

**Extract of historic documents from the NYISO website
pertaining to the Astoria West Station Fault Current Issue**

Compiled by NRG for BIC – 10-10-07

The following pages are a compilation of materials taken from documents posted on the NYISO's website that provide background information and history concerning the identification of the Astoria West overduty breaker condition. These documents show that the need to replace the breakers was known and scheduled for replacement in 2001. Furthermore, the NYPA SRIS, which was conducted by Con Edison to assess the feasibility and consequences of interconnecting all three generating units of the NYPA combined cycle unit to the Astoria West 138kv substation, assumed *“all implements of the “Class of 2001 Fault Current Mitigation Plan”, as formulated by Con Edison in its ATRA submittal to the NYISO.”*

- June 2001 Fault Current Management Plan
- June 2001 Fault Current Management Plan – Appendix A
- October 2001 Fault Current Management Plan presentation to TPAS/IITF
- April 2002 SRIS for the Astoria West interconnection of the NYPA Combined Cycle Unit

FAULT CURRENT MANAGEMENT PLAN

June 2001

Consolidated Edison Company of New York, Inc.
Transmission Planning
4 Irving Place
New York, NY 10003

Executive Summary

• **Management Plan Description**

The proposed interconnection of new generating units to the Con Edison transmission system would result in fault currents that exceed the interrupting capability of existing circuit breakers at various Con Edison Bulk Power Substations. For the purpose of mitigating these fault currents to acceptable levels, a fault current management plan (the Plan) has been developed. The Plan consists of the following system upgrades:

- Installing a series reactor in each of these 345 kV feeders: M51, M52, 71 and 72.
- Installing a series reactor in Feeder 15055 (138 kV feeder).
- Installing a bus tie series reactor at the 138 kV Corona Substation.
- Installing a bus tie Phase Angle Regulator at the 138 kV Astoria East Substation.
- Moving the interconnection point of Hell Gate distribution transformers 1 and 4 from the current two Astoria East feeders to two Astoria West feeders.
- Replacing two 345 kV, thirty-eight 138 kV and twelve 69 kV circuit breakers.

• **Conclusions**

All study work was performed in accordance with the NPCC Basic Criteria, the NYSRC Reliability Rules, and the Con Edison System Transmission Design and Operating Criteria.

The study conclusions are as follows:

• **Fault Duty Analysis**

The Plan will permit the interconnection of approximately 8,200MW of new generation to the Con Edison system (of which approximately 5,500MW are located in-City) by keeping fault current levels below the rated interrupting capability of circuit breakers at all 345kV, 138kV, and 69kV Con Edison transmission substations.

• **Thermal and Voltage Analysis**

Power flows for normal system conditions can be controlled within applicable ratings through normal operating procedures (this may result in some bottled up generating capacity in the In-City load pocket). Power flows on all transmission feeders are also within applicable circuit ratings following first and second contingency conditions. The same can be said about the voltage performance at all transmission substations.

FAULT CURRENT MANAGEMENT PLAN

APPENDIX A

FIGURES AND TABLES

June 2001

Consolidated Edison Company of New York, Inc.
Transmission Planning
4 Irving Place
New York, NY 10003

Table No. 2
List of 38-138kV Circuit Breakers Requiring Replacement

Station Name	Breaker No.	Breaker Rating (kA)
Astoria East	1E	45
Astoria East	2W	45
Astoria East	7E	45
Astoria East	BT	45
Astoria West	1N	45
Astoria West	1S	45
Astoria West	2N	45
Astoria West	2S	45
Astoria West	8N	45
Astoria West	8S	45
Astoria West	9N	45
Astoria West G	G1N*	45
Astoria West G	G2N*	45
Astoria West G	G4-WN*	45
Astoria West G	G4-WS*	45
Astoria West G	G5-WN*	40
Astoria West G	G5-WS*	40
Greenwood	4S	45
Greenwood	BT	45
Queensbridge	10E	45
Queensbridge	11E	45
Queensbridge	14E	45
Queensbridge	1E	45
Queensbridge	2E	45
Queensbridge	3E	45
Queensbridge	4E	45
Queensbridge	5E	45
Queensbridge	6E	45
Queensbridge	7E	45
Queensbridge	8E	45
Queensbridge	9E	45
Sherman Creek	3W	40
Sherman Creek	4E	40
Sherman Creek	5E	40
East 13 Street	F4	40
East 13 Street	F5	40
East 13 Street	F12	40
East 13 Street	BT11-1	40

<p>* These circuit breakers are owned and operated by Orion.</p>
--

Con Edison System
Fault Current
Management Plan
Presentation At The
NYISO Joint TPAS/IITF Meeting

October 4, 2001

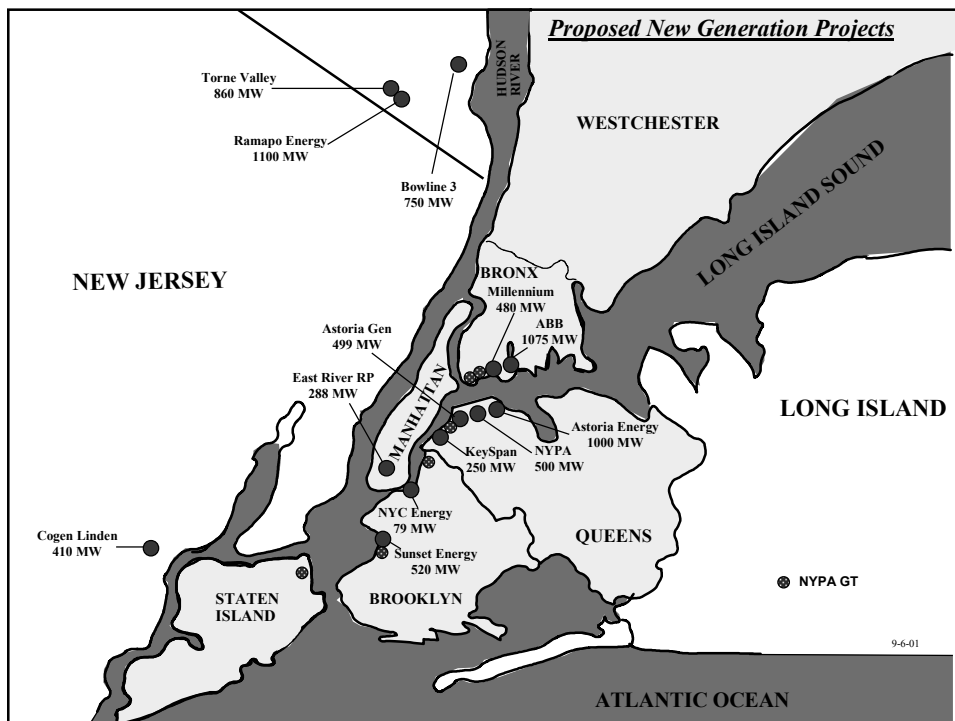
Scope

- Definition of Problem
- Existing Conditions
- The Plan
- Review Process
- Class Year 2001
- Next Steps

Definition Of Problem

- Interconnection of New Generation⁽¹⁾
 - In-City 5500 MW
 - Out-of-City 2700 MW
- Increased Fault Duties
 - 345 kV System
 - 71 kA
 - Existing Breaker Capabilities: 40/63 kA
 - 138 kV System
 - 83 kA
 - Existing Breaker Capabilities: 40/45/63 kA

(1) Includes the GTs that NYPA installed for Summer 2001. Does not reflect the reduction in projected capacity of the Torne Valley Project. 3



Existing Conditions

- 345 kV System
 - All Breakers Within Capability
- 138 kV System
 - All Breakers Within Capability
 - Except
 - Astoria West: 6 Breakers
 - Queensbridge: 1 Breaker
 - » Two breakers have been replaced.
 - » Five breakers are scheduled to be replaced in 2001.

5

The Plan⁽¹⁾

- 345 kV System
 - 2% Series Reactors in Feeders M51/52 and 71/72
 - Replace 2 Breakers at Ramapo
- 138 kV System
 - 5% Series Reactor in Feeder 15055
 - Reconnect Hell Gate Transformers No. 1 and 4
 - Phase Angle Regulator in Bus Tie at Astoria East
 - 5% Bus Tie Reactor at Corona
 - Replace 38 Breakers at Various Substations⁽²⁾
- 69 kV System
 - Replace 12 Breakers at East River

(1) Bypass switches will be installed for each series reactor and the phase angle regulator.

(2) Includes six breakers at Astoria West that are owned and operated by Orion and require replacement.

6

Cost Estimates⁽¹⁾

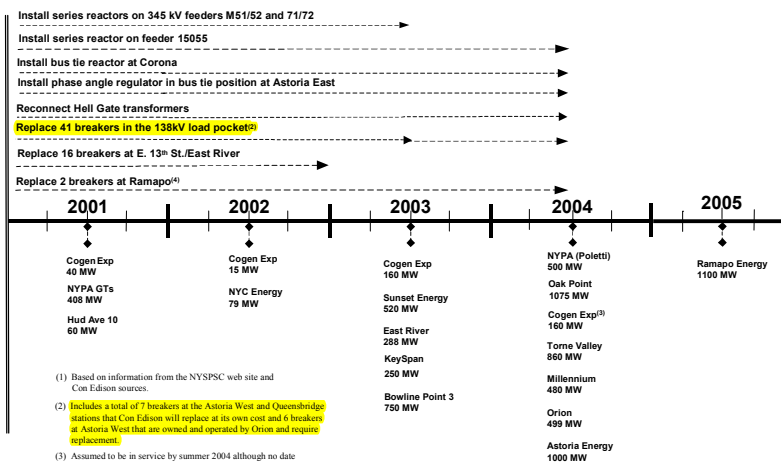
(\$ Million)

• Series Reactors (Feeders M51/52 & 71/72)	43.8
• Series Reactor (Feeder 15055)	2.9
• Reconnect Hell Gate Transformers	2.2
• Phase Angle Regulator At Astoria East	10.2
• Bus Tie Reactor At Corona	2.5
• Breaker Replacement	
– Two 345 kV	1.7
– Thirty Eight 138 kV	17.2 ⁽²⁾
– Twelve 69 kV	<u>4.8</u>
Total	85.3

- (1) Fully loaded escalated costs. Do not include costs of environmental remediation, if required.
 (2) Does not include the cost of replacing six breakers at the Astoria West station that are owned and operated by Orion.

Milestone Schedule

Revised Service Dates⁽¹⁾



Note: The Developers' Projects are assumed to be in service by the summer of the specified year.

System Reliability Impact Study

For

**NYPA's 500 MW Combined Cycle Generation Project at Poletti
(Alternative interconnection to Astoria West)**

April 8, 2002

Prepared by:

**Consolidated Edison Company of New York, Inc.
Planning and Engineering
4 Irving Place
New York, NY 10003**

The peak summer base case was developed with the objective of maximizing the dispatch of (existing and proposed) generation in the Astoria pocket, without violating any thermal/voltage constraint imposed by normal operating conditions. Subsequently, contingency conditions were evaluated to ensure that the appropriate contingency ratings are not violated. Due to fault duty concerns at the Astoria West bus, only Orion's unit #3 is dispatched with all three NYPA's units (the Project) at Astoria West. Orion's units # 2, 4, and 5, plus all SCS Energy generating units were represented as interconnected to the Astoria East bus. Finally, in order to mitigate fault over-duty conditions on the Con Edison system, due to the Class of 2001 projects (including the Project), the base representation for the Con Edison system was modified to include all implements of the "Class of 2001 Fault Current Mitigation Plan", as formulated by Con Edison in its ATRA submittal to the NYISO.

- **Design Criteria and Methodology** – The Con Edison System Transmission and Operating Criteria dictates that the post-contingency loading of underground cables can exceed their LTE 3-hour rating (but not to exceed their STE ratings), provided that 10-minute generation reserve and/or phase shifter control are adequate to reduce loadings on all other facilities to their Normal ratings within the appropriate time frame. These Criteria must be met following a first and then a second contingency. Additionally, corrective actions following each contingency must be adequate in restoring all facilities to pre-contingency voltage and thermal ratings.
- **Results and Observations** – The total (existing and proposed) available generation in the pocket amounts to approximately 3500 MW, and includes:
 - 1250 MW from Orion's Astoria units # 2, 3, 4, 5
 - 625 Mw from NRG's Astoria GTs

- 160 MW of NYPA GTs to Hell Gate
- 1000 MW of SCS Energy to Astoria East
- 500 MW from the Project to Astoria West

The combined outlet capacity of the Astoria West and East 138 kV Substations totals approximately 3200 MW, and consists of:

- the six Astoria East – Corona feeders (6x154 MW)
- the two Astoria East – East 179th Street feeders (2x161 MW)
- 400 MW of North Queens load supplied radially from Astoria East
- the four Astoria West – Hell Gate/Bruckner feeders, two of which are radial (2x177 MW, and 2x148 MW). A third radial feeder is a stand-by feeder for the spare area station transformer #5, one each at the Hell Gate and Bruckner area stations.
- the four Astoria West – Queensbridge feeders (2x154 MW, and 2x308 MW)

Analysis shows that approximately 800 MW of generation could be bottled up at the Astoria East bus, due to limited transmission capacity in the pocket. It is also noted that the aforementioned amount of bottled up generation would be substantially larger if the Project were to be integrated into the Con Edison system via the previously proposed interconnection scheme. **As NYPA is now proposing to interconnect all three units to the Astoria West bus, its full generating capacity will not**

be curtailed due to transmission constraints in the pocket. In fact, the existing outlet transmission capacity of the Astoria West bus (1575 MW, per the above list) is adequate to accommodate the entire amount of generation interconnected to this bus (355 MW of Orion's Astoria #3, 500 MW of the Project, plus 87 MW from existing GT generating units owned by NRG).

As the Astoria load pocket is designed for second contingency, simulations were performed to evaluate the combined, non-simultaneous, effect of the two largest contingencies in the pocket: the loss of Orion's Astoria # 4 and #5, each rated at 361 MW. All thermal loadings and voltage levels in the Astoria pocket, pre-disturbance and after each contingency are within the Con Edison Design Criteria (please refer to the attached one-line diagrams). The results of the thermal and voltage analysis are summarized on Tables 1 and 2, respectively.