OPERATING PROTOCOL FOR AND COMPENSATION OF THE CROSS SOUND CABLE FOR THE PROVISION OF DYNAMIC REACTIVE POWER SUPPORT UNDER SCHEDULE 2 TO THE ISO OATT

1. Purpose. The purpose of this document is to establish the Operating Protocol ("Protocol") defining the requirements that shall allow the Cross Sound Cable Merchant Transmission Facilities ("CSC") to receive compensation for its provision of reactive power voltage support services from its dynamic reactive power equipment located at the Halvarsson Converter Station, under Schedule 2 – Reactive Supply and Voltage Control from Qualified Reactive Resources Service ("Schedule 2") of the ISO New England, Inc. ("ISO-NE") Open Access Transmission Tariff ("OATT"). The OATT is in Section II of the ISO-NE Transmission, Markets and Services Tariff, FERC Electric Tariff No. 3 ("ISO-NE Tariff"), as amended from time to time.

2. Ownership and Operational Control. CSC is owned, operated and maintained by Cross-Sound Cable Company, LLC ("CSC LLC"). As of the effective date of this agreement, it is recognized by CSC LLC and ISO-NE ("the Parties" or individually "Party") that ISO-NE has operational control over the CSC pursuant to Section II.48.7(c) of the ISO-NE Tariff.

3. Term. The Protocol set forth herein shall become effective on May 1, 2007, and shall remain in effect until such time as the CSC LLC ceases to provide and seek compensation for dynamic reactive power support pursuant to Schedule 2 of the OATT, or fails to comply with the criteria for the eligibility for compensation for the dynamic reactive power support set forth in Schedule 2 of the OATT and the ISO New England Ancillary Service No. 2 Business Procedures ("Schedule 2 Business Procedure"). Any suspension of the CSC under the Schedule 2 Business Procedure Capacity Cost Compensation Program shall not cause a termination of this Protocol.

The termination of this Protocol shall terminate the compensation of CSC under Schedule 2 of the OATT but shall not terminate CSC LLC's obligations under the ISO-NE Tariff, CONVEX Operating Instruction #0202 – Halvarsson – Tomson 481 Line ("COI") (attached hereto as Exhibit A), and the Interconnection Agreement between The United Illuminating Company and CSC LLC, dated January 4, 2006, FERC Docket No. ER03-31-000.[1]

4. Description of CSC's Non-Generator Dynamic Reactive Power Equipment. CSC is a High Voltage Direct Current Cable Transmission Facility that utilizes voltage source converter ("VSC") technology in its converter stations. The VSC technology provides independent Static Var Compensator functionality at each of its converter stations. Each converter can maintain and dynamically support the AC system voltage through fast control of the reactive power exchange. The reactive power exchange is handled independently at each of the converters in Connecticut and Long Island. This Protocol pertains to the operation and performance of the CSC Halvarsson Converter Station (located in New Haven, CT) that allows

[1] The CONVEX Local Control Center, pursuant to Section 3.06 of the Transmission Operating Agreement, has the right and responsibility to implement the instructions, orders and directions received from the ISO in the exercise of its Operating Authority, and perform the certain functions in accordance with applicable ISO New England Operating Documents.

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CSC to receive Schedule 2 compensation for the reactive supply and voltage control services provided by the CSC.

5. Operating Authority. The CSC's dynamic reactive power/AC voltage control equipment at the Halvarsson Converter Station shall remain subject to the operating authority of ISO-NE as required in Section II.B(4) of Schedule 2 of the OATT and consistent with Section II.48.7 of the ISO-NE Tariff. Consistent with its operating authority, ISO-NE shall develop any modifications to this Protocol that it may deem necessary or appropriate in coordination with CSC LLC. In the event that ISO-NE and CSC LLC disagree about such modifications to this Protocol, ISO-NE and CSC LLC may resolve such dispute pursuant to the dispute resolution process set forth in Section I.6 of the ISO-NE Tariff.

6. Operating Instructions. The ISO New England Operating Documents and the COI shall serve as the principal set of operating criteria for the CSC dynamic reactive power/AC voltage control equipment at the Halvarsson Converter Station *provided that* in the event of a conflict between the terms of the ISO New England Operating Documents, COI and this Protocol, the ISO New England Operating Documents shall govern the operation of the Halvarsson Converter Station for purposes of providing dynamic reactive capability and voltage support to the New England Transmission System (as defined in Section II.1.85 of the ISO-NE Tariff). The following terms hereby supplement the COI with respect to operation of the CSC reactive equipment at the Halvarsson Converter Station:

a. The CSC LLC shall implement the instructions, orders and directions received from the Connecticut Valley Exchange ("CONVEX") Local Control Center ("LCC") and/or ISO-NE for the purpose of:

(1) providing voltage and reactive support from the Halvarsson Converter Station equipment to the New England Transmission System (within the capability of the Halvarsson Converter Station equipment); and

(2) coordinating with the CONVEX LCC and ISO-NE on the development of settings for the Halvarsson Converter Station reactive capability and operation.

(a) Halvarsson Converter SCADA Information and Operating Modes

i. SCADA Information. CSC LLC provides the following SCADA information for Halvarsson Converter to both the CONVEX LCC and ISO-NE via the Inter Control-Center Communications Protocol (ICCP) Link:

ANALOG SIGNALS
Active Power (MW)
Reactive Power (MVar)
Reactive Power Set Point (MVar)

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Voltage Control Set Point 3-Phase (kV)
Line Voltage 1-Phase A,B&C (kV)

DIGITAL SIGNALS (ON/OFF)
Converter Blocked
Converter Deblocked
Reactive Control Mode
Voltage Control Mode

ii. Halvarsson Converter Station Operating Modes:

Converter Blocked ("Blocked") – The converter station is energized, but not operational. The Reactive and Voltage Control Modes are not available, and the station provides 28-30 MVar to the New England Transmission System.

Converter Deblocked ("Deblocked") – The converter is operational and both the Reactive and Voltage Control Modes are available.

Reactive Control Mode – The converter station controls reactive power exchange with the New England Transmission System to a fixed MVar level at the Reactive Power Set Point.

Voltage Control Mode – The converter station controls reactive power exchange with the New England Transmission System continuously adjusting the MVar level, within the MVar capability of the converter station, in order to maintain the Voltage Control Set Point.

iii. Active Power Transfers flowing on the CSC during the real-time operating day that are greater than 0 MW in either direction: When the Halvarsson-Tomson 481 Line is in-service for active power transfers greater than 0MW, the CSC LLC shall operate the Halvarsson Converter in a manner to maintain the nominal scheduled steady-state voltage at the point of interconnection at 357 kV. Normally, the Halvarsson Converter will be operated in the Voltage Control Mode with a Voltage Control Set Point of 357 kV. The station control system will automatically supply or absorb MVar, within the MVar capability of the converter station, to maintain a line voltage of 357 kV. CONVEX LCC may request the CSC LLC to adjust the Voltage Control Set Point, or change to the Reactive

Control Mode and enter a Reactive Power Set Point to supply/absorb a specific amount of MVar.

iv. Active Power Transfer Schedule of 0MW during the real-time operating day. When the Halvarsson-Tomson 481 Line active power transfer schedule is 0 MW, the CSC LLC will call the CONVEX LLC and request authorization to Block the Halvarsson Converter. When the Halvarsson Converter is Blocked, approximately 28-30 MVar will be supplied to the New England Transmission System. If the 28-30MVar supplied to the New England Transmission System will contribute to high voltage problems on the New England Transmission System and/or the CONVEX Transmission System, the CONVEX LCC will request that CSC LLC keep the Halvarsson Converter Deblocked in the Reactive Control Mode and regulate the Reactive Power Set Point to 0 MVar.

v. Request for Dynamic Reactive Power/Voltage Support at 0MW Active Power Transfer during the real-time operating day.

If the CONVEX LCC determines that Dynamic Reactive Power/Voltage Control Support from the CSC Halvarsson Converter Station is necessary to support voltage on the New England Transmission System when CSC has an active Power Transfer Schedule of 0 MW, the CONVEX LCC will request that CSC LLC Deblock the Halvarsson Converter (if necessary), set the Converter to the Voltage Control Mode and enter a Voltage Control Set Point of 357 kV or other value as determined appropriate by the CONVEX LCC.

b. CSC LLC will respond to all reactive power/AC voltage control dispatching instructions for the Halvarsson Converter Station that are made by the CONVEX LCC or ISO-NE pursuant to the ISO New England Operating Documents, the COI and this Protocol.

c. The CONVEX LCC and CSC LLC shall coordinate with ISO-NE with respect to voltage reduction measures and subsequent restoration and voltage/VAR control actions by the Halvarsson Converter Station which are necessary during system emergencies. Any such emergency measures shall be directed by ISO-NE in coordination with the CONVEX LCC and in accordance with applicable NERC/NPCC requirements. An emergency communications plan shall be maintained for purpose of communications between ISO-NE, CSC LLC and CONVEX LCC (the primary real-time dispatching authority over the CSC reactive power/AC voltage control equipment) regarding the direct

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communications between CSC LLC and ISO-NE for dispatch of reactive power/AC voltage support from the Halvarsson Converter Station during emergency conditions.

d. In directing the operation of the CSC reactive power/AC voltage control equipment at the Halvarsson Converter Station, neither CONVEX LLC nor ISO-NE shall direct the reduction of scheduled megawatt ("MW") loading over the CSC for the specific purposes of obtaining additional dynamic reactive capability from the Halvarsson Converter Station.

e. ISO-NE shall include the CSC and the reactive capability of the Halvarsson Converter Station in its security analyses for the New England Transmission System. The modeling and inclusion of the CSC and the Halvarsson Converter Station in the security analysis by ISO-NE shall be in accordance with facility ratings established by CSC LLC in collaboration with the CONVEX LCC and ISO-NE.

7. Requirements under Schedule 2 of the ISO-NE OATT and the ISO New England Ancillary Service No. 2 Business Procedures.

All qualification and testing provisions (including testing periods and submittal of supporting NX-12D data) currently applied to Generators in the Schedule 2 Business Procedure shall apply to CSC with the following exceptions. The Schedule 2 Business Procedure shall be modified to recognize these exceptions.

CSC LLC shall perform its initial leading and lagging reactive capability tests for the CSC under the Capacity Cost Compensation Program during the applicable 2007 Reactive Capability Testing Periods.

CSC LLC shall submit data reflecting CSC reactive capability of the Halvarsson converter terminal over the full MW transfer loading range. The CSC full MW transfer loading range covers the CSC external node (.I.SHOREHAM138 99 (Location ID 4014)) being loaded between (a) 330 MWs of energy flowing from New England to New York; and (b) 346 MWs of energy flowing from New York to New England;

CSC LLC shall perform lagging reactive capability (MVar supply) testing of the Halvarsson converter terminal during hours in which the CSC is scheduled at its full MW transfer loading is in the southward direction. CSC's full MW transfer loading in the southward direction is achieved when the total net sum of external transactions submitted by Market Participants and scheduled by the ISO in the ISO Real-time Energy Market at the CSC external node (.I.SHOREHAM138 99 (Location ID 4014)) results in 330 MWs of energy flowing from New England to New York. The target lagging reactive capability value during these tests is 40 MVar, which shall be the basis of the CSC lagging capability as submitted in the NX-12D. The 330MWs flow would be considered to be the equivalent of the S-SCC value used by Generators; and

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CSC shall perform leading reactive capability (MVar absorption) testing of the Halvarsson converter terminal during hours in which the Halvarsson Converter Station is Deblocked and the total net sum of external transactions submitted by Market Participants and scheduled by the ISO in the ISO Real-time Energy Market at the CSC external node (.I.SHOREHAM138 99 (Location ID 4014)) results in zero ('0') MWs of energy flowing on the CSC. The target leading reactive capability value during these tests is -150 MVar, which shall be the basis of the CSC leading capability as submitted in the NX-12D. The 0 MW flow would be considered to be the equivalent of the EcoMin value used by Generators.

8. AVR Control Mode Telemetry. Automatic voltage regulator and control mode telemetry for the CSC shall be provided to ISO-NE and the CONVEX LCC consistent with the procedures and criteria set forth in the ISO New England Operating Documents, including, but not limited to, Schedule 2 of the ISO OATT, and the Schedule 2 Business Procedure, ISO New England Operating Procedure No. 18 and Section III-C-1 of the COI.

IN WITNESS WHEREOF, ISO-NE and CSC LLC have caused this Protocol to be executed in duplicate originals, each of which shall constitute and be an original effective Protocol between the Parties, effective the first day of May, 2007 by their duly authorized officers.

ISO NEW ENGLAND, INC.

By: _____

Name: Stephen G. Whitley

Title: Senior Vice President & Chief Operating Officer

CROSS SOUND CABLE COMPANY, LLC

By: _____

Name: Bradley D. Railing, P.E.

Title: Chief Operating Officer

Exhibit A

CONVEX Operating Instruction #0202 – Halvarsson – Tomson 481 Line

BSR

THE CONNECTICUT
VALLEY ELECTRIC
EXCHANGE

3333 Berlin Turnpike
Newington, CT 06111

CONVEX - 3333
P.O. Box 270
Hartford, CT 06141-0270

PHONE: (860) 665-4986

March 2, 2005

To: Cross Sound Cable LLC, Westborough, MA (5)
ISO-NE
NYISO
Distributed Resource Management, KEYSPAN Electric Services LLC
Manager ESO, KEYSPAN Electric Services LLC
Chief System Operator, Long Island Power Authority
UI Process Owner-Operate the Electric System, Shelton (6)
Director-NU Transmission Maintenance, Berlin-3333 Building
Manager-NU Transmission Substation Engineering and Design, Berlin-East
Manager-NU Transmission Test, Berlin-3333 Building
Manager-NU Transmission Construction, Test, & Maintenance, CL&P- Berlin-3333 Building
Manager-CONVEX Operations, CONVEX, Berlin-3333 Building (4)

From: Roger McBeth RM/cak
CONVEX – (Ext. 4986)

Subject CONVEX Operating Instruction # 0202 - Halvarsson-Tomson 481 Line

The above subject CONVEX Operating Instruction has been produced due to the Halvarsson Converter Station 14P and the Halvarsson-Tomson 481 Line being connected to the Transmission System.

Please file this copy of the CONVEX Operating Instruction 1st Issue 08-13-04.

PB/cak
Attachment

cc: 481 Line OI File, CONVEX

THE CONNECTICUT VALLEY ELECTRIC EXCHANGE

1st Issue Date: 08/13/04

CONVEX OPERATING INSTRUCTION # 0202 – Halvarsson-Tomson 481 Line

TO: CONVEX System Operations Supervisor, Cross Sound Cable LLC Control Center, United Illuminating Company (UI) System Operations Supervisors, Senior System Operators of KEYSPAN Electric Services LLC, KEYSPAN Electric Services LLC, ISO-NE Pool Coordinators, NYISO System Operators, Qualified Persons at Halvarsson Converter Station 14P, and Qualified Persons at 8ZN Tomson Converter Station

EFFECTIVE: Immediately

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SECTION PAGE

SUMMARY OF CHANGES

Revised Date	Affected Pages	Reason for Change

I. OWNERSHIP, MAINTENANCE, AND OPERATION

Cross Sound Cable LLC (CSC) owns, maintains, and operates the Halvarsson-Tomson 481 Line, the Halvarsson Converter Station 14P up to and including the 387-14P-5 MOD, and the 387-14P-9 ground switch and the 8ZN Tomson Converter Station up to and including the 1314 MOD.

CSC will operate the Halvarsson Converter Station 14P and the 8ZN Tomson Converter Station from the CSC Control Center via the Remote Operator Work Stations for each Converter Station.

The Long Island Power Authority (LIPA) owns and maintains the equipment from the 138kV AC System up to the hinge-side of the 1314 MOD at the 8ZN Tomson Converter Station.

The United Illuminating Company (UI) owns and maintains the equipment from the 345kV AC System up to the jaw-side of the 387-14P-5 MOD at Halvarsson Converter Station 14P.

II. DISPATCHING JURISDICTION

The CSC Control Room Operator has control authority of the Halvarsson-Tomson 481 Line, the Halvarsson Converter Station 14P up to but not including the 387-14P-5 MOD and the 387-14P-9 ground switch, and the 8ZN Tomson Converter Station, up to and including 1314 MOD.

Any communication concerning the operation of CSC equipment will be made with the CSC Control Room Operator using the contact list in Appendix III - Communications. CSC will coordinate the converter stations and Halvarsson-Tomson 481 Line outage requests for CSC work.

The CONVEX System Operations Supervisor is the dispatching authority for the Connecticut Transmission System (United Illuminating and Connecticut Light and Power), and has dispatching jurisdiction of the East Shore-Halvarsson Converter Station-Scovill Rock 387 Line up to and including the 387-14P-5 MOD and the 387-14P-9 ground switch at Halvarsson Converter Station 14P. This includes associated dc control, ac supply, switches, relays, and metering. (See Appendix I - Diagram of Connections for limit of CONVEX Switching and Tagging Jurisdiction.)

Any communication concerning the operation of CONVEX equipment will be made with the CONVEX System Operations Supervisor using the contact list in Appendix III - Communications. The CONVEX System Operations Supervisor coordinates the East Shore-Halvarsson Converter Station-Scovill Rock 387 Line outage requests for UI and CL&P work.

The Senior System Operator of KEYSPAN controls the LIPA Transmission System and has control authority of the 138-892 Circuit up to but not including the 1314 MOD at 8ZN Tomson Converter Station. (See Appendix I-Diagram of Connections for limit of KEYSPAN control authority.)

Any communication concerning the operation of LIPA equipment will be made with the Senior System Operator of KEYSPAN using the contact list in Appendix III - Communications. The System Work Coordinator of KEYSPAN coordinates the138-892 Circuit outage requests for LIPA work.

Dispatch Orders for Power Scheduling and Power Changes on the Halvarsson-Tomson 481 Line will be provided to the CSC Control Room Operator by ISO-NE in accordance with Appendix III - Communications.

The Point of Delivery, or Point of Net Interchange, for Power Scheduling and Power Changes will be the 138kV Metering Point at the Tomson Converter Station. This is also the Revenue Metering Settlement point for power transactions on the transmission line (Refer to Section III - D 'Synchronizing, Metering, Relaying, and Indicating Potential).

- A sale to New York, power flow from Connecticut to New York, is considered Export and shall be scheduled as Positive Net Interchange from 0 to 330 MW.

- A purchase from New York, power flow from New York to Connecticut, is considered Import and shall be scheduled as Negative Net Interchange from 0 to -346 MW.

III. NORMAL OPERATION

The Halvarsson-Tomson 481 Line is a HVDC interconnection between Connecticut and New York. It is connected to the Halvarsson Converter Station 14P located in New Haven, Connecticut, and the 8ZN Tomson Converter Station located in Shoreham, New York. It will be operated in conformance with published procedures established by ISO-NE, NYISO, and CONVEX.

A. Normal Connections

1. Halvarsson-Tomson 481 Line

a. The 14P-WP1-Q11 and the 14P-WP2-Q11 will be closed and connected to the Halvarsson-Tomson 481 Line at the Halvarsson Converter Station 14P. The 14P-WP1-Q21 and the 14P-WP2-Q21 ground switches will be open at the Halvarsson Converter Station 14P.

b. The 8ZN-WP1-Q11 and the 8ZN-WP2-Q11 will be closed and connected to the Halvarsson-Tomson 481 Line at the 8ZN Tomson Converter Station. The 8ZN-WP1-Q21 and the 8ZN-WP2-Q21 will be open at the 8ZN Tomson Converter Station.

2. Halvarsson Converter Station 14P

a. The 387-14P-5 MOD will be closed and connected to the East Shore-Halvarsson Converter Station-Scovill Rock 387 Line. The 387-14P-9 ground switch will be open.

b. The 14P-1X1-2 gas circuit breaker (GCB) will be closed.

c. The 14P-1X3-4 will be closed. The 14P-1X3-9 ground switch will be open.

3. 8ZN Tomson Converter Station

a. The 1314 MOD will be closed and connected to the 138-892 Circuit.

b. The 1310 gas circuit breaker (GCB) will be closed.

c. The 1311 will be closed. The 131G ground switch will be open.

B. Notification of Changes in Connections Affecting the Halvarsson-Tomson 481 Line

The CONVEX System Operations Supervisor will keep the CSC Control Room Operator, the Senior System Operator of KEYSPAN, the UI System Operations Supervisor, and ISO-NE System Operator informed of any changes from normal connections affecting the Halvarsson-Tomson 481 Line.

The CSC Control Room Operator will keep the CONVEX System Operations Supervisor, and the Senior System Operator of KEYSPAN informed of any changes from normal connections affecting the Halvarsson-Tomson 481 Line.

The Senior System Operator of KEYSPAN will keep the CSC Control Room Operator and NYISO informed of any changes from normal connections affecting the Halvarsson-Tomson 481 Line.

C. Supervisory Control and Data Acquisition (SCADA)

1. CONVEX

CONVEX is equipped for Indication Only, Status Indication, Data Acquisition, and Emergency Trip via the Halvarsson Converter Station 14P RTU and UI ICCP Link as follows:

a. Indication and Alarm Summary Abbreviation:

Device	Status Indication	Alarm Indication	Alarm Summary Abbreviation	NOTE
387-14P-5	Open-Closed		TN	
14P-1X3-4	Open-Closed		TN	
14P-1X1-2	Open-Closed		TC	
14P-WT-Q2 (This is a pre-insertion resistor by-pass breaker associated with the 14P-1X1-2. It is not shown on Appendix I)	Open-Closed		GN	1

Device	Status Indication	Alarm Indication	Alarm Summary Abbreviation	NOTE
14P-WP1-Q11 (MOD)	Open-Closed		TN	
14P-WP2-Q11 (MOD)	Open-Closed		TN	
AC Reactive Control Mode	On Off	Alarm Normal	TR	
AC Voltage Control Mode	On Off	Alarm Normal	TR	
DC Power Control Mode	On Off	Alarm Normal	TR	
DC Voltage Control Mode	On Off	Alarm Normal	TR	
Converter Blocked	On Off	Alarm Normal	TR	
Converter De-Blocked	On Off	Alarm Normal	TR	
Ramp in Progress	On Off	Alarm Normal	TR	
Breaker Failure Alarm (14P-1X1-2)		Alarm-Normal	TR	
387 Line Primary Relay Alarm RFL9300 (87L1)		Alarm-Normal	TR	

Note: 1. These signals are sent over RTU/SCADA link but not displayed for CONVEX operator.

The table below describes the Alarm Summary

ALARM SUMMARY	ABBREVIATION	AUDIBLE OR NON-AUDIBLE
Trip Critical	TC	Big Gong
Trip Non-Critical	TN	Non-Audible
Trouble Critical	TR	Small Gong
Limit Violation	LV	Big Gong
Sequence of Event	SO	Big Gong
General	GN	Non-Audible
RTU Failed	RF	Non-Audible

b. Data Acquisition

Device	Data	Note
Halvarsson Converter Station 345kV Bus	Active Power (MW) Reactive Power (MVars) Current (Amperes) 3-1Ø Voltage (Kilovolts) 3-1Ø	
Converter Measurements		
Power Level Set Point	MW	1
Reactive Power Set Point	MVars	1
Voltage Control Set Point	Voltage (kV) 3 Ø	1
387 Line Ø 1 (Amperes)	AMP	
387 Line Ø 2 (Amperes)	AMP	
387 Line Ø 3 (Amperes)	AMP	
387 Line Ø 1 (Voltage)	kV	
387 Line Ø 2 (Voltage)	kV	
387 Line Ø 3 (Voltage)	kV	
Bus Frequency	HZ (Hertz)	

Note: 1. These data points are only used when the associated control system mode is active.

c. Emergency Trip (At UI System Operations Center, Shelton, CT)

Device	Command	Note
14P-1X1-2 Gas Circuit Breaker (GCB) EMERGENCY TRIP	Trips the 14P-1X1-2, isolating the Halvarsson Converter Station from the 387 Line	1

Note: 1. On EMERGENCY TRIP, the Halvarsson Converter Station will be blocked and then the 14P-1X1-2 will be opened.

2. CSC

CSC Local and Remote Operator Work Stations are equipped for Control, Alarm Indication, Sequence of Events (SOE), and Data Acquisition as follows:

a. Halvarsson Converter Station 14P

1) Control, Alarm Indication, and SOE

Device	Control	Alarm Indication	Sequence Of Events	Note
14P-1X1-2	Yes	Open-Closed	Yes	
387-14P-5	Yes	Open-Closed	Yes	
387-14P-9	No	No Indication	No	Manual
14P-1X3-4	Yes	Open-Closed	Yes	
14P-1X3-9	Yes	Open-Closed	Yes	
14P-WT-Q2	No	Open-Closed	Yes	Automatic
14P-WZ-Q1	No	Open-Closed	Yes	Automatic
14P-WP1-Q11	Yes	Open-Closed	Yes	
14P-WP1-Q21	Yes	Open-Closed	Yes	
14P-WP2-Q11	Yes	Open-Closed	Yes	
14P-WP2-Q21	Yes	Open-Closed	Yes	

Device	Control	Alarm Indication	Sequence Of Events	Note
AC Reactive Power Control Mode	Yes	On/Off	Yes	
AC Voltage Control Mode	Yes	On/Off	Yes	
dc Power Control Mode	Yes	On/Off	Yes	
dc Voltage Control Mode	Yes	On/Off	Yes	
Converter Blocked	Yes	On/Off	Yes	
Converter De-Blocked	Yes	On/Off	Yes	
Ramp in Progress	Yes	On/Off	Yes	
Ramp Speed (MW/Min)	Yes	N/A	Yes	
Local Control	Yes		Yes	
Remote Control	Yes		Yes	
RPC Set Point (Mvar)	Yes	N/A	Yes	
VC Set Point (kV)	Yes	N/A	Yes	
Active Power Set Point (MW)	Yes	N/A	Yes	

2) Data Acquisition

Device	Data	
Halvarsson-Tomson 481 Line	Active Power Reactive Power dc Current dc Voltage	(Megawatts) (Megavars) (Amperes) (Kilovolts dc)
345kV Bus 14P-1X Transformer	Active Power Reactive Power Frequency Voltage	(Megawatts) (Megavars) (Hertz) (Kilovolts)
AC Filter Bus	Current Voltage	(Amperes) (Kilovolts)

b. 8ZN Tomson Converter Station

1) Control, Alarm, and SOE

Device	Control	Alarm Indication	Sequence Of Events	Note
1310	Yes	Open-Closed	Yes	
1314	Yes	Open-Closed	Yes	
1311	Yes	Open-Closed	Yes	
131G	Yes	Open-Closed	Yes	
8ZN-WP1-Q11	Yes	Open-Closed	Yes	
8ZN-WP1-Q21	Yes	Open-Closed	Yes	
8ZN-WP2-Q11	Yes	Open-Closed	Yes	
8ZN-WP2-Q21	Yes	Open-Closed	Yes	
8ZN-WT-Q2	No	Open-Closed	Yes	Automatic
8ZN-WZ-Q1	No	Open-Closed	Yes	Automatic
8ZN-WZ-Q2	No	Open-Closed	Yes	Automatic
AC Reactive Power Control Mode	Yes	On/Off	Yes	
AC Voltage Control Mode	Yes	On/Off	Yes	
Active Power Control Mode	Yes	On/Off	Yes	
dc Voltage Control Mode	Yes	On/Off	Yes	
Converter Blocked	Yes	On/Off	Yes	
Converter De-Blocked	Yes	On/Off	Yes	
Ramp in Progress	Yes	On/Off	Yes	
Ramp Speed (MW/Min)	Yes	N/A	Yes	
Local Control	Yes		Yes	
Remote Control	Yes		Yes	

Device	Control	Alarm Indication	Sequence Of Events	Note
RPC Set Point (Mvar)	Yes	N/A	Yes	
VC Set Point (kV)	Yes	N/A	Yes	
AC Power Set Point (MW)	Yes	N/A	Yes	

2) Data Acquisition

Device	Data	
Halvarsson-Tomson 481 Line	Active Power Reactive Power dc Current dc Voltage	(Megawatts) (Megavars) (Amperes) (dc Kilovolts)
138kV Bus Bank #1 Transformer	Active Power Reactive Power Frequency Voltage	(Megawatts) (Megavars) (Hertz) (Kilovolts)
AC Filter Bus	Current Voltage	(Amperes) (Kilovolts)

3. KEYSPAN

KEYSPAN is equipped for Indication of Alarms, Data Acquisition, and Emergency Trip via the 8ZN Tomson Converter Station and Hathaway RTU as follows:

a. Indication of Status / Control

Device	Indication	Note
1310	Open-Closed	1
1314	Open-Closed	
1311	Open-Closed	
8ZN-WP1-Q11	Open-Closed	
8ZN-WP2-Q11	Open-Closed	
138-892 Circuit Relay Status	Alarm-Normal	

Device	Indication	Note
Reactive Power Control Mode	On-Off	
AC Voltage Control Mode	On-Off	
Active Power Control Mode	On-Off	
dc Voltage Control Mode	On-Off	
Converter Blocked	On-Off	
Converter De-Blocked	On-Off	
Ramp in Progress	On-Off	
Local Operator Control	On-Off	
Remote Operator Control	On-Off	
RTU Local/Remote		

Note: 1. On EMERGENCY TRIP, the Converter Station will be blocked and then the GCB will be opened.

b. Data Acquisition

Device	Data	Note
8ZN Tomson Converter Station 138kV Bus	Voltage (Kilovolts) 3-1Ø Current (Amperes) 3-1Ø Active Power (Megawatts) Reactive Power (Megavars)	
Control Setpoints	Active Power Set point (MW) Reactive Power Set Point (Mvar) Voltage Control Set Point (kV)	1
481 Line dc Voltage	Kilovolts dc	
Revenue Metering Pulse Accumulator	MWHR Received MWHR Delivered MVARHR Received MVARHR Delivered	2

Note: 1. These data points are only used when the associated control system mode is active.

2. Revenue Meter pulse data is sent directly to the 8Z Shoreham Substation RTU from the KEYSPAN meters.

c. Indication of Alarms

Device	Indication	Note
1310 Breaker Failure	Trip - Reset	
138-892 RFL 9300 Major	Normal - Alarm	
138-892 Alstrom Major	Normal - Alarm	
138-892 RFL 9300 C/O Switch	Normal - Alarm	
138-892 Alstrom C/O Switch	Normal - Alarm	

d. Emergency Trip

Device	Command	Note
1310 Gas Circuit Breaker (GCB) EMERGENCY TRIP	Trips the 1310 GCB isolating the Converter Station from the 138-892 Circuit	1

Note: 1. On EMERGENCY TRIP, the Converter Station will be blocked and then the GCB will be opened.

D. Synchronizing, Metering, Relaying, and Indicating Potential

1. Halvarsson Converter Station 14P

Equipment	Potential Source	Note
CSC Revenue Metering, UI Revenue Metering, UI Digital Fault Recorder, ABB System A Control and ABB System B Control, and 387 Line Relaying	14P-1H	

2. 8ZN Tomson Converter Station

Equipment	Potential Source	Note
CSC Revenue Metering, ABB System A Control and ABB System B Control, LIPA 138-892 Circuit Relaying, and 892 Line Relaying	PT #2	
LIPA Revenue Metering	PT #1	1

Note: PT #1 LIPA Revenue Metering is installed at the 138kV Point of Common Coupling between the Tomson Converter Station and the LIPA System. This is the Phase I and II Area Control Metering Point and is the Revenue Metering Settlement Point for the Halvarsson-Tomson 481 Line.

E. Operating Capability of Disconnect Switches

1. Halvarsson Converter Station 14P

Disconnect Switch	Operating Capability
387-14P-5	Energize or De-energize the Associated Bus Section up to the 14P-1X1-2 GCB
14P-WP1-Q11 14P-WP2-Q11	Connect or Isolate the Converter to the dc Cable at Halvarsson Converter Station 14P
14P-1X3-4	Connect the AC Filter bus

2. 8ZN Tomson Converter Station

Disconnect Switch	Operating Capability
1314	Energize or De-energize the Associated Bus Section up to the 1310 GCB
8ZN-WP1-Q11 8ZN-WP2-Q11	Connect or Isolate the Converter to the dc Cable at 8ZN Tomson Converter Station
1311	Connect the AC Filter bus

F. Interlocking

1. Halvarsson Converter Station 14P

To Open	To Close	Completely Open Position Required	Completely Closed Position Required	Type
	387-14P-5	387-14P-9 14P-1X1-2 14P-1X3-9		No Interlock Electrical Electrical
387-14P-5		14P-1X1-2		Electrical
	387-14P-9	387-14P-5		Mechanical
14P-1X3-4		14P-1X1-2		Electrical
	14P-1X3-4	14P-1X3-9 14P-1X1-2		Electrical Electrical
14P-1X3-9		387-14P-5		Electrical
	14P-1X3-9	14P-1X3-4 387-14P-5		Electrical Electrical

2. 8ZN Tomson Converter Station

To Open	To Close	Completely Open Position Required	Completely Closed Position Required	Type
1311		1310		Electrical
	1311	131G 1310		Electrical Electrical
131G		1314		Electrical
	131G	1311 1314		Electrical Electrical
1314		1310		Electrical
	1314	1310 1311		Electrical Electrical

G. Automatic Reclosing

1. Halvarsson Converter Station 14P is not equipped for Automatic Reclosing.

2. 8ZN Tomson Converter Station is not equipped for Automatic Reclosing.

H. Station Service Throwover Scheme

Halvarsson Converter Station 14P and 8ZN Tomson Converter Station are equipped with a Station Service Throwover Scheme for maintaining station service to the converter stations. At Halvarsson Converter Station 14P, the Primary Station Service is supplied from the 14P-1X transformer. The Backup Station Service is supplied from a distribution transformer. At 8ZN Tomson Converter Station, the Primary Station Service is supplied from the Bank #1 transformer. The Backup Station Service is supplied from a distribution transformer. When the Primary Station Service trips, a Throwover Logic Break-Before-Make Scheme is used before the backup station service closes.

I. Voltage Regulation

1. CONVEX

The CONVEX System Operations Supervisor is responsible for maintaining the Voltage on the 345kV Bus at the Halvarsson Converter Station 14P as follows:

VOLTAGE REGULATION	Heavy Load Period 0700 to 2200 Hours Monday through Saturday Except Holidays	Light Load Period Other Hours
Schedule	357kV	357kV
Maximum Limit	362kV	362kV
Minimum Limit	340kV	340kV

Normally, the Halvarsson Converter Station 14P will be in the Reactive Power Control Mode to compensate for the impacts of the 481 Line load on the 345kV system voltage. During ramping events, the AC Voltage Control Mode will be used to immediately compensate for load changes. Once ramping is complete, the converter will be switched back to Reactive Power Control Mode and the Mvar order reached during the ramping process will be maintained.

During the energizing process, the converter will be de-blocked in the Reactive Power Control Mode with a 0 Mvar order. Prior to any ramping to achieve a MW order, the converter will be switched to the AC Voltage Control Mode. When switching to AC Voltage Control, the AC Voltage Reference Setting will be automatically adjusted to match the existing East Shore-Halvarsson Converter Station-Scovill Rock 387 Line Voltage.

When the Halvarsson-Tomson 481 Line is in-service for active power transfers, the Cross Sound Cable Control Room Operator shall operate the facility to maintain the steady-state 345kV voltage at the point of interconnection to within the standard NEPOOL operating range referenced in Operating Procedure No. 12. The Cross Sound Cable Control Room Operator shall schedule the reactive power dispatch at the Halvarsson Converter Station 14P with the objective of maintaining the steady-state 345kV voltage at the East Shore substation at a secure level established by the CONVEX System Operator. At no time will the Cross Sound Cable Control Room Operator be required to operate beyond the rated capability of Halvarsson Converter Station 14P equipment. Unless reactive support is requested by the CONVEX System Operations Supervisor during an abnormal system condition or emergency, the Cross Sound Cable Control Room Operator is under no obligation as part of their agreement to provide reactive support to the NEPOOL Transmission System, CONVEX Transmission System, or UI Transmission System when the Halvarsson-Tomson 481 Line is not in-service for active power transfers.

The Cross Sound Cable Control Room Operator will regulate the 345kV voltage and keep the CONVEX System Operations Supervisor informed if unable to maintain the Schedule voltage level at 357kV. Unusual loading conditions may prompt the CONVEX System Operations Supervisor to request variation from the Schedule voltage level.

When the HVDC Facility is blocked, the CONVEX System Operations Supervisor will monitor the 345kV voltage at Halvarsson Converter Station 14P via SCADA. In the event SCADA has failed or the RTU is in Local at the Converter Terminal, the CONVEX System Operations Supervisor will request the Cross Sound Cable Control Room Operator to monitor the 345kV Bus Voltage at the Halvarsson Converter Station 14P and notify the CONVEX System Operations Supervisor when the voltage at his/her location approaches the above limits.

Note: When the converter is energized and blocked, approximately 28-30 MVars will be sent into the CONVEX system.

If the 28-30 MVars being supplied to the CONVEX system are contributing to high voltage problems on the CONVEX system, the System Operations Supervisor (SOS) at CONVEX will contact the Halvarsson converter station operator and ask only that he reduce that Mvar output to "0". The Halvarsson converter station operator will decide the most appropriate method of accomplishing that for their operation.

2. KEYSPAN

The Senior System Operator of KEYSPAN is responsible for maintaining Voltage on the 138kV Bus at the 8ZN Tomson Converter Station as follows:

VOLTAGE REGULATION	Heavy Load Period 0700 to 2200 Hours Monday through Saturday Except Holidays	Light Load Period Other Hours
Nominal	138kV	138kV
Maximum Limit	145kV	145kV
Minimum Limit	131kV	131kV

The Senior System Operator of KEYSPAN will monitor the Voltage via SCADA. In the event SCADA has failed or the RTU is in Local at the Converter Terminal, the Senior System Operator of KEYSPAN will request the CSC Control Room Operator to monitor the 138kV Bus Voltage at 8ZN Tomson Converter Station and notify the Senior System Operator of KEYSPAN when the voltage at his/her location approaches the above limits.

J. Line Load Limits

1. CONVEX

The maximum load permissible is:

TRANSMISSION LINE		Normal Continuous		Long Time Emergency 12 Hours		Short Time Emergency 15 Minutes		Drastic Action Limit 5 Minutes		NOTE
		S	W	S	W	S	W	S	W	
East Shore-Halvarsson Converter Station-Scovill Rock 387 Line	AMP	2492	3120	3200	3668	3510	4060	4190	4952	1
	MVA	1489	1864	1912	2192	2097	2426	2504	2959	1,2
Halvarsson-Tomson 481 Line	AMP	591	591	591	591	591	591	591	591	3
	MVA	353	353	353	353	353	353	353	353	3

Note: 1. This Load Limit is applicable from East Shore Tap to Halvarsson Converter Station 14P.

2. Megavolt-Ampere (MVA) is calculated at 345kV.

3. Ampere (AMP) and Megavolt-Ampere (MVA) are calculated at the point of common coupling at 345kV

Use of Emergency Load Limits in excess of Normal Load Limits involves loss-of-life or loss-of-tensile strength of equipment in excess of that incurred at Normal Load Limits. Therefore, Emergency Load Limits should not be scheduled.

Winter is the period from November 1 through March 31.

The CONVEX System Operations Supervisor will monitor the Line Load Limits via SCADA. In the event SCADA has failed or the RTUs are in Local at the Halvarsson Converter Station 14P, the CONVEX System Operations Supervisor will request the CSC Control Room Operator to have the Line Load Limits monitored, and notify the CONVEX System Operations Supervisor when the load at this location approaches the above limits.

2. KEYSPAN

The maximum load permissible is:

TRANSMISSION LINE		Normal Continuous		Long Time Emergency 12 Hours		Short Time Emergency 15 Minutes		Drastic Action Limit 5 Minutes		NOTE
		S	W	S	W	S	W	S	W	
Halvarsson-Tomson 481 Line	AMP	1477	1477	1477	1477	1477	1477	1477	1477	1
	MVA	353	353	353	353	353	353	353	353	1
138-892 Circuit (Tomson - Shoreham)	AMP	1879	2392	2134	2583	2420	2843	----	----	
	MW	----	----	----	----	----	----	----	----	
	MVA	449	571	510	617	578	679	----	----	2

Note: 1. Ampere (AMP) and Megavolt-Ampere (MVA) are calculated at the point of common coupling at 138kV

2. Megavolt-Ampere (MVA) is calculated at 345kV.

Use of Emergency Load Limits in excess of Normal Load Limits involves loss-of-life or loss-of-tensile strength of equipment in excess of that incurred at Normal Load Limits. Therefore, Emergency Load Limits should not be scheduled.

Winter is the period from November 1 through April 30.

The Senior System Operator of KEYSPAN will monitor the Line Load Limits via SCADA. In the event SCADA has failed or the RTUs are in Local at the 8ZN Tomson Converter Station, the Senior System Operator of KEYSPAN will request the CSC Control Room Operator to have the Line Load Limits monitored. In the event of SCADA failure, an auto-page will be sent to the CSC Operator.

The CSC Control Room Operator will notify the Senior System Operator at KEYSPAN when the load at this location approaches the above limits.

K. Transformer Load Limits

1. Halvarsson Converter Station 14P

The maximum load permissible is:

Transformer	Type of Cooling		Normal						Emergency 24 Hours						NOTE
			345kV		200kV		7kV		345kV		200kV		7kV		
			S	W	S	W	S	W	S	W	S	W	S	W	
14P-1X	Nameplate	AMP	602		1039		124		---		----		----		
		MVA	360		360		1.5		---		----		----		

Note: 1. Ammeter Scale Limit is 700 Amperes (AMP).

Amperes (AMP) is calculated at indicated kV.

Megavolt-Ampere (MVA) is calculated at indicated kV.

Emergency Loads may be carried during switching operations, and for periods, not exceeding hours indicated, following the failure of a transformer.

The cooling equipment will be set-up so that both 1st and 2nd stage cooling are operative automatically.

Winter is the period from November 1 through March 31.

2. 8ZN Tomson Converter Station

The maximum load permissible is:

Transformer	Type of Cooling		Normal						Emergency 24 Hours						NOTE
			200kV		138kV		4kV		200kV		138kV		4kV		
			S	W	S	W	S	W	S	W	S	W	S	W	
Bank #1	Nameplate	AMP	1039	1506			216		----		----		----		
		MVA	360	360			1.5		----		----		----		

Note: 1. Ammeter Scale Limit is 1600 Amperes (AMP).

Amperes (AMP) is calculated at indicated kV rating.

Megavolt-Ampere (MVA) is calculated at indicated kV rating.

Emergency Loads may be carried during switching operations, and for periods, not exceeding hours indicated, following the failure of a transformer.

The cooling equipment will be set-up so that both 1st and 2nd stage cooling are operative automatically.

Winter is the period from November 1 through April 30.

L. Reactive Capability for Converter Stations

Load Levels	MW	Maximum MVARS Lagging	Maximum MVARS Leading
Zero Power	0	150	150
Half Load	165	113	113
Three-quarter Load	247	95	95
Full Load	330	76	76

Note: 1. A converter station should not exceed its Megavar limit for the load level at which it is operating.

M. Relay Switches

1. Halvarsson Converter Station 14P

Protected Equipment	Name of Switch	Panel Number	Positions of Switch
East Shore-Halvarsson Converter Station-Scovill Rock 387 Line	43DTT / ESSR-P	ARP Cabinet RFL 9300	Normal/Off
	87L1 – C/O	ARP Cabinet RFL 9300	Normal/Off
	43POTT / ESSR	MET Cabinet GE ALPS	Normal/Off
	43DTT / ESSR	MET Cabinet GE ALPS	Normal/Off

2. 8ZN Tomson Converter Station

Protected Equipment	Name of Switch	Panel Number	Positions of Switch
138-892 Circuit	87L1-C/O	ARP Cabinet RFL9300	Normal/Off
	87L1 - TTST	ARP Cabinet (RFL9300 BF)	Normal/Off/Test
	87L2 – C/O	MET Cabinet Alston P541	Normal/Off
	87L2 - TTST	MET Cabinet (Alston P541 BF)	Normal/Off/Test

N. Special Operating and Maintenance Precautions

1. Middletown Unit 4U Torsional Stress Relay (TSR)

Middletown Unit 4 is equipped with a Torsional Stress Relay (TSR) that monitors the sub-synchronous oscillation stress on the generator shaft. Operation of the TSR is based on an alarm for oscillations that could result in possible damage to the generator shaft. The TSR will trip Middletown Unit 4.

When the Middletown Unit 4 TSR is out-of-service, Halvarsson Converter Station 14P and Middletown Unit 4 will not be allowed to operate simultaneously if any of the following facilities are **ALSO** out-of-service:

- Manchester-Scovill Rock 353 Line
- Haddam Neck-Scovill Rock 376 Line
- 22P-4T-2 circuit breaker at Scovill Rock 22P
- 22P-8T-2 circuit breaker at Scovill Rock 22P

ISO-NE and CONVEX will determine which facility, Middletown Unit 4 or Halvarsson Converter Station 14P, will be allowed to operate based on the nature of the outages and prevailing system conditions.

O. Special Protection Systems (SPS)

1. New Haven Harbor Unit 1U Torsional Stress SPS

The New Haven Harbor Unit 1U is equipped with an NPCC Type III Special Protection Scheme that will be armed 100% of the time, and is triggered by a Torsional Stress Relay that monitors the sub-synchronous oscillation stress on the generator shaft. Operation of the SPS is based on relay alarm for oscillations that could result in possible damage to the generator shaft and assumed to be as a result of the Cross Sound Cable HVDC facilities. Relay alarm will result in a primary action to block the Cross Sound Cable HVDC facilities. If oscillations persist following the primary action, a secondary action of the relay will trip the New Haven Harbor Unit 1U.

2. Scovill Rock 22P Halvarsson-Tomson 481 Line SPS

Scovill Rock 22P is equipped with an NPCC Type III Special Protection Scheme that will be armed 100% of the time, with the exception of the conditions listed below. The Scovill Rock 22P Halvarsson-Tomson 481 Line SPS is triggered by the open circuit breaker status of 22P-5T-2 and 22P-8T-2 at Scovill Rock 22P or the open circuit breaker status of 22P-4T-2 and 22P-8T-2 at Scovill Rock 22P.

Operation of the Scovill Rock 22P Halvarsson-Tomson 481 Line SPS will transmit a signal to Halvarsson Converter Station 14P and will result in blocking the Cross Sound Cable HVDC facilities (0 MW and 0 Mvar) whether the flow is from Connecticut to Long Island or from Long Island to Connecticut.

CONVEX will **disarm** the Scovill Rock 22P Halvarsson-Tomson 481 Line SPS transmitter at Scovill Rock 22P via SCADA under the following conditions:

- ISO-NE has performed studies and determined the Scovill Rock 22P Halvarsson-Tomson 481 Line Special Protection Scheme has to be disarmed.

- ISO-NE will notify the CONVEX System Operations Supervisor, in full detail, as to why the Scovill Rock 22P Halvarsson-Tomson 481 Line Special Protection Scheme needs to be disarmed.

- The UI Transmission Lead Engineer has been notified by the CONVEX System Operations Supervisor (via the UI System Operations Supervisor), and has approved the disarming of the Scovill Rock 22P Halvarsson-Tomson 481 Line Special Protection Scheme.

This protection is monitored by the control and protections scheme and will report a failure to the sequence of events recorder. The CSC Control Room Operator will report any failures in accordance with Section IV B-Notifications.

IV. ABNORMAL OPERATION

A. Lines

1. Halvarsson–Tomson 481 Line

In the event of a fault within the converter zone of either dc cable, the Protective Relaying Schemes will trip and lockout the gas circuit breakers (GCB's) isolating the Halvarsson-Tomson 481 Line from the CONVEX 345kV AC System and the KEYSPAN 138kV AC System.

2. East Shore–Halvarsson Converter Station–Scovill Rock 387 Line

In the event of a fault within the converter zone of either dc cable, the Protective Relaying Schemes will trip and lockout the gas circuit breakers (GCB's) isolating the Halvarsson Converter Station 14P from the East Shore-Halvarsson Converter Station-Scovill Rock 387 Line.

3. 138-892 Circuit

In the event of a fault within the converter zone of either dc cable, the Protective Relaying Schemes will trip and lockout the gas circuit breakers (GCB's) isolating the 8ZN Tomson Converter Station from the 138-892 Circuit.

B. Notifications

The CONVEX System Operations Supervisor will notify the CSC Control Room Operator of all alarms and/or operations associated with the CSC converter station equipment or the associated transmission equipment.

The Senior System Operator-KEYSPAN will notify the CSC Control Room Operator of all alarms listed in Table 3.C associated with the transmission equipment.

The CSC Control Room Operator will notify the CONVEX System Operations Supervisor and the Senior System Operator of KEYSPAN of all emergency alarms and/or operations associated with the CSC converter station equipment or the associated transmission equipment. The qualified person at the Halvarsson Converter Station 14P and the 8ZN Tomson Converter Station will notify the CSC Control Room Operator of the specific trouble. In addition, the CSC Control Room Operator will transmit an email to KEYSPAN at trans_outagenotify.com@keyspanenergy to notify KEYSPAN of any outages or operating limitations.

The CONVEX System Operations Supervisor will notify the UI Transmission Operations Lead Engineer (via the UI System Operations Supervisor) of all faults that result in the tripping of any device associated with the CSC installation under the CONVEX System Operations Supervisor's dispatching jurisdiction.

V. REMOVING EQUIPMENT FROM SERVICE FOR WORK

A. Advance Arrangements

Requests for taking equipment out-of-service under the CONVEX System Operations Supervisor dispatching jurisdiction will be made to the CONVEX Transmission Coordinator as described in CONVEX Operating Instruction # 6401 and NEPOOL Operating Procedure No. 3 (OP3).

Requests for taking equipment out-of-service under the LIPA System Operator dispatching jurisdiction will be made to the LIPA Transmission Work Coordinator as described in NEPOOL Operating Procedure No. 3 (OP3). In addition, the CSC Control Room Operator will transmit an email to KEYSPAN at trans_outagenotify.com@keyspanenergy to notify KEYSPAN of any outages or operating limitations.

1. Work on the Halvarsson-Tomson 481 Line

   The CSC qualified person will forward an advance notification to CONVEX and KEYSPAN. CONVEX Transmission Coordinator will notify ISO-NE. KEYSPAN Work Coordinator will notify NYISO.

2. Work at Either Converter Station

   The CSC qualified person will forward an advance notification to CONVEX Transmission Coordinator and KEYSPAN Work Coordinator. CONVEX Transmission Coordinator will notify ISO-NE. KEYSPAN Work Coordinator will notify NYISO.

3. Work on the East Shore-Halvarsson Converter Station-Scovill Rock 387 Line

   The UI or CL&P qualified person will forward an advance notification to CONVEX Transmission Coordinator. CONVEX Transmission Coordinator will notify the CSC Control Room Operator, KEYSPAN Work Coordinator, UI, CL&P, and ISO-NE. KEYSPAN Work Coordinator will notify NYISO.

4. Work on LIPA Equipment Requiring a CSC Equipment Outage

KEYSPAN Work Coordinator will notify the CSC Control Room Operator, CONVEX Transmission Coordinator, and NYISO. CONVEX Transmission Coordinator will notify ISO-NE.

B. Emergency Work

If the CSC Control Room Operator has to take transmission related equipment out-of-service under emergency conditions, the CONVEX System Operations Supervisor and the Senior System Operator of KEYSPAN would be notified of the problem and any actions taken as soon as possible. In addition, the CSC Control Room Operator will transmit an email to KEYSPAN at trans_outagenotify.com@ keyspanenergy to notify KEYSPAN of any outages or operating limitations.

C. Sequence for Line Switching

Advance notification of line switching will be made to all parties prior to line switching.

1. Work at Either HVDC Converter Terminal

To take either converter terminal out-of-service, BOTH converter stations must be disconnected from the AC system. The CSC Control Room Operator will execute the following sequence to remove the Halvarsson-Tomson 481 Line from service:

- Under direction from ISO-NE, ramp power to zero MW and reactive power to zero Mvar.
- Block the APC* station, then block the DCVC* station.

  * The APC station is defined as the converter station that controls Active Power. The DCVC station is defined as the converter station that controls the dc voltage level on the cable.

- Notify the CONVEX System Operations Supervisor that the Halvarsson Converter Station 14P will be de-energized.

- Open the 14P-1X1-2 GCB, de-energizing the AC Filter bus and Converter.
- Notify the Senior System Operator of KEYSPAN that the 8ZN Tomson Converter Station will be de-energized.
- Open the 1310 GCB, de-energizing the AC Filter bus and Converter.
- Check open the 1310 GCB.
- Open and tag the 1314 MOD Control Switch.
- Check Open, Block, and Tag the 1314 MOD.
- (Red Tag Points - CSC jurisdiction).
- Check Open the 14P-1X1-2 GCB.
- Open and Tag the 387-14P-5 MOD Control Switch*.

  * Operating the 387-14P-5 MOD requires prior approval by the CONVEX System Operations Supervisor because it is under the dispatching jurisdiction of CONVEX.

- Check Open, Block, and Tag the 387-14P-5 MOD.
- Execute CSC internal switching to remove all other sources of potential at Halvarsson Converter Station 14P and 8ZN Tomson Converter Station.

2. Work on East Shore-Halvarsson Converter Station-Scovill Rock 387 Line

This work will require the Halvarsson Converter Station 14P to be blocked and de-energized. (14P-1X1-2 GCB Open).

* 387-14P-5 Open / 387-14P-9 Closed

3. Work on LIPA Equipment Requiring a CSC Equipment Outage

This work will require the 8ZN Tomson Converter Station to be blocked and de-energized. (1310 GCB Open).

* 1314 MOD Open - Unless working on MOD, then the breakers must be opened

4. To Return the Halvarsson-Tomson 481 Line to Service

Once all the grounds have been removed or opened, tags have been removed from both converter stations, and the equipment is ready for service, the CSC Control Room Operator will:

- Notify the CONVEX System Operations Supervisor that the Halvarsson Converter Station 14P is ready to be energized. Notify the Senior System Operator of KEYSPAN that the 8ZN Tomson Converter Station is ready to be energized.

- Close or verify closed the 14P-WP1-Q11 and 14P-WP2-Q11 at Halvarsson Converter Station 14P.

  Close or verify closed the 8ZN-WP1-Q11 and 8ZN-WP2-Q11 at the 8ZN Tomson Converter Station.

- Close the 14P-1X3-4 MOD and the 387-14P-5* MOD at Halvarsson Converter Station 14P.

  * Operating the 387-14P-5 MOD requires prior approval by the CONVEX System Operations Supervisor because it is under the dispatching jurisdiction of CONVEX.

- Close the 1311 MOD and the 1314 MOD at the 8ZN Tomson Converter Station.

- Satisfy all requirements to receive RFE (Ready For Energizing) at both stations.

- Close the 1310 GCB and verify 8ZN Tomson Converter Station is ready to energize. Close the 14P-1X1-2 GCB and verify Halvarsson Converter Station 14P is ready to energize.

- Satisfy all requirements to receive RFO (Ready for Operation) at both converter stations and notify the CONVEX System Operations Supervisor, the Senior System Operator of KEYSPAN, and ISO-NE that the Halvarsson-Tomson 481 Line is available and ready for service.

DISTRIBUTION LIST

Cross Sound Cable LLC, Westborough, MA (5)
ISO-NE
NYISO
Distributed Resource Management, KEYSPAN Electric Services LLC
Manager ESO, KEYSPAN Electric Services LLC
Chief System Operator, Long Island Power Authority
UI Process Owner-Operate the Electric System, Shelton (6)
Director-NU Transmission Maintenance, Berlin-3333 Building
Manager-NU Transmission Substation Engineering and Design, Berlin-East
Manager-NU Transmission Test, Berlin-3333 Building
Manager-NU Transmission Construction, Test, & Maintenance, CL&P- Berlin-3333 Building
Manager-CONVEX Operations, CONVEX, Berlin-3333 Building (2)
CONVEX O.I. Book, CONVEX, Berlin-3333 Building
CONVEX Backup O.I. Book, CONVEX, Berlin-3333 Building

APPROVED: _____
Brian Reinhart
CSC Asset Manager
Trans Énergie U.S. Ltd.

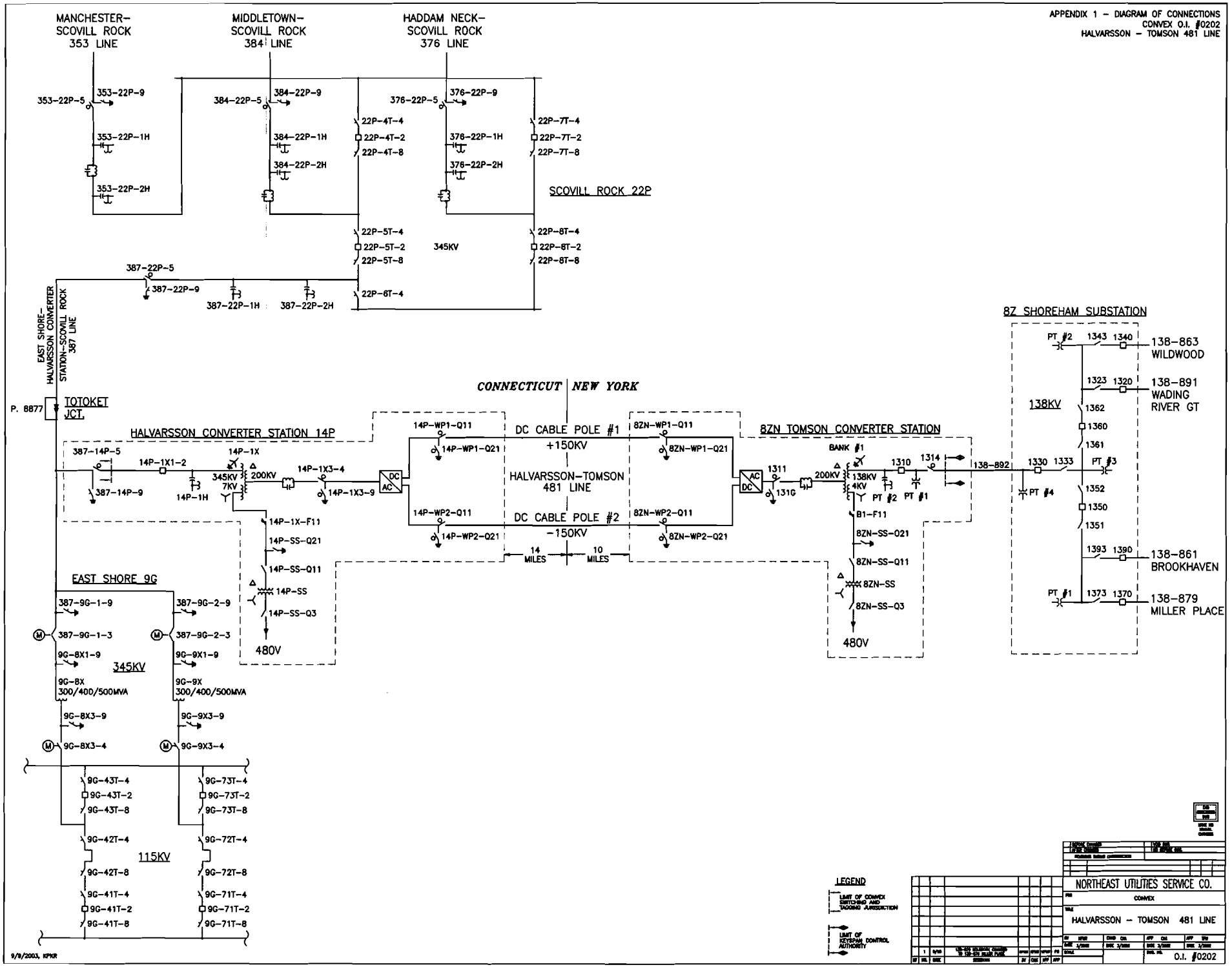
APPROVED: _____
J. Dolan
UI Process Owner -
Operate the Electric System
The United Illuminating
Company

APPROVED: _____
M. F. Ahern
Director – Transmission
Operations
Northeast Utilities Service
Company

SIGNED: _____ APPROVED: _____ 11/31/05
A. A. Charette, Jr.
Manager - CONVEX
Operations
Connecticut Valley
Electric Exchange

Patrick Hogan
Director – Electric System
Operations
Keyspan Electric Services
on behalf of LIPA

PB/pam


MANCHESTER–SCOVILL ROCK 353 LINE
MIDDLETOWN–SCOVILL ROCK 384 LINE
HADDAM NECK–SCOVILL ROCK 376 LINE
353-22P-5
353-22P-9
353-22P-1H
353-22P-2H
384-22P-5
384-22P-9
384-22P-1H
384-22P-2H
376-22P-5
376-22P-9
376-22P-1H
376-22P-2H
22P-4T-4
22P-4T-2
22P-4T-8
22P-7T-4
22P-7T-2
22P-7T-8
SCOVILL ROCK 22P
22P-5T-4
22P-5T-2
22P-5T-8
345KV
22P-8T-4
22P-8T-2
22P-8T-8
387-22P-5
387-22P-9
387-22P-1H
387-22P-2H
22P-6T-4
EAST SHORE–HALVARSSON CONVERTER STATION–SCOVILL ROCK 387 LINE
P. 8877
TOTOKET JCT.
CONNECTICUT | NEW YORK
HALVARSSON CONVERTER STATION 14P
387-14P-5
14P-1X1-2
14P-1X
345KV
7KV
200KV
14P-1X3-4
387-14P-9
14P-1H
14P-1X3-9
DC
AC
14P-WP1-Q11
14P-WP1-Q21
DC CABLE POLE #1
+150KV
HALVARSSON–TOMSON 481 LINE
14P-WP2-Q11
14P-WP2-Q21
DC CABLE POLE #2
–150KV
14 MILES
10 MILES
8ZN-WP1-Q11
8ZN-WP1-Q21
8ZN-WP2-Q11
8ZN-WP2-Q21
8ZN TOMSON CONVERTER STATION
AC
DC
1311
131G
BANK #1
200KV
138KV
4KV
1310
1314
PT #2
PT #1
B1-F11
8ZN-SS-Q21
8ZN-SS-Q11
8ZN-SS
8ZN-SS-Q3
480V
14P-1X-F11
14P-SS-Q21
14P-SS-Q11
14P-SS
14P-SS-Q3
480V
EAST SHORE 9G
387-9G-1-9
387-9G-2-9
387-9G-1-3
387-9G-2-3
9G-8X1-9
9G-9X1-9
345KV
9G-8X
300/400/500MVA
9G-9X
300/400/500MVA
9G-8X3-9
9G-9X3-9
9G-8X3-4
9G-9X3-4
9G-43T-4
9G-43T-2
9G-43T-8
9G-73T-4
9G-73T-2
9G-73T-8
9G-42T-4
9G-72T-4
115KV
9G-42T-8
9G-72T-8
9G-41T-4
9G-41T-2
9G-41T-8
9G-71T-4
9G-71T-2
9G-71T-8
138-892
8Z SHOREHAM SUBSTATION
PT #2
1343
1340
138-863 WILDWOOD
1323
1320
138-891 WADING RIVER GT
1330
1333
PT #3
PT #4
1362
1360
1361
1352
1350
1351
1393
1390
138-861 BROOKHAVEN
PT #1
1373
1370
138-879 MILLER PLACE
LEGEND
LIMIT OF CONVEX SWITCHING AND TAGGING JURISDICTION
LIMIT OF KEYSPAN CONTROL AUTHORITY
NORTHEAST UTILITIES SERVICE CO.
CONVEX
HALVARSSON – TOMSON 481 LINE
O.I. #0202
9/8/2003, KPKR

RELAY GLOSSARY

STANDARD ABBREVIATIONS:

Aux.	- Auxiliary
B or BU	- Backup
BF	- Breaker Failure
BFI	- Breaker Failure Initiate
Bkr.	- Breaker
C.T.	- Current Transformer
Cur.	- Current
Diff.	- Differential
Dir.	- Directional
Dist.	- Distance
Fdrs.	- Feeders
Grd.	- Ground
Inst.	- Instantaneous
O.C.	- Overcurrent
O.V.	- Overvoltage
P or Pri.	- Primary
ph. to grd.	- Phase-to-Ground
ph. to ph.	- Phase-to-Phase
Start.	- Starting
Sup.	- Supply
Tr.	- Transfer
U.V.	- Undervoltage
Xfmr.	- Transformer

STANDARD TARGET DESIGNATIONS:

ØA or A	- Phase A (G)
ØB or B	- Phase B (R)
ØC or C	- Phase C (W)
*	- Identifies Time Delay
1	- Unclassified
4	- Zone 4
52A	Status Input Assertion
81	- Frequency
86BFT	- Lockout Relay Trip
86RS	- Lockout Relay reset
87-1	- Differential Element 1
87-2	- Differential Element 1
87-3	- Differential Element 1
BKR FAIL 1	- Breaker 1 Trip Circuit
BKR FAIL 2	- Breaker 2 Trip Circuit
CLOSE	- Breaker Close Received
COMM	- Communications Scheme Assist.
CY	- Reclose Cycle State (79)
DTT TRIP 1	- Direct Transfer Trip Output 1
DTT TRIP2	- Direct Transfer Trip Output 2
FAIL RCL.	- Failure to Reclose
FAULT	- Fault Current Protection
FLASH	- Flashover Protection
G	- Ground
G.L.	- Ground Light
G4.L.	- High Set Instantaneous Ground
Grd or G	- Ground
H	- High
HBDL	- Indicates Hot Bus, Dead Line
HLDB	- Indicates Hot Line, Dead Bus
I, INST.	- Instantaneous
Inst. or 50	- Instantaneous Overcurrent
L	- Low
Last Fault	
LCB TRIP1	- Trip Output 1
LCB TRIP2	- Trip Output 2
LCD	- LCD Display on Relay
LO	- Reclosing Locked Out (79)
LOAD	- Load Current Protection
LOCKOUT	- Reclosing Locked Out
MOD	- MOD Status Input assertion
N	- Ground Overcurrent Unit
N	- Neutral Overcurrent
OTHER	-----
PF	- Pending Breaker Failure
Ph.L.	- Phase Light
PILOT	- Communications Type Trip
PROG 12	- Programmable Target
PROG 21	- Programmable Target
PROG 22	- Programmable Target
PROG 23	- Programmable Target
PROG 24	- Programmable Target
Q	- Negative Sequence
RECL. IN SERV.	- Reclosing In Service
RS	- Reclose Reset (79)
SOTF	- Switch-Onto-Fault
T	- Time
T1	- Breaker Tripping Impulse
T2	- Breaker Tripping Impulse
THERM	- Thermal Failure Protection
Time or 51	- Time Overcurrent
TRIP	- Relay trip or BKR.Trip Rec'd (352)
UBAL	- Current Unbalance Protection
W1	- Winding 1 Overcurrent
W2	- Winding 2 Overcurrent
W3	- Winding 3 Overcurrent
W4	- Winding 4 Overcurrent
Zone 1, Z1 or 1	- Zone 1
Zone 2, Z2 or 2	- Zone 2
Zone 3, Z3 or 3	- Zone 3

APPENDIX II

RELAYS AT HALVARSSON CONVERTER STATION 14P AFFECTING THE OPERATION OF THE TRANSMISSION SYSTEM

EQUIPMENT PROTECTED	RELAY NUMBER	RELAY NAME	PROTECTION	PROTECTS FOR FAULTS	TRIPS 14P-X1-2	TRIPS 38P-11-5	TRIPS 13-10	TRIPS 13-14	TARGETS	NOTE
East Shore - Halvarsson Converter Station - Scovill Rock 387 Line	BFP310	Circuit Breaker Failure Protection	P	Stuck Breaker	X				Sequence of Events Recorder	
	87L1	RFL 9300 Line Charge Comparison Relay	P	Line Differential	X				Sequence of Events Recorder	
	21/67N	ALPS Distance Relay	B	Distance/Overcurrent	X				Sequence of Events Recorder	
	9745-SPS	RFL 9745 Communications Relay	P	387 Line-End-Open					Sequence of Events Recorder	1
	LOR	Electro Switch Lockout Relay	P	New Haven Harbor TSR Protection					Sequence of Events Recorder	2
	85/SR	RFL 9745 Communications Relay		Breaker Failure		X			Sequence of Events Recorder	
	85/ES	RFL 9745 Communications Relay		Breaker Failure		X			Sequence of Events Recorder	

RELAYS FOR HALVARSSON – TOMSON 481 LINE AFFECTING THE OPERATION OF THE TRANSMISSION SYSTEM

EQUIPMENT PROTECTED	RELAY NUMBER	RELAY NAME	PROTECTION	PROTECTS FOR FAULTS	TRIPS 14P1X1-2	TRIPS 38P1-5	TRIPS 13710	TRIPS 1314	TARGETS	NOTE
Halvarsson-Tomson 481 Line	Protection for the DC side of the Halvarsson Converter Station 14P and the 8ZN Tomson Converter Station are part of a software code at each converter station. When protection for the Halvarsson-Tomson 481 Line is initiated, the software determines if the converter must be blocked, if the AC Breaker is locked-out, and if the DC disconnects is opened. This is determined by where the fault is.									

APPENDIX III

COMMUNICATIONS

- B -

CONVEX Contact List

Title of Contact	Telephone Number	Hours Available
CONVEX System Operations Supervisor	(860) 665-6690	24/7
CONVEX Transmission Coordinator	(860) 665-4943	M-F
Manager - CONVEX Operations	(860) 665-4951	M-F

APPENDIX III

COMMUNICATIONS

- C -

CSC Contact List

Title of Contact	Telephone Number	Hours Available
CSC Remote Control Operator		
Halvarsson Converter Station 14P Control Room	(203) 469-4907	
8ZN Tomson Converter Station	(631) 821-8093	
CSC "On-Call" O&M Support	(508) 410-9297 *	
Emergency Contact: CSC Asset Manager (Brian Reinhart)	(508) 870-9900 Ext. 107 (508) 380-5416 Backup	M-F 24/7
Emergency Contact: TransEnergie US, Ltd. VP of Projects (Brad Railing)	(508) 870-9900 Ext. 103	M-F

* . Temporary number for CSC "On-Call" Staff

APPENDIX III

COMMUNICATIONS

- D -

KEYSPAN Contact List

Title of Contact	Telephone Number	Hours Available
Manager	(516) 545-4011	M-F
Chief System Operator	(516) 545-5751	M-F
Work Coordinator	(516) 545-4009	M-F
Senior System Operators	(516) 545-4007	24/7
System Operators	(516) 545-4003	24/7
District Operators	(516) 545-4004	24/7

Email Notifications: trans_outagenotify@keyspanenergy.com

APPENDIX III

COMMUNICATIONS

- E -

ISO-NE Contact List

Title of Contact	Telephone Number	Hours Available
ISO-NE System Operator-Holyoke, MA	(413) 536-7386	24/7
ISO-NE Forecaster-Holyoke, MA	(413) 535-4340	24/7
ISO-NE TSO Administrator-Holyoke, MA	(413) 540-4243	24/7
ISO-NE Outage Coordinator-Holyoke, MA	(413) 535-4304	M-F