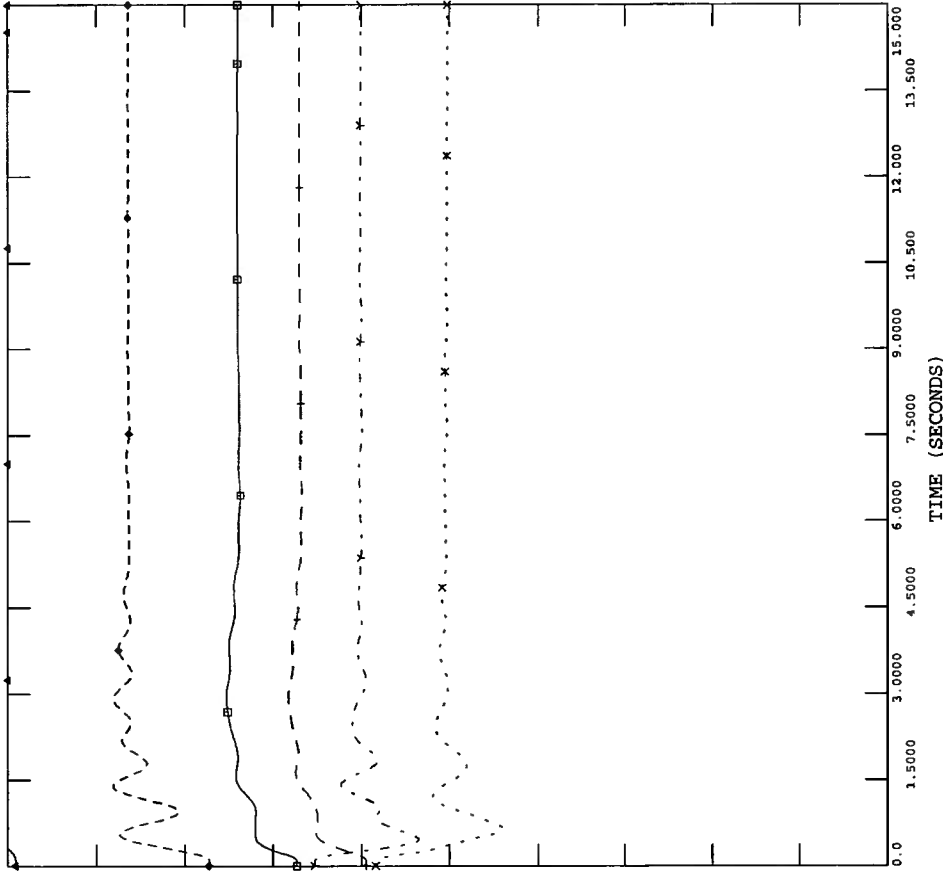


EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out

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10.000	CHNL# 1007: [ANGL 78964 [BETH STM18.000] [1]]	-90.00
10.000	CHNL# 146: [ANGL 78706 [ATHENSCT16.000] [1]]	-90.00
10.000	CHNL# 138: [ANGL 77950 [9M PT 2G25.000] [2]]	-90.00
10.000	CHNL# 1068: [ANGLE-78963-BETHLEHEM]	-90.00

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EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out

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10.000	CHNL# 101: [ANGL 74190 [ROSE GN124.000] [1]]	-90.00
10.000	CHNL# 108: [ANGL 74701 [IND PT 222.000] [2]]	-90.00
10.000	CHNL# 391: [ANGL 74390 [KEYSPG-118.000] [1]]	-90.00

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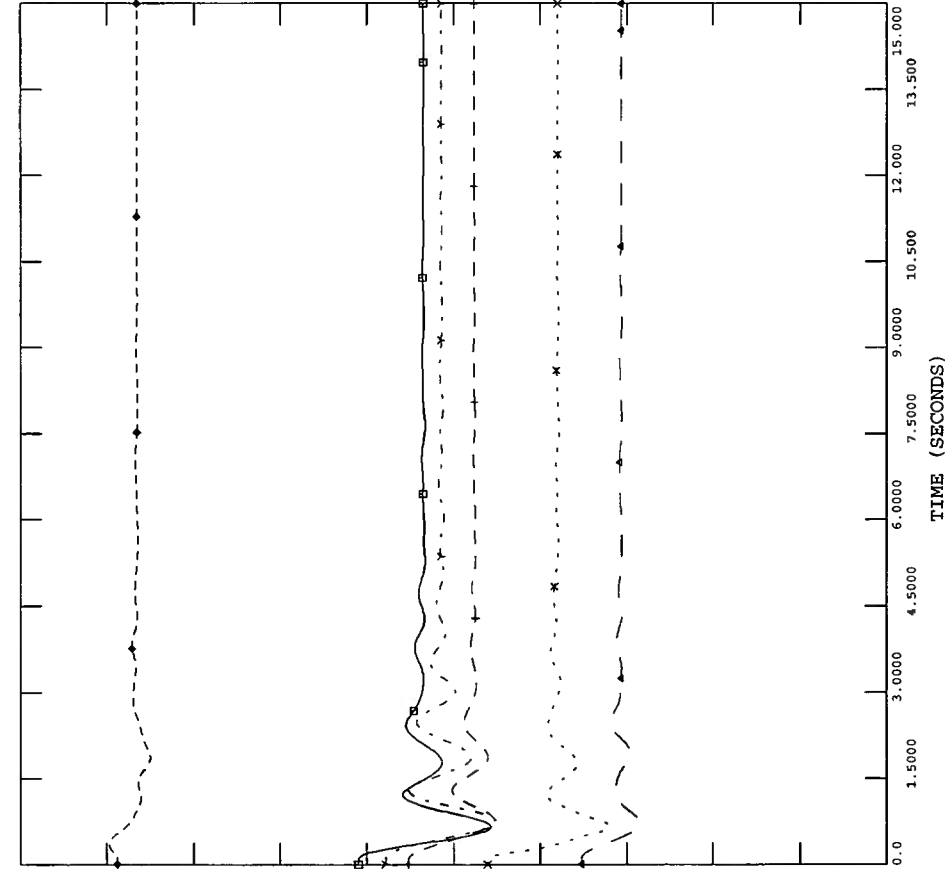


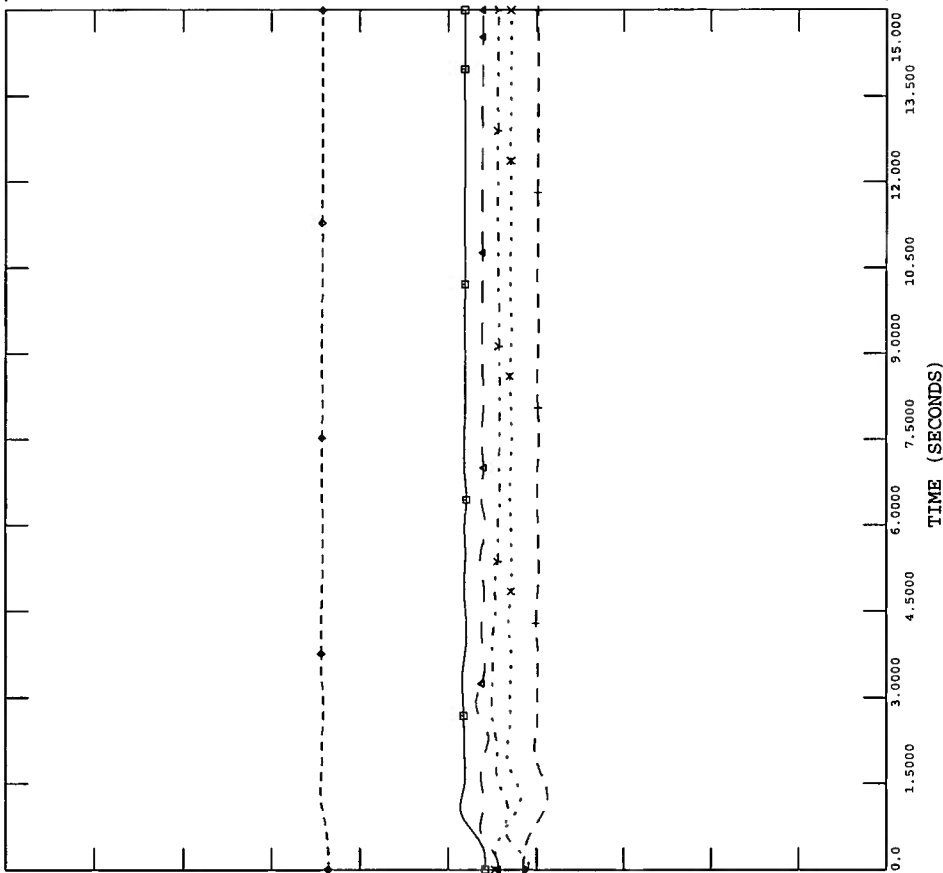
Figure 7.2 (e) Stability Plots for Rotor Angles for EC40 for the Summer Base Case with the Empire Connection (I/S).



EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

FILE: C:\conjunction\EC40A.out

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110.00	CHNL# 1008: [ANGL 81768 [NANTICG322.000] [1]]	-90.00
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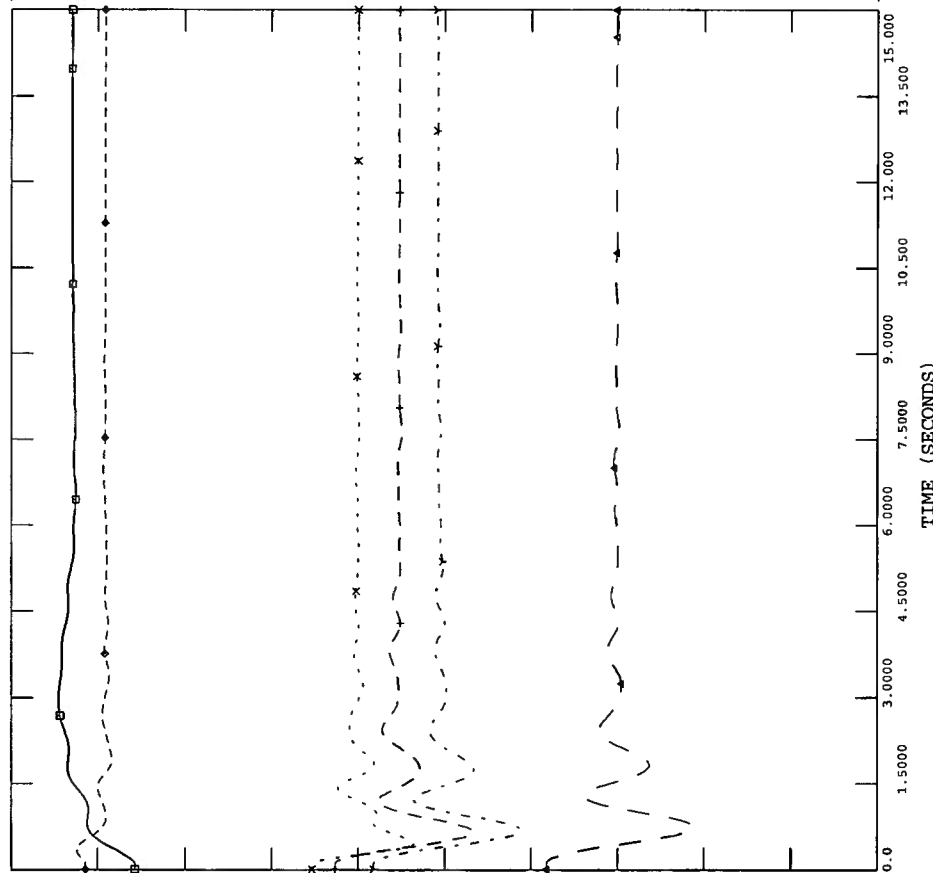
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EXT CTGY SUMMER 2008 CASE EC40 LOSS OF HVDC LINES CONJUNCT.
CONJUNCTION PROJECT ON LINE

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10.000	CHNL# 102: [ANGL 74192 [ROSE GN224.000] [2]]	-90.00
10.000	CHNL# 112: [ANGL 74703 [AK 2 20.000] [2]]	-90.00
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Light Load Dynamic Simulation

The purpose of this analysis is to evaluate the impact of the Empire Connection Project between upstate New York and NYC on the NYBPS under light load conditions. The analysis was conducted following the NYISO's SRIS Criteria and Procedures.

The Bulk Power System of North America's entire eastern interconnection is represented in the study. However, the analysis focuses on the area of the bulk power system in proximity to, and most likely to be affected by the Project. This include the area of New York State from Utica east to and including the New York-New England interconnections, and from Utica, south to NYC, including the New York-PJM interconnections.

The analysis is conducted by comparing the results with and without the Empire Connection Project for light load conditions.

Three interfaces were considered for the stability analysis. These interfaces are Central East, Total East and UPNY-ConEd. One hundred and nine contingencies corresponding to these interfaces have been analyzed for dynamic simulations under light load conditions. A detailed list of all the contingencies tested is included in Appendix M of this report.

The plots show besides some NYISO machine parameters, two machines in New England, MILL #3 and Seabrook. Additionally, Nanticoke in Ontario Hydro, and Limerick and Salem for PJM have been also included.

The conclusion of this analysis based on the results obtained from the simulations is that the Empire Connection Project does not degrade the dynamic response of the NYBPS for the contingencies tested under light load conditions.

Although, one hundred and nine contingencies have been analyzed, only the plots for contingency TE32 are included in this report. Figures 8.1 (a), 8.1b, 8.2a and 8.2b show transient stability plots for TE32. These plots show voltage and rotor angle responses.

Appendices V and W show the system transient performance for all contingencies with and without the Empire Connection Project, respectively.

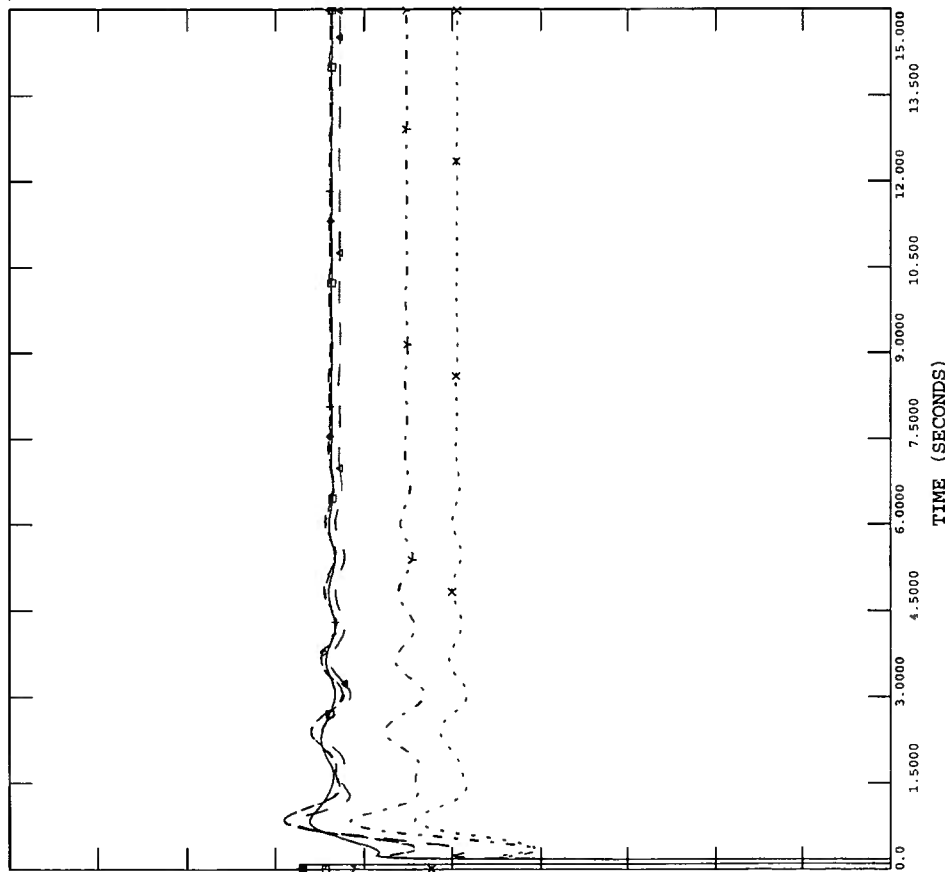
Figure 8.1 (a) Stability Plots for Bus Voltages for TE32 for the Light Load Case with the Empire Connection (O/S)



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FILE: C:\stab-te-bc\OUTPUT\TE32.out
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1.1000	CHNL# 344: [VOLT 78450 [EDIC 345.00]]	0.90000
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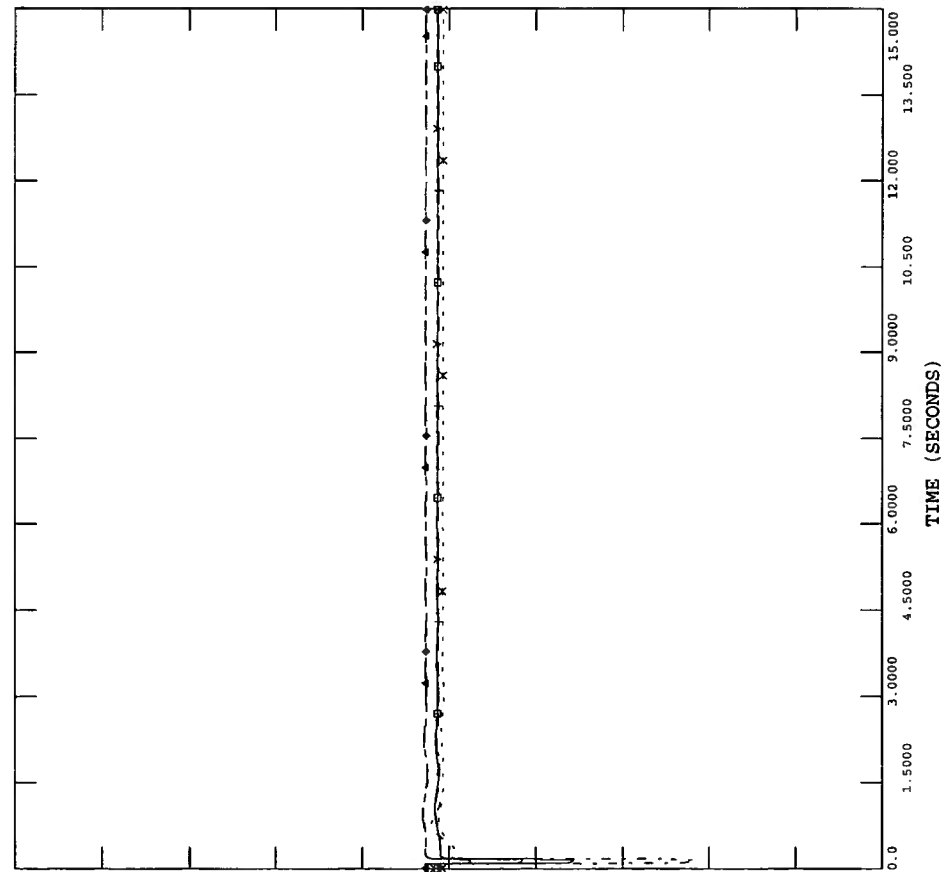
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VOLTAGES



2003 ANNUAL TRANSMISSION REVIEW
2008 LIGHT LOAD W/ 2001 MMWG AND 2002 NPCC

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2.0000	CHNL# 1063: [RAINEY-VOLT-345]	0.0
2.0000	CHNL# 1062: [W49-VOLT-345]	0.0
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VOLTAGES

Figure 8.1 (b) Stability Plots for Rotor Angles for TE32 for the Light Load Case with the Empire Connection (O/S)

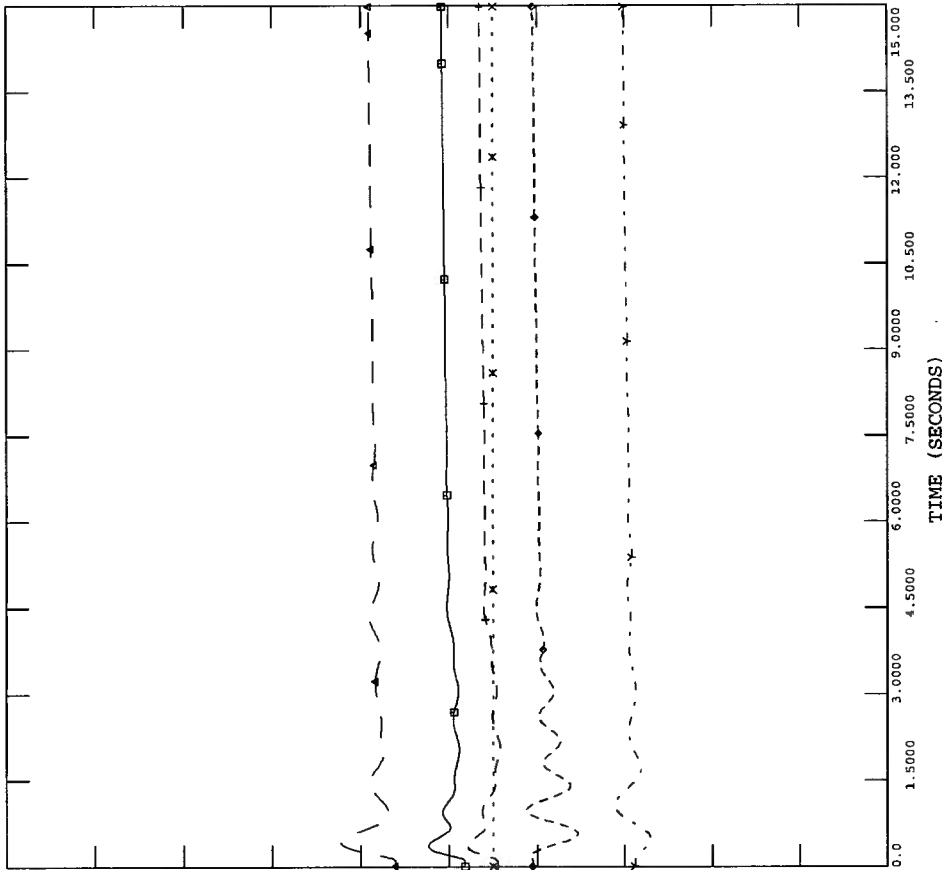


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2008 LIGHT LOAD W/ 2001 MMWG AND 2002 NPCC

FILE: C:\stab-te-bc\OUTPUT\TE32.out

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110.00	CHNL# 146: [ANGL 78706 [ATHENSCT16.000] [1 1]]	-90.00
110.00	CHNL# 138: [ANGL 77950 [9M PT 2G25.000] [2 1]]	-90.00
110.00	CHNL# 1068: [ANGLE-78963-BETHLEHEM]	-90.00

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2008 LIGHT LOAD W/ 2001 MMWG AND 2002 NPCC

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110.00	CHNL# 108: [ANGL 74701 [IND PT 222.000] [2 1]]	-90.00
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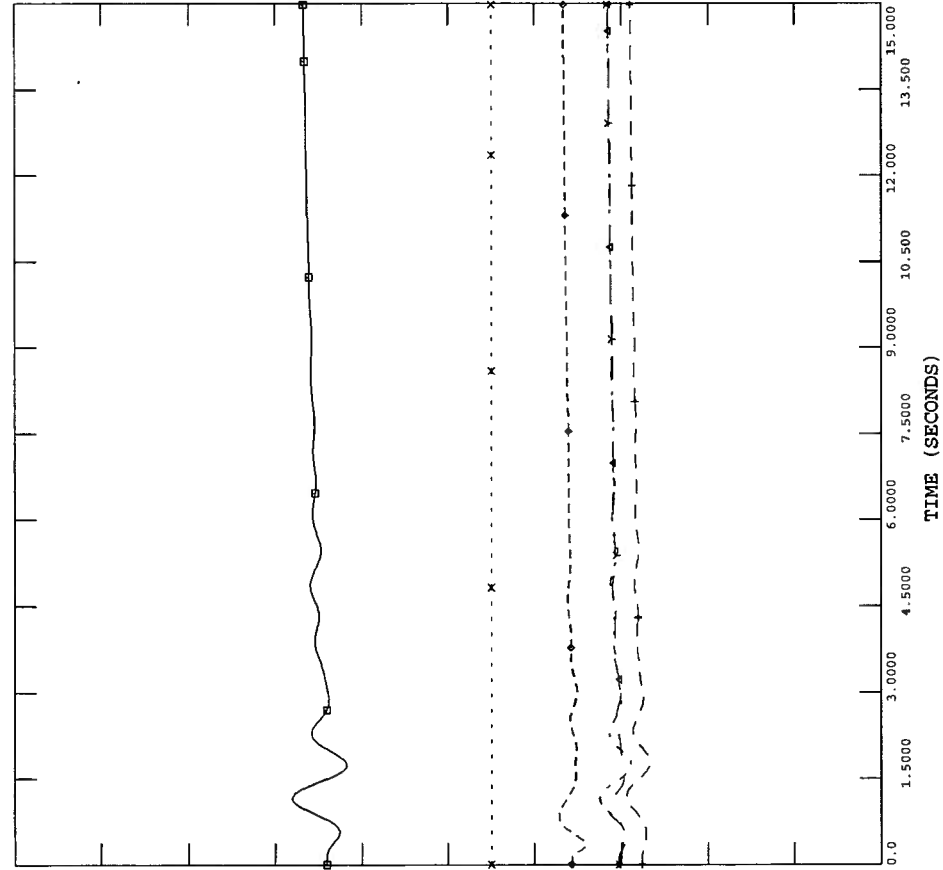


Figure 8.2 (a) Stability Plots for Bus Voltages for TE32 for the Light Load Case with the Empire Connection (I/S)

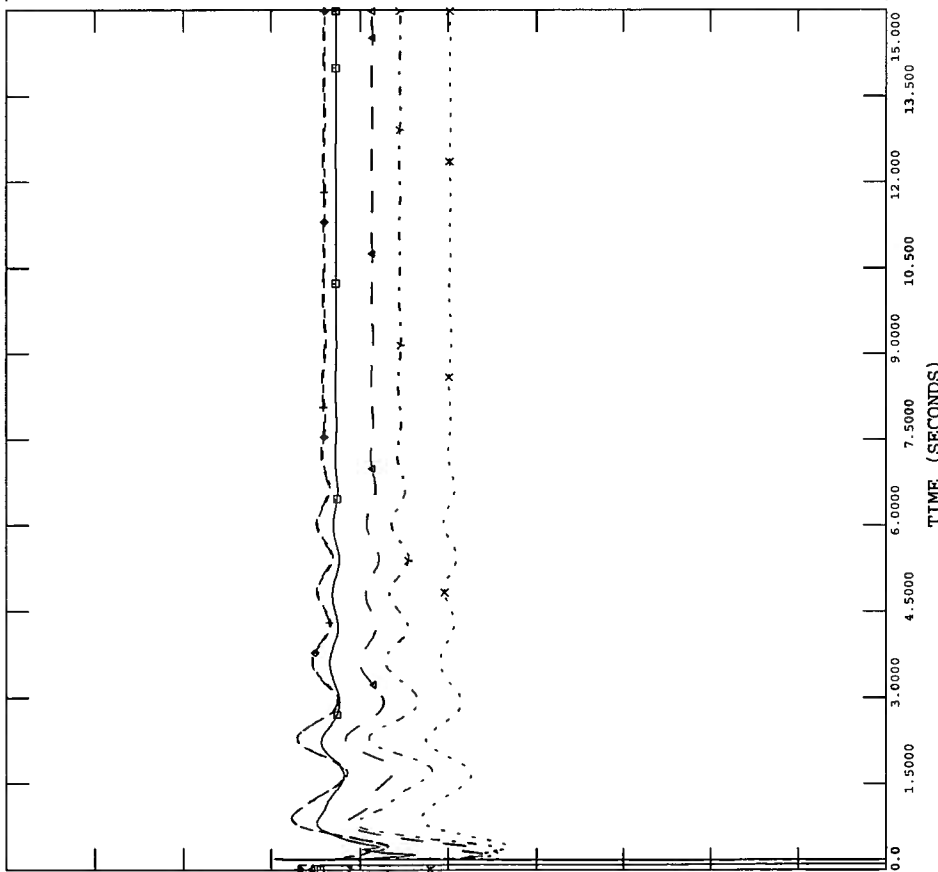


2003 ANNUAL TRANSMISSION REVIEW
2008 LIGHT LOAD W/ 2001 MMWG AND 2002 NPCC

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1.1000	CHNL# 344: [VOLT 78450 [EDIC 345.00]]	0.90000
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VOLTAGES



2003 ANNUAL TRANSMISSION REVIEW
2008 LIGHT LOAD W/ 2001 MMWG AND 2002 NPCC

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2.0000	CHNL# 1063: [RAINEY-VOLT-345]	0.0
2.0000	CHNL# 1062: [W49-VOLT-345]	0.0
2.0000	CHNL# 336: [VOLT 74344 [PLTVLLEY345.00]]	0.0

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VOLTAGES

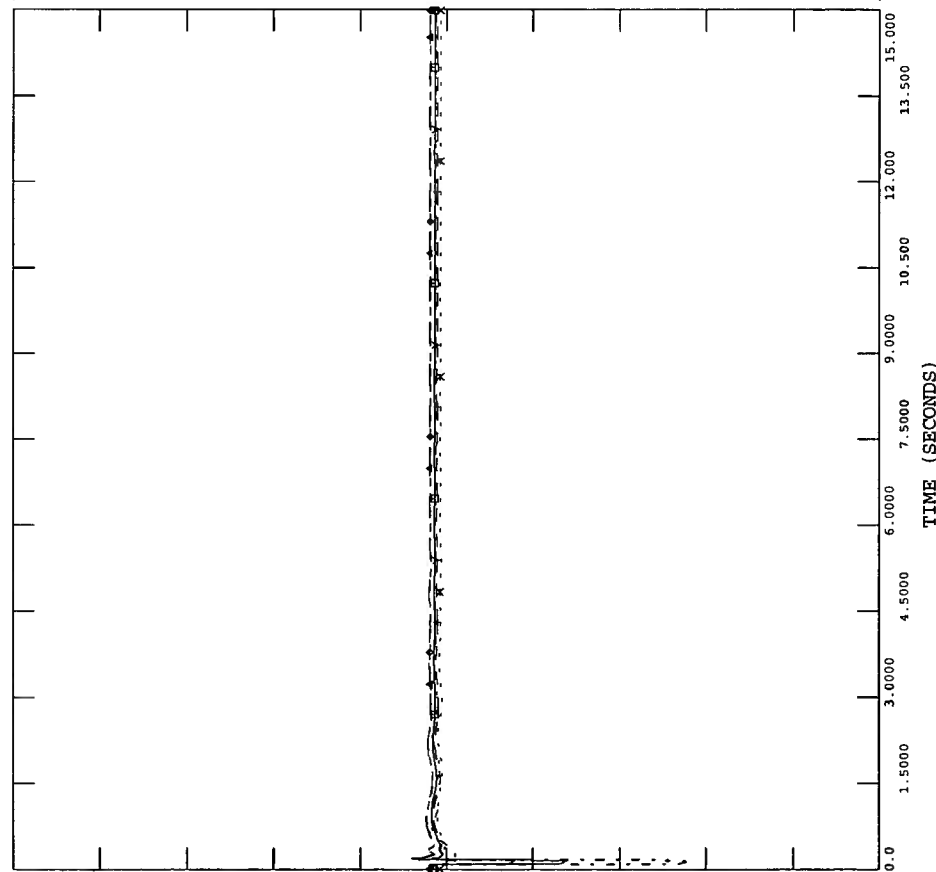


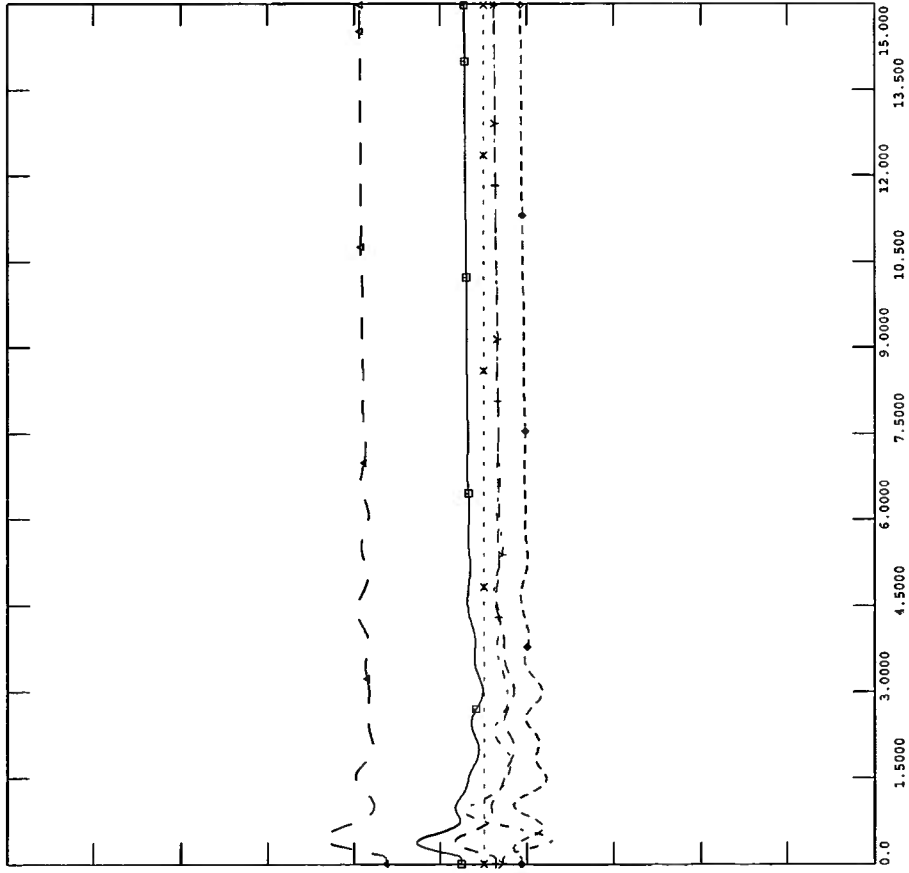
Figure 8.2.4a) Stability Plots for Potor Angles For TE32 for the Light Load Case with the Empire Connection (US)



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FILE: C:\STAB-TE\OUTPUT\TE32.out

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110.00	CHNL# 146: [ANGL 78706 [ATHENSCT16.000] [1]]	-90.00
110.00	CHNL# 138: [ANGL 77950 [9M PT 2G25.000] [2]]	-90.00
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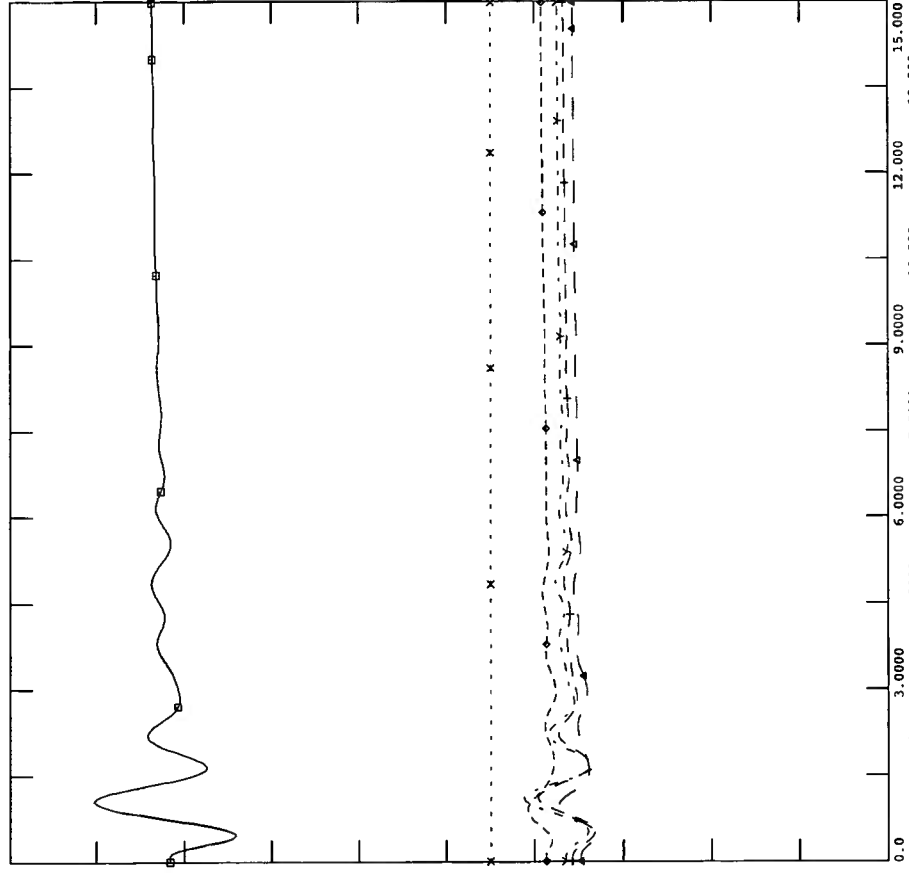
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ANGLES



2003 ANNUAL TRANSMISSION REVIEW
2008 LIGHT LOAD W/ 2001 MMWG AND 2002 NPCC

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110.00	CHNL# 101: [ANGL 74190 [ROSE GN124.000] [1]]	-90.00
110.00	CHNL# 108: [ANGL 74701 [IND PT 222.000] [2]]	-90.00
10.000	CHNL# 391: [ANGL 74390 [KEYSPG-118.000] [1]]	-90.00



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Results of Short Circuit Analysis

A short circuit analysis was performed to assess the impact of Conjunction LLC's 2000 MW HVDC Empire Connection Project on the adequacy of existing circuit breakers and related equipment on the Con Edison, NYPA and Niagara Mohawk systems. The analysis employed the ASPEN Program which is also currently being used by NYISO and Con Edison. The assessment was based on the Con Edison Practice or Method and calculated three-phase-to-ground, two-phase-to-ground, and single-phase-to ground faults.

The calculation covered all Con Edison's 69 kV, 138 kV, and 345 kV substations, the Niagara Mohawk 115 and 345 kV stations close to the Project, the NYPA 115 kV and 345 kV buses, the 115 kV and 345 kV stations in the Central Hudson Gas and Electric system, and NYSEG's Wyanntstill 115 kV bus. In accordance with the NYISO SRIS Criteria and Procedures, the calculation assumed that all currently existing facilities within and outside New York State and all new queued interconnection projects specified in the Scope of Work are in service.

9.1 Methodology

In the calculation, the method used to evaluate circuit breaker performance follows Con Edison's practice. This practice is referred to as the Classical Method, which implies the following system conditions:

- All generating units in service
- All transmission feeders in service
- All series reactors in service
- All shunt loads and other paths to ground except for generator internal impedances, transformer grounding paths, and shunt loads in the zero-sequence not modeled
- Transformer phase shifts and bus voltage phase angle differences not modeled
- Voltages of all generator buses set to one per unit at zero phase angle

From the inception of the fault, typical total clearing times (relay plus breaker operation) for Con Edison 345 kV and 138 kV breakers are 4.5 cycles and 7 to 8 cycles, respectively. Therefore, Con Edison represents generators by their direct-axis sub-transient reactance at rated voltage ($X_{d'}''$).

Con Edison and Niagara Mohawk criteria dictate that the nominal rating of any breaker on the bulk power transmission system at 69 kV and higher should not exceed its rated fault duty level.

Generation project 23 in Table 2.1 (TransGas Energy) was not included in the short circuit calculations because its SRIS report does not indicate the form of a fault mitigation plan for overdutied circuit breakers at Rainey and Farragut. Consequently, its interconnection could not be simulated. However, the Developer will rely on the development of a practical fault mitigation plan for the interconnection of the TransGas Energy project. The cost responsibility of the Empire Connection Project toward system upgrades identified by the TransGas Energy fault mitigation plan will be determined in accordance with cost allocation procedures that have been filed by the NYISO with FERC.

9.2 Results of Short Circuit Analysis

Short circuit currents were calculated using the short circuit model developed in Section 3.4. The calculations were performed for the cases with and without the Empire Connection Project. In both cases the Neptune PJM-NYC DC 660 MW project was in service. The goal of the analysis was to determine how the addition of the Project would increase fault currents on the Con Edison, NYPA and Niagara Mohawk systems, and other nearby stations. Tables 9-1 to 9-5 show the short circuit results with and without the project.

The short circuit calculation indicates that for unbalanced fault currents the Empire Connection Project causes an increase in the total short circuit currents of some of the stations reported. However, none of the stations reported is over-dutied compared to the lowest breaker ratings. Three phase short circuit currents were not affected since the HVDC delta-wye grounded converter transformers only affect unbalanced faults. Therefore the Project has no negative impact on the station duties in the system under study.

Table 9-1 Con Edison Stations Total Fault Duties (kA)

BULK POWER SUBSTATIONS	LOWEST BREAKER RATING	Without Conjunction Project			With Conjunction Project			INCREMENT			
		3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	
AST-EAST-E	138.kV	63	44.01	47.08	47.90	44.01	47.08	47.90	0.00	0.00	0.00
AST-EAST-W	138.kV	63	48.90	53.49	55.55	48.90	53.49	55.55	0.00	0.00	0.00
AST-WEST	138.kV	63	37.97	42.06	43.77	37.97	42.07	43.77	0.00	0.00	0.01
BUCHAN N	345.kV	40	29.94	29.40	27.63	29.95	29.40	27.64	0.00	0.00	0.00
BUCHAN S	345.kV	40	40.13	39.13	35.60	40.13	39.14	35.61	0.00	0.01	0.02
BUCHANAN	138.kV	40	15.65	15.09	13.88	15.65	15.09	13.88	0.00	0.00	0.00
CORONA NORTH	138.kV	45	40.41	45.21	40.11	40.41	45.21	40.12	0.00	0.00	0.00
CORONA SOUTH	138.kV	45	43.70	49.62	43.51	43.70	49.62	43.51	0.00	0.00	0.00
DUN NO	138.kV	40	32.10	32.04	28.80	32.10	32.07	28.89	0.00	0.02	0.09
DUN SO	138.kV	40	30.09	30.39	28.86	30.09	30.41	28.94	0.00	0.02	0.08
DUNWODIE	345.kV	63	50.39	49.22	41.00	50.40	49.41	41.60	0.00	0.19	0.60
E 13 ST	138.kV	63	45.42	46.74	47.27	45.42	47.18	48.01	0.00	0.45	0.74
E 179 ST	138.kV	63	41.76	43.63	39.67	41.76	43.66	39.72	0.00	0.03	0.05
E FISHKILL	345.kV	63	38.79	36.99	28.71	38.79	37.02	28.77	0.00	0.03	0.06
E RIVER	69.kV	50	46.20	50.34	52.60	46.20	50.42	52.69	0.00	0.08	0.09
FARRAGUT	345.kV	63	52.92	55.85	55.52	52.92	58.92	59.36	0.00	3.07	3.84
FOXHLS 1	138.kV	40	34.67	35.26	27.15	34.67	35.27	27.15	0.00	0.00	0.00
FOXHLS 2	138.kV	40	35.11	35.71	28.37	35.11	35.71	28.38	0.00	0.00	0.00
FR KILLS	138.kV	40	39.25	40.67	40.38	39.25	40.67	40.39	0.00	0.00	0.01
FR KILLS	345.kV	63	25.67	26.51	26.19	25.67	26.53	26.23	0.00	0.03	0.03
GOETHL N	345.kV	40	25.24	25.94	25.77	25.24	25.97	25.82	0.00	0.04	0.04
GOETHL S	345.kV	63	24.64	25.67	25.81	24.64	25.71	25.85	0.00	0.04	0.04
GOW N	345.kV	40	20.40	20.60	18.59	20.40	20.62	18.65	0.00	0.03	0.06
GOW S	345.kV	40	20.10	20.43	18.43	20.10	20.45	18.49	0.00	0.03	0.06
GRENWOOD	138.kV	63	50.59	53.95	53.39	50.59	53.95	53.40	0.00	0.01	0.01
HG 6	138.kV	63	35.85	40.52	38.86	35.85	40.52	38.87	0.00	0.00	0.01
HUDSON E	138.kV	40	40.72	40.30	37.24	40.72	40.34	37.35	0.00	0.04	0.11
JAMAICA	138.kV	40	48.92	50.45	45.56	48.92	50.48	45.60	0.00	0.03	0.04
MILLWOOD	138.kV	20	19.13	18.68	17.11	19.13	18.69	17.12	0.00	0.00	0.01
MILLWOOD	345.kV	63	45.29	43.28	33.37	45.29	43.30	33.45	0.00	0.03	0.08
PLEASANT VAL	345.kV	63	39.56	37.23	25.74	39.56	37.28	25.87	0.00	0.05	0.13
QUEENSBG	138.kV	45	37.19	42.25	41.13	37.19	42.25	41.14	0.00	0.00	0.01
RAINEY	345.kV	63	50.80	52.97	51.10	50.80	55.65	55.64	0.00	2.68	4.54
RAMAPO	345.kV	40	46.32	45.61	39.51	46.32	45.61	39.51	0.00	0.00	0.00
SHM CRK	138.kV	63	38.59	39.70	33.99	38.59	39.72	34.04	0.00	0.02	0.04
SPRN BRK	345.kV	63	51.46	50.20	41.65	51.46	50.39	42.27	0.00	0.19	0.62
VERNON E	138.kV	40	35.07	36.60	37.32	35.07	36.62	37.35	0.00	0.01	0.03
VERNON W	138.kV	40	31.47	32.53	32.64	31.47	32.54	32.67	0.00	0.01	0.03
W 49 ST	345.kV	63	47.07	49.13	46.62	47.07	51.53	51.14	0.00	2.40	4.52

Table 9-2 Niagara Mohawk Stations Total Fault Duties (kA)

BULK POWER SUBSTATIONS	LOWEST BREAKER RATING	Without Conjunction Project			With Conjunction Project			INCREMENT			
		3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	
EDIC	345.kV	37	32.51	31.38	26.84	32.51	31.40	26.89	0.00	0.02	0.05
ALPS	345.kV	40	17.77	17.12	13.72	17.77	17.24	14.16	0.00	0.11	0.44
ATHENS	345.kV	40	33.16	32.27	29.68	33.16	33.51	32.45	0.00	1.24	2.77
LEEDS	345.kV	37	33.76	32.87	30.06	33.76	34.27	33.21	0.00	1.40	3.15
NEW SCOTLAND	345.kV	37	31.02	29.69	23.55	31.02	30.93	28.03	0.00	1.24	4.48
NEW SCOTLAND T33	115.kV	40	50.72	50.67	49.50	50.72	50.97	50.86	0.00	0.31	1.36

Table 9-3 NYPA Stations Total Fault Duties (kA)

BULK POWER SUBSTATIONS	LOWEST BREAKER RATING	Without Conjunction Project			With Conjunction Project			INCREMENT		
		3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	3-PH	2-PH	1-PH
42(34-4E)	345.kV	19.64	18.99	18.09	19.64	18.99	18.09	0.00	0.00	0.00
DVNPT NK	345.kV	9.47	9.72	9.42	9.47	9.72	9.43	0.00	0.00	0.01
E.G.C.-1	345.kV	7.80	7.99	7.98	7.80	7.99	7.98	0.00	0.00	0.00
E.G.C.-2	345.kV	7.80	7.99	7.98	7.80	7.99	7.98	0.00	0.00	0.00
EGC PAR	345.kV	9.51	9.74	9.58	9.52	9.74	9.59	0.00	0.00	0.01
FITZPATRICK	345.kV	39.62	42.70	42.88	39.62	42.70	42.88	0.00	0.00	0.00
GILBOA 345	345.kV	22.32	22.31	21.68	22.32	22.48	21.93	0.00	0.17	0.26
HMP HRBR	345.kV	9.47	9.73	9.44	9.47	9.73	9.45	0.00	0.00	0.01
IP-3	345.kV	38.65	37.65	34.56	38.65	37.66	34.58	0.00	0.01	0.02
MARCY 345	345.kV	31.73	30.61	25.64	31.73	30.63	25.68	0.00	0.02	0.05
MIDDLETN TAP	345.kV	17.89	16.92	15.24	17.89	16.92	15.24	0.00	0.00	0.00
POLETTI	345.kV	41.64	43.19	39.90	41.64	44.34	41.27	0.00	1.15	1.38
SFBY49SR	345.kV	9.50	9.71	9.40	9.50	9.71	9.41	0.00	0.00	0.01
CB408	230.kV	43.16	46.01	45.80	43.16	46.01	45.80	0.00	0.00	0.00
CB438	230.kV	43.16	46.01	45.80	43.16	46.01	45.80	0.00	0.00	0.00
MASN TR1 230	230.kV	21.58	22.19	21.18	21.58	22.19	21.18	0.00	0.00	0.00
MASN TR2 230	230.kV	21.58	22.18	21.16	21.58	22.18	21.16	0.00	0.00	0.00
MW-WP1TAP BT	230.kV	10.50	10.22	8.61	10.50	10.22	8.61	0.00	0.00	0.00
MW-WP1TAP230	230.kV	9.49	9.26	7.80	9.49	9.26	7.80	0.00	0.00	0.00
MW-WP2TAP BT	230.kV	10.50	10.19	8.57	10.50	10.19	8.57	0.00	0.00	0.00
MW-WP2TAP230	230.kV	9.49	9.26	7.80	9.49	9.26	7.80	0.00	0.00	0.00
WILLIS 230	230.kV	9.49	9.26	7.80	9.49	9.26	7.80	0.00	0.00	0.00
FLYNN	138.kV	45.70	45.32	43.05	45.70	45.32	43.05	0.00	0.00	0.00
PATHG1MD	138.kV	31.65	32.33	27.54	31.65	32.34	27.55	0.00	0.01	0.01
PATHG4MD	138.kV	31.56	32.24	27.40	31.56	32.25	27.41	0.00	0.01	0.01
PATVRNMD	138.kV	31.26	32.26	32.35	31.26	32.27	32.38	0.00	0.01	0.03
ALCOA NO 115	115.kV	24.09	23.81	22.23	24.09	23.81	22.23	0.00	0.00	0.00
ALCOA SO 115	115.kV	24.09	23.81	22.23	24.09	23.81	22.23	0.00	0.00	0.00
CB318	115.kV	31.09	30.90	30.39	31.09	30.90	30.39	0.00	0.00	0.00
CB328	115.kV	31.09	30.90	30.39	31.09	30.90	30.39	0.00	0.00	0.00
CB338	115.kV	31.09	30.90	30.39	31.09	30.90	30.39	0.00	0.00	0.00
CB348	115.kV	36.44	37.48	37.67	36.44	37.48	37.67	0.00	0.00	0.00
CB368	115.kV	36.44	37.48	37.67	36.44	37.48	37.67	0.00	0.00	0.00
CUMBHD TERM	115.kV	8.18	7.88	6.49	8.18	7.88	6.49	0.00	0.00	0.00
GEN MOT1 115	115.kV	11.59	10.88	8.43	11.59	10.88	8.43	0.00	0.00	0.00
GEN MOT2 115	115.kV	11.69	11.03	8.61	11.69	11.03	8.61	0.00	0.00	0.00
GORDLG TERM	115.kV	8.14	7.83	6.46	8.14	7.83	6.46	0.00	0.00	0.00
GRSRVRT1 115	115.kV	15.51	14.70	12.13	15.51	14.70	12.13	0.00	0.00	0.00
GRSRVRT2 115	115.kV	15.42	14.55	11.74	15.42	14.55	11.74	0.00	0.00	0.00
PMLD STL #1	115.kV	10.70	9.94	8.19	10.70	9.94	8.19	0.00	0.00	0.00
PMLD STL #2	115.kV	9.97	9.57	8.29	9.97	9.57	8.29	0.00	0.00	0.00
PMLD STL #3	115.kV	7.70	7.03	5.23	7.70	7.03	5.23	0.00	0.00	0.00
PMLD#2 115BT	115.kV	8.40	8.12	7.17	8.40	8.12	7.17	0.00	0.00	0.00
PMLD#2TAP115	115.kV	9.97	9.57	8.29	9.97	9.57	8.29	0.00	0.00	0.00
REYNLD#1 115	115.kV	13.24	12.56	10.07	13.24	12.56	10.07	0.00	0.00	0.00
REYNLD#2 115	115.kV	13.37	12.77	10.33	13.37	12.77	10.33	0.00	0.00	0.00
REYNLD#3 115	115.kV	13.45	12.82	10.38	13.45	12.82	10.38	0.00	0.00	0.00
SARANAC NYPA	115.kV	8.01	7.58	6.30	8.01	7.58	6.30	0.00	0.00	0.00
ST LAWRN 115	115.kV	39.55	44.18	45.78	39.55	44.18	45.78	0.00	0.00	0.00
STA #02 115	115.kV	17.58	16.85	15.00	17.58	16.85	15.00	0.00	0.00	0.00
STA #25 115	115.kV	19.71	18.90	16.67	19.71	18.90	16.67	0.00	0.00	0.00
WILLIS 115	115.kV	9.80	9.13	7.48	9.80	9.13	7.48	0.00	0.00	0.00
X612 TAP 1	115.kV	24.09	23.81	22.23	24.09	23.81	22.23	0.00	0.00	0.00
X612 TAP 2	115.kV	24.09	23.81	22.23	24.09	23.81	22.23	0.00	0.00	0.00

Table 9-4 CHG&E Stations Total Fault Duties (kA)

BULK POWER SUBSTATIONS	LOWEST BREAKER RATING	Without Conjunction Project			With Conjunction Project			INCREMENT		
		3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	3-PH	2-PH	1-PH
BARNEGAT	115.kV	13.68	13.38	11.96	13.68	13.38	11.96	0.00	0.00	0.00
BETH ROAD	115.kV	11.88	11.46	10.23	11.88	11.46	10.23	0.00	0.00	0.00
CHADWIK LAKE	115.kV	19.68	18.66	15.24	19.68	18.66	15.24	0.00	0.00	0.00
COLDENHAM	115.kV	15.47	14.69	11.69	15.47	14.69	11.69	0.00	0.00	0.00
DANSKAMMER	115.kV	32.45	34.07	35.05	32.45	34.07	35.05	0.00	0.00	0.00
E FISHKILL	115.kV	22.60	22.20	21.06	22.60	22.21	21.06	0.00	0.00	0.00
E KNGTN	115.kV	9.98	9.54	8.49	9.98	9.54	8.50	0.00	0.00	0.01
E WALDEN	115.kV	21.36	20.22	16.38	21.36	20.22	16.38	0.00	0.00	0.00
FISH PL	115.kV	22.90	22.54	20.69	22.90	22.54	20.70	0.00	0.00	0.00
FORGEBROOK	115.kV	18.95	17.81	15.44	18.95	17.81	15.44	0.00	0.00	0.00
FSHKLTERM345	345.kV	37.55	35.85	28.01	37.55	35.88	28.07	0.00	0.03	0.06
HIGHLAND	115.kV	17.73	16.98	14.47	17.73	16.98	14.47	0.00	0.00	0.00
HURLEY AVE	115.kV	15.87	15.69	14.86	15.87	15.70	14.88	0.00	0.01	0.02
HURLEY AVE.	345.kV	16.88	16.01	12.03	16.88	16.05	12.14	0.00	0.04	0.11
INWOOD AVE.	115.kV	17.86	16.84	13.90	17.86	16.84	13.90	0.00	0.00	0.00
KNAPPS	115.kV	13.07	12.66	11.42	13.07	12.66	11.42	0.00	0.00	0.00
LINCOLN PARK	115.kV	10.90	10.59	9.92	10.90	10.60	9.93	0.00	0.00	0.01
MANCHESTER	115.kV	14.02	13.48	11.78	14.02	13.48	11.78	0.00	0.00	0.00
MARLBORO	115.kV	20.40	19.93	18.17	20.40	19.93	18.17	0.00	0.00	0.00
MILAN	115.kV	9.45	8.82	7.05	9.45	8.82	7.05	0.00	0.00	0.00
MODENA	115.kV	14.25	13.45	10.84	14.25	13.45	10.84	0.00	0.00	0.00
N CATSKILL	115.kV	6.64	6.28	5.45	6.64	6.28	5.45	0.00	0.00	0.00
N. CHELSEA	115.kV	30.58	31.80	31.13	30.58	31.80	31.13	0.00	0.00	0.00
NYCDWR-CHL	115.kV	27.16	27.93	26.52	27.16	27.93	26.52	0.00	0.00	0.00
NYCDWR-TAP	115.kV	30.79	32.40	31.69	30.79	32.40	31.69	0.00	0.00	0.00
OHIOVILLE	115.kV	15.63	14.83	12.18	15.63	14.83	12.18	0.00	0.00	0.00
PLEASANT VAL	115.kV	27.00	26.20	24.43	27.00	26.20	24.44	0.00	0.01	0.01
REY HILL	115.kV	18.26	17.29	14.65	18.26	17.29	14.65	0.00	0.00	0.00
Rhinebeck	115.kV	9.10	8.61	7.41	9.10	8.61	7.42	0.00	0.00	0.00
ROCK TAVERN	115.kV	27.43	26.70	24.92	27.43	26.70	24.92	0.00	0.00	0.00
ROCK TAVERN	345.kV	29.21	27.78	22.57	29.21	27.78	22.57	0.00	0.00	0.00
ROSETON	345.kV	35.10	34.06	30.72	35.10	34.09	30.75	0.00	0.03	0.04
RSTWNTERM345	345.kV	37.46	35.76	27.96	37.46	35.79	28.02	0.00	0.03	0.06
SAND DK	115.kV	13.70	13.40	11.98	13.70	13.40	11.98	0.00	0.00	0.00
SHEN	115.kV	18.43	17.86	16.54	18.43	17.86	16.54	0.00	0.00	0.00
SUGARLOAF	115.kV	13.38	12.66	10.82	13.38	12.66	10.82	0.00	0.00	0.00
TIORONDA	115.kV	8.61	8.07	6.78	8.61	8.07	6.78	0.00	0.00	0.00
TODD HILL	115.kV	16.21	15.60	13.41	16.21	15.60	13.42	0.00	0.00	0.00
UNION AV	115.kV	10.92	10.49	8.82	10.92	10.49	8.82	0.00	0.00	0.00
W. BALMVILLE	115.kV	16.05	15.14	12.73	16.05	15.14	12.73	0.00	0.00	0.00
WICOPEE	115.kV	17.32	16.60	14.70	17.32	16.60	14.70	0.00	0.00	0.00

Table 9-5 NYSEG Stations Total Fault Duties (kA)

BULK POWER SUBSTATIONS	LOWEST BREAKER RATING	Without Conjunction Project			With Conjunction Project			INCREMENT		
		3-PH	2-PH	1-PH	3-PH	2-PH	1-PH	3-PH	2-PH	1-PH
WYNANTSKILL 115.kV		19.78	18.80	15.82	19.78	18.80	15.83	0.00	0.00	0.01

Analysis of Con Edison Local Transmission System

10.1 Introduction

This section includes verification of PAR range availability to bring the post-contingency flow of feeders in the underground cable system in NYC below their LTE rating when the NYC Cable interface is at its thermal limit. This analysis was conducted only for the case with the Empire Connection Project in service. It also includes thermal and voltage analysis for W49th St and the In-City load pockets for the sequential loss of Rav 3 and SCS Astoria. Results of the analyses are reported in the sections below and in Appendices Z, CC and DD.

Additionally, a table is included which shows the NYC Cable Interface transfer level at which the PARs between NYC and New Jersey run out of regulating capability. The table includes results for the case with and without the Empire Connection Project in service.

10.2 AC Load Flow Verification of the Thermal Transfer Analysis Limit for the ConEd Cable Interface

In Section 4 the normal and emergency thermal transfer limits for the NYC Cable Interface were found to be, for the two base cases with and without the Empire Connection Project, 6522 MW and 4897 MW, respectively. These limits were calculated using a DC load flow model that inherently assumes unlimited regulating capabilities for the PARs in order to keep the linearity of the network. In this regard, an AC load flow verification of the thermal transfer limit reported in Table 4.1 of Section 4, with the Empire Connection Project in service was conducted.

According to the criteria used to determine the thermal transfer limit for the NYC Cable Interface, the NYC cable system is allowed to operate up to the STE Rating for post-contingency conditions under normal and emergency transfer criteria provided that sufficient PAR range exists to return flows to sub-LTE levels on the underground feeders following a design contingency. Consequently, an AC load flow case was prepared with a flow level of 6522 MW through the NYC Cable Interface with the limiting contingency (E15St 46 345 kV in Table 4.1) applied. All the feeders 138 kV and above in ConEd's service area were monitored for thermal violations by comparing the post-contingency MW flow through the feeders against their LTE Ratings.

The post contingency loading conditions (with the NYC Cable interface transfer level at 6522 MW) indicated the following results:

1. The post contingency flow through several of the 138 kV and 345 kV feeders were less than STE but exceeded their LTE Ratings.
2. The PARs at Goethals 345 kV and Dunwoodie North 138 KV lost their regulating capabilities.

Rescheduling the flows through the PARs at Ramapo, Dunwoodie North and South, Parkchester, Jamaica, and Fresh Kills helped to bring flows through the 138 kV and 345 kV feeders to sub-LTE levels as well as recovering the regulating capabilities of the PARs mentioned above. Details of the flows after PAR rescheduling are also shown in Appendix Z.

In conclusion, sufficient PAR range was available to bring flows to sub-LTE levels on the NYC underground cable system following the loss of the limiting contingency for the NYC Cable Interface as reported in Table 4.1 of Section 4. Results of this analysis are included in Appendix Z.

10.3 Voltage & Thermal Analysis for W49TH ST and In-City Pocket

Contingency evaluation was performed for the sequential outages of the two largest sources of reactive power in the study area. In this study the two worst sequential contingencies were as follows:

1. The loss of the Ravenswood #3 Plant, with Unit 1 at 429 MW and Unit 2 at 542 MW for a total generation of 971 MW.
2. The loss of the SCS Astoria Plant (500 MW)

In the evaluation, an inertial power flow solution was used for the loss of the aforementioned plants. The inertial power flow solves network conditions at half a second following the event, and machine powers are set according to their inertias. The NYISO provided the machine inertia data as included in Appendix EE.

The following steps were taken for the sequential double contingency simulation:

- (a) Loss of the Ravenswood #3 Plant: solve the contingency power flow using INLF activity without any corrective actions (i.e. with transformer taps, phase angle regulators and switched shunts frozen). Check for loading violations (should be less than STE) and voltages violations (should be not less than 0.95 and not more than 1.05) in the Con Edison system.
- (b) Loss of the Ravenswood #3 Plant: based on Case (a), solve the post-contingency power flow with corrective actions. After corrective actions all facilities loading should be restored to within their normal rating and voltages in the Con Edison system should be restored to within the normal ranges as specified in Table 10.1 below.
- (c) Loss of SCS Astoria Plant: based on Case (b), solve the contingency power flow using INLF without any corrective actions (i.e. with transformer taps, phase angle regulators and switched shunts frozen). Check for loading violations (should be less than STE) and voltages violations (should be not less than 0.95 and not more than 1.05) in the Con Edison system.

- (d) Loss of SCS Astoria Plant: based on Case (c): Solve the post-contingency power flow with corrective actions. After corrective actions all facilities loading should be restored to within their normal rating and voltages in the Con Edison system should be restored to within the normal ranges as specified in Table 10.1 below.

Table 10.1 Con Edison System Voltage Criteria (p.u.)

Voltage Level	Voltage Limit for Normal Condition		Voltage Limit for Contingency Condition	
	Low	High	Low	High
345 kV	1.003	1.041	0.95	1.05
138 kV	0.986	1.036	0.95	1.05

10.3.1 Case without the Empire Project (Base Case)

The thermal and voltage analysis results for the non-sequential loss of the Ravenswood #3 and the SCS plants are summarized in two tables as included in Appendix CC:

Thermal table monitoring the loading, normal and contingency (before and after corrective actions) of ConEd 345 and 138 kV transmission lines.

Voltage table monitoring all the ConEd 345 and 138 kV stations under normal and contingency (before and after corrective actions) conditions.

When the Ravenswood #3 Plant was tripped, all monitored branches and stations were within the emergency (post-contingency) thermal and voltage criteria. There were a few overloads and voltage violations under normal criteria following the loss of the plant. In addition, the NYC Cable Interface increased to 4910 MW from 4000 MW or about 910 MW increase. The NYC Cable Interface flow was adjusted back to 4000 MW by increasing the generation in NYC and reducing generation in Upstate New York and in PJM. The overloads or voltage violations were eliminated by corrective measures as follows:

1. Adjustment of In-City phase angle regulators (PARs) and transformer taps.
2. Adjustment of scheduled voltages of certain generators.
3. Re-dispatch of generation outside ConEd's territory
4. Starting of In-City GTs and adjustment of the output of some on line units

With the sequential outage of the SCS Astoria Plant, all monitored branches and stations were within the emergency (post-contingency) thermal and voltage criteria. There were a few overloads and voltage violations under normal criteria following the loss of this unit. These overloads or voltage violations were eliminated by similar corrective actions as those listed above.

Note that the loading tables in Appendix CC show branch MVA flows and MW ratings. The branches with flows exceeding the MW ratings were re-examined in accordance with Con Edison's practice, i.e., ensuring that all MW flows do not exceed the appropriate MW ratings (Rate A, B, or C). The results of such re-examination are also listed in Appendix CC.

Voltages in the voltage table in Appendix CC were checked against Con Edison's Voltage Criteria in Table 10.1 and all values were within limits.

In summary, the corrective actions taken restored branch flows and voltages within the normal (pre-contingency) operating criteria in the base case.

10.3.2 Case with the Empire Project

The thermal and voltage analysis results for the non-sequential loss of the Ravenswood #3 Plant are summarized in two tables included in Appendix DD:

Thermal table monitoring the loading, normal and contingency (before and after corrective actions), of ConEd 345 and 138 kV transmission lines

Voltage table monitoring all the ConEd 345 and 138 kV stations under normal and contingency (before and after corrective actions) conditions.

When the Ravenswood #3 Plant was tripped, all monitored branches and stations were within the emergency (post-contingency) thermal and voltage criteria. There were a few overloads and no voltage violations (under normal criteria following the loss of the plant). In addition, the NYC Cable Interface increased to 5945 MW from 5000 MW or about 945 MW increase. The interface flow was adjusted back to 5000 MW by increasing the generation in NYC and reducing generation in Upstate New York. The overloads or voltage violations were eliminated by corrective measures as follows:

5. Adjustment of In-City phase angle regulators (PARs) and transformer taps.
6. Adjustment of scheduled voltages of certain generators.
7. Re-dispatch of generation outside ConEd's territory
8. Starting of In-City GTs and adjustment of the output of some on line units

With the non-sequential outage of the SCS Astoria Plant, all monitored branches and stations were within the emergency (post-contingency) thermal and voltage criteria. There were a few overloads and voltage violations under normal criteria following the loss of the second unit. These overloads or voltage violations were eliminated by similar corrective actions as those listed above.

Note that the loading table in Appendix DD show branch MVA flows and MW ratings. The branches with flows exceeding the MW ratings were re-examined in accordance with Con Edison's practice, i.e., ensuring that all MW flows do not exceed the appropriate MW ratings (Rate A, B, or C). The results of such re-examination are also listed in Appendix DD.

Voltages in the voltage table in Appendix DD were checked against Con Edison's Voltage Criteria in Table 10.1 and all values were within limits.

In summary, the corrective actions taken restored branch flows and voltages within normal (pre-contingency) operating criteria. Thus, the Empire Connection Project does not have a negative impact on the thermal and voltage performance of ConEd local transmission system.

10.4 Effect of the Empire Connection Project on Con Edison – PJM 1000 MW Wheeling

According to the scope of work for the Empire Connection Project approved by TPAS on September 10, 2003 the effect of the Empire Connection Project on the phase-shifted tie lines regulating the 1000 MW wheeling contract between Con Edison and PSE&G was evaluated in this SRIS. These phase-shifted tie lines have the following settings in the base cases with and without the Empire Connection Project:

1. The Goethals 345 kV PAR is set to 100 MW
2. The two Hudson - Farragut 345 kV PARs are set to 450 MW each.

The objective of this analysis is to find the NYC Cable Interface transfer levels at which the PARs mentioned above will not have sufficient angle to hold the scheduled flows. These loading levels are evaluated for each of the phase angle regulated ties in the base case and in the case with the Empire Connection Project in service. The results are summarized in Table 10.2.

Table 10.2 Loading Levels at which the PARs Lose Controlling Capability

LF Case	NYC Cable Loading Level (MW)	G1* Angle (Degrees)	F1** Angle (Degrees)	F2*** Angle (Degrees)
Base Case Empire Connection (O/S)	3236 (BC1)	-4.8	1.5	2.0
	4727	-25(L)		
	5858			30.0(H)
	5943		30.0(H)	
Base Case Empire Connection (I/S)	4350 (BC2)	0.0	1.3	1.5
	6093	-25(L)		
	7093		30.0(H)	30.0(H)

G1*: 345 kV PAR at Goethals.

F1**: PAR1 at Farragut (Hudson1 – Farragut1 345 kV)

F2***: PAR2 at Farragut (Hudson2 – Farragut2 345 kV)

(BC1): Base case flow through the NYC Cable Interface with the Empire Connection Project out of service.

(BC2): Base case flow through the NYC Cable Interface with the Empire Connection Project in service.

(L): Low Angle Limit

(H): High Angle limit

As shown in Table 10.2 the following observations can be made:

1. In both base cases (BC1 and BC2) with and without the Empire Connection Project, the 345 kV PARs at Goethals and Farragut were regulating.
2. The PARs run out of regulating capability at a higher transfer level through the NYC Cable Interface in the case with the Project than in the case without the Project.
3. In the base case with the Empire Connection Project out of service the 345 kV PAR at Goethals loses its regulating capability at a transfer level of approximately 4727 MW through the NYC Cable interface while in the case with the Empire Connection Project in service it loses its regulating capability at a transfer level of approximately 6093 MW.
4. The same conclusion holds for the two 345 kV PARs at Farragut. In the base case without the Empire Connection Project PAR1 and PAR2 at Farragut start losing their regulating capabilities at transfer levels through the NYC Cable Interface of approximately 5943 MW and 5858 MW, respectively. With the Empire Connection Project in service, both PARs lose their regulating capability at a transfer level through the ConEd Cable Interface of approximately 7093 MW.

Conclusions

The results of the SRIS show that the performance of the New York Bulk Power System (NYBPS) is not degraded by the interconnection of Conjunction LLC's 2,000 MW HVDC Empire Connection Project (Empire Connection Project):

1. For the transfer analysis the results show that the thermal transfer limits for the intra NY State interfaces under study were substantially increased with the Empire Connection Project in service. The transfer limits of the NY-PJM and the NY-NE interfaces (both directions) are not substantially affected by the Empire Connection Project.
2. For the PV voltage transfer analysis the results show that the voltage-constrained transfer limits for all the interfaces under study (Central East, Total East, UPNY-ConEd and NYC Cable Interface) were substantially increased with the Empire Connection Project in service.
3. For the stability transfer analysis for the summer case, the simulation was run for the same set of interfaces used for the voltage transfer analysis. The interfaces were loaded to test levels which represent ten percent above the more restrictive of the emergency thermal or voltage limits. The results show that with the Empire Connection Project in service the dynamic performance of the NYBPS was not degraded and for the set of contingencies used to test the interfaces the system response was stable and positively damped.
4. For the steady state extreme contingency analysis the results show that the Empire Connection Project does not degrade the system's response under these extreme contingencies. Similarly, the results of the dynamic simulations under extreme contingency conditions also indicate that the Empire Connection Project does not degrade the dynamic response of the system due to these tested extreme contingencies.
5. For the light load dynamic simulation the results show that the Empire Connection Project does not degrade the dynamic response of the NYBPS for the contingencies tested under light load conditions.
6. The short circuit calculation indicates that for unbalanced fault currents the Empire Connection Project causes an increase in the total short circuit currents of some of the stations reported. However, none of the stations (where breaker ratings are available) are over-dutied compared to the lowest breaker ratings. Three phase short circuit currents were not affected, since the HVDC delta-wye-grounded converter transformers only affect unbalanced faults. Therefore the Project has no negative impact on the station duties in the system under study.
7. For the contingency analysis conducted for Central Hudson and Con Edison local transmission systems the analysis indicates that the Empire Connection Project does not have any adverse impact on Central Hudson and ConEd's local transmission systems.

8. Study results (Addendum Report "AC Contingency Analysis for National Grid Central 115 kV System", dated March 11, 2004) indicate overloading of some local 115 kV lines in Niagara Mohawk's system for certain conditions both pre and post Empire Connection project, as a function of local generation dispatch. These concerns must be addressed prior to completion of interconnection studies for the Empire Connection project.

9. Finally, critical clearing time calculations were conducted for substations in NYPA, Niagara Mohawk and ConEd systems. The results of the critical clearing time show no adverse impact of the Empire Connection Project on existing settings at those substations.

All analysis conducted throughout this SRIS was conducted with the Empire Connection Project transferring power only from Upstate New York to NYC. Nevertheless, the Project has the capability to transfer power in the opposite direction as well. Studies will be required prior to utilizing the project to transfer power from south to north should such operation be desired in the future.

It is noted that the NYC Cable Interface is not presently voltage constrained but was in this case due to Poletti and IP#3 being uncommitted in the base case and for the case with the Project in service. A sensitivity analysis with those units committed showed that the NYC Cable Interface reverted to being thermally constrained.