Q. Further to the response to PUB-NLH-007, is there a written procedure outlining the coordination process to be followed with Newfoundland Power? If yes, provide a copy. If no, why not?

A. Hydro and Newfoundland Power coordinate many activities in the areas of forecasting, planning and operations. There is no single documented procedure that outlines the coordination processes that exists between the two utilities. For particular activities, Hydro maintains documented procedures that are used to guide the coordination between the two utilities. The following list identifies the procedures, or instructions, maintained by Hydro:

- 010 - System Outages;
- 042 - Forest Fires Near Transmission Lines;
- A-003 - Notification of Weather Warnings and Lightning Activity;
- T-001 - Generation Loading Sequence and Generation Shortages[1];
- T-007 - Holyrood Black Start Restoration Using Hardwoods Gas Turbine;
- T-032 - Restoration Plan for Loss of TL202 and TL206; and
- T-078 - Hardwoods and Oxen Pond Restoration.

These instructions are attached as PUB-NLH-054, Attachments 1 to 7.

[1] T-001 does not reference the temporary arrangement with CBPP. Please refer to Hydro's response to PUB-NLH-070.

In any case, all activities are coordinated between the utilities. Discussions and communications occur on an ongoing basis between personnel at various levels of the utilities.

These activities, and the coordination that exists, have developed over time and through particular oversight of the Inter-Utility System Planning and Reliability Committee, with representation by both utilities.

newfoundland labrador hydro
a nalcor energy company

**OPERATIONS STANDARD INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | All Stations | **Inst. No.** | 010 |
| **TITLE:** | System Equipment Outages | **Page** 1 | **of** 4 |

To adequately plan the operation of the power system, it is necessary to have sufficient time to plan equipment outages and evaluate the effect of these equipment outages on system operation and customer service. This is particularly important for outages affecting Hydro's Rural customers, Industrial Customers or Newfoundland Power. Equipment outages on Hydro's system can affect customers on Newfoundland Power's operation and vice versa. Therefore adequate time for co-ordination between control centres must be provided.

1. PLANNED SYSTEM EQUIPMENT OUTAGES

a) Planned system equipment outages must be requested from the Energy Control Centre (ECC) as far in advance as possible.

A minimum of **FIVE WORKING DAYS** notice shall be given for equipment outages which are internal to Hydro (i.e., do not require customer outages).

For outages involving Newfoundland Power, Industrial Customers and Hydro Rural customers, a minimum of **SEVEN WORKING DAYS** notice is required.

b) The equipment outage is to be requested using the Planned System Equipment outage database application.

c) Requests for equipment outages shall originate from:

i. Short Term Work Planning and Scheduling – Planner (TRO Regions);
ii. Short Term Work Planning and Scheduling – Planner (Hydro);
iii. Short Term Work Planning and Scheduling – Planner (Thermal)
iv. Short Term Work Planning and Scheduling – Planner (Exploits)
v. Other departments shall direct their equipment outage requests through the appropriate planning areas; and
vi. Newfoundland Power Control Centre – Superintendent (or designate).

d) All requests shall be made to the Supervisor - ECC (or designate) with copies sent to stakeholders.

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**OPERATIONS STANDARD INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | All Stations | **Inst. No.** | 010 |
| **TITLE:** | System Equipment Outages | **Page** 2 | **of** 4 |

1. PLANNED SYSTEM EQUIPMENT OUTAGES (cont'd.)

e) Equipment outages requested by Transmission and Rural Operations shall contain the following information:

i. specific equipment affected (in case of transmission line indicate specific section)
ii. starting date and time*
iii. ending date and time*
iv. type of work protection required
v. purpose of equipment outage
vi. switching arrangements

* The starting and ending times will include switching time and work time. This is especially important when customer interruptions are involved.

f) Equipment outages requested by Hydro Operations, Thermal Operations or Exploits Generation shall contain the following information:

i. equipment affected
ii. starting date and time*
iii. ending date and time*
iv. purpose of equipment outage

* The starting time is the time the equipment is disconnected from the system. The ending time is the time the unit is restored to available status.

g) Equipment outage notification by Newfoundland Power shall contain the following information:

i) specific equipment affected
ii) starting date and time*
iii) ending date and time*
v) condition guarantee (if required)
vi) purpose of equipment outage
vii) switching arrangements

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**OPERATIONS STANDARD INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | All Stations | **Inst. No.** | 010 |
| **TITLE:** | System Equipment Outages | **Page** 3 | **of** 4 |

1. PLANNED SYSTEM EQUIPMENT OUTAGES (cont'd.)

h) Other equipment outage requests, from CF(L)Co, NUGs, Industrial Customer, etc. will be channelled through the Supervisor - ECC, ( or designate) who will discuss the requirements with the area concerned before the request is granted.

i) When a decision has been made, the Supervisor, ECC (or designate) will notify the originator of the equipment outage request with copies to the same personnel as in the original request and to other stakeholders.

j) Switching arrangements shall be confirmed at the time of the equipment outage confirmation.

k) The equipment outage confirmation will be given as much in advance as possible notice.

l) If there is a requirement for an equipment outage to be extended the ECC Shift Supervisor shall be advised.

OUTAGE APPROVAL

Prior to the approval of any planned equipment outages, the Planned System Equipment Checklist is to be completed by the Supervisor –ECC (or designate). To assist with the checklist, the document - *System Constraints for Planned Equipment Outages* should be reviewed. This document provides guidelines, constraints and other considerations when approving outages to power system equipment. A link to this document follows:

..\..\ECC Management\INSTRUCTIONS\System Constraints for Planned Equipment Outages Rev 3.doc

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | All Stations | **Inst. No.** | 010 |
| **TITLE:** | System Equipment Outages | **Page** 4 | **of** 4 |

2. DEVIATION FROM STANDARD

All parties shall attempt to work within the time limits as outlined in this standard. Timeframes may be relaxed through discussion and agreement between all stakeholders.

3. FORCED REMOVAL OF EQUIPMENT

Non-scheduled removal of equipment from service shall be determined by the ECC Shift Supervisor in consultation with available personnel or system on-call.

In case of an emergency, when time limitations prohibit consultation, the ECC Shift Supervisor shall exercise proper judgement and report the problem and action taken to appropriate personnel or on-call as soon as possible.

**REVISION HISTORY**

| Version Number | Date | Description of Change |
|---|---|---|
| 0 | 1980-11-19 | Original Issue |
| 12 | 2012-11-08 | General Changes and added link to document - *System Constraints for Planned Equipment Outages* |

| | |
|---|---|
| **PREPARED:** Art Bursey | **APPROVED:** |

HYDRO
THE POWER OF COMMITMENT

**NEWFOUNDLAND AND LABRADOR HYDRO - OPERATIONS**

**STANDARD INSTRUCTION**

| **TITLE:** | **Inst. No.** 042 |
|---|---|
| FOREST FIRES NEAR TRANSMISSION LINES | **Rev. No.** |
| | **Page** 1 **of** 4 |

## Introduction

Forest fires occurring in the vicinity of transmission lines present the potential for direct damage to transmission line structures, as well as creating operational concerns for Control Center operators and others involved in fire suppression activities.

The exchange of reliable information plays a key role in effectively managing a fire situation. It is therefore important that all personnel involved recognize **the necessity of forwarding information/instructions as quickly as possible.**

## Communication

Reports of forest fire activity in or around transmission lines will normally be reported to the **Newfoundland Power Control Center (737-5847)** or the **Newfoundland and Labrador Hydro Control Center (745-3116, 745-3123, 737-1957 or 737-1958)** by the Newfoundland and Labrador Forest Service.

At that time, the Control Center Operator will be informed as to the location of the fire and will determine if the affected transmission line is within his jurisdiction. If this is not the case, the Control Center Operator will advise the Forest Service of the correct jurisdiction.

When the Forest Service has contacted the Control Center having jurisdiction over the transmission line, the Control Center shall be informed as to a contact in the Forest Service.

Incidents may occur when the report of a forest fire may go directly to a Hydro Area Representative. In such cases, the area receiving the call will immediately inform the Control Center, relaying all pertinent information.

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 1996-06-10 |
|---|---|---|
| D. Fever | | **REV. DATE:** 1997-07-31 |

HYDRO
THE POWER OF COMMITMENT

**NEWFOUNDLAND AND LABRADOR HYDRO - OPERATIONS**

**STANDARD INSTRUCTION**

| **TITLE:** FOREST FIRES NEAR TRANSMISSION LINES | **Inst. No.** 042<br>**Rev. No.**<br>**Page** 2 **of** 4 |
|---|---|

**Communication** (cont'd.)

Hydro Area Representative dispatched to the fire scene will advise the Forest Service contact they are enroute.

Control Center Operators having been advised of a fire situation will proceed to invoke the procedures section of this document.

**Guidelines**

Transmission Lines **will not normally** be removed from service as a result of forest fire activity within a transmission line right of way.

Transmission Lines **will be removed from service** if transmission structures are damaged to the point they are considered structurally unsafe.

If an emergency situation exists, (direct threat to personnel safety), the line shall be removed from service immediately.

The decision to remove a transmission line from service will be made by the Control Center Shift Supervisor. A decision of this nature will normally involve:

an on-site assessment of the situation by Hydro Area Representative

consideration as to the impact that the loss of this line will have on customer supply and/or system security

consultation with other Control Center personnel

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 1996-06-10 |
|---|---|---|
| D. Fever | | **REV. DATE:** 1997-07-31 |

HYDRO
THE POWER OF COMMITMENT

**NEWFOUNDLAND AND LABRADOR HYDRO - OPERATIONS**

**STANDARD INSTRUCTION**

| **TITLE:** FOREST FIRES NEAR TRANSMISSION LINES | **Inst. No.** 042<br>**Rev. No.**<br>**Page** 3 **of** 4 |
|---|---|

**Guidelines** (cont'd.)

If a line is removed from service, it shall **not be re-energized** until approval to do so has been received from the on-site Hydro Area Representative.

Lines which are removed from service due to fire activity will be inspected by Hydro Area Representative prior to re-energization.

Ground personnel engaged in fire suppression activities near or at the right of way will:

clear the area when water bombing is underway

not direct streams of water at overhead conductors

maintain a safe working distance from energized conductors

The direct water bombing of transmission structures shall be avoided.

When possible, water bombing shall be done parallel to the transmission lines.

When possible, salt water will not be used for water bombing around energized lines.

**Procedures**

When informed of forest fire activity on or near a transmission line right of way, the Control Center operator will:

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 1996-06-10 |
|---|---|---|
| D. Fever | | **REV. DATE:** 1997-07-31 |

HYDRO
THE POWER OF COMMITMENT

**NEWFOUNDLAND AND LABRADOR HYDRO - OPERATIONS**

**STANDARD INSTRUCTION**

| **TITLE:** FOREST FIRES NEAR TRANSMISSION LINES | **Inst. No.** 042<br>**Rev. No.**<br>**Page** 4 **of** 4 |
|---|---|

**Procedures** (cont'd.)
confirm the fire location, name and telephone number of the Forest Service contact person, name of the "Fire Boss" assigned to the scene and where/how this person may be contacted.

request that a Hydro Area Representative be immediately dispatched to the fire scene (location of the Fire Boss).

advise the Control Center Superintendent and appropriate on-call personnel of the fire situation.

Once on site, the Hydro Area Representative shall:

in consultation with the "Fire Boss", inspect the scene and evaluate the situation.

identify the lines involved by the designated line number.

report this information to the Control Center.

The Hydro Area Representative shall remain on the fire scene until the fire no longer poses a threat to the transmission line.

The Hydro Area Representative shall periodically (at least once per hour) contact the Control Center and inform the operator of the status of the fire and fire fighting activity.

Control Center Operators shall pass all updated information to the Control Center Superintendent and the on-call person.

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 1996-06-10 |
|---|---|---|
| D. Fever | | **REV. DATE:** 1997-07-31 |

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# SYSTEM OPERATING INSTRUCTION

| | | | |
|---|---|---|---|
| **STATION:** | GENERAL | **Inst. No.** | A-003 |
| **TITLE:** | Notification of Weather Warnings and Lightning Activity | **Page** 1 | **of** 2 |

## GENERAL

Weather warnings include extreme winds, heavy rainfalls or floods, lightning, ice storms, blizzards, and other extreme occurrences. Warnings are not the regular daily public forecasts that Environment Canada issues. Also, the Energy Control Centre operates a real time Lightning Tracking System (LTS) application to monitor the activity of lightning around Newfoundland and Labrador.

## OBJECTIVE

Its primary purpose is to provide early warning of lightning activity and adverse weather. Use this information to improve power system security and reliability. In response to warnings, Energy Control Centre staff shall position the power system in order to guard against the impending threat of lightning and adverse weather.

## ADVERSE WEATHER:

Procedure

When Environment Canada issues to the Energy Control Centre a special weather warning, the information contained in the warning shall be forwarded to regional and plant staff, who maybe potentially impacted. After hours, on-call persons shall be notified.

Use this information to improve power system security and reliability. In response to warnings, Energy Control Centre staff shall position the power system in order to guard against the impending threat of adverse weather.

## LIGHTNING ACTIVITY

Similarly, others may benefit from notification of lightning activity. The Energy Control Centre shall notify other parties that may be impacted by lightning activity.

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# SYSTEM OPERATING INSTRUCTION

| | | | |
|---|---|---|---|
| **STATION:** | GENERAL | **Inst. No.** | A-003 |
| **TITLE:** | Notification of Weather Warnings and Lightning Activity | **Page** 2 | **of** 2 |

**PROCEDURE**

Energy Control Centre staff will notify the following parties of lightning that may affect their operations or activities:

1. Hydro personnel working in switchyards or near transmission lines.
2. Bay d'Espoir Control Room
3. Holyrood Control Room
4. Northern region personnel (Manager – Generation and Terminals or Production Supervisor during normal hours and on-call after hours) of any lightning activity in the vicinity of L'Anse au Loop and Lac Robertson
5. Newfoundland Power Control Centre
6. Industrial Customers
7. Exploits Grand Falls Control Room

**Part of the Emergency Response Plan

**REVISION HISTORY**

| Version Number | Date | Description of Change |
|---|---|---|
| 0 | 2004-08-23 | Original Issue |
| 2 | 2013-09-25 | Add Exploits Grand Falls Control Room |

| | |
|---|---|
| **PREPARED:** Bob Butler/Ross Kearley | **APPROVED:** |

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | GENERAL | **Inst. No.** | T-001 |
| **TITLE:** | GENERATION LOADING SEQUENCE AND GENERATION SHORTAGES*, ** | **Rev. No.** | 07 |
| | | **Page** 1 | **of** 2 |

**INTRODUCTION**

In the event of a system generation shortage, the following guidelines shall be followed in the sequence outlined in order to minimize outages to customers:

**PROCEDURE**

A. Normal Generation Loading Sequence

1. Bring on line all available Hydro hydroelectric generators and load them to near their full capacity.

2. Request Newfoundland Power to maximize their hydro production.

3. Make a Capacity Request of Deer Lake Power to maximize their hydroelectric generation.

4. Request Non-Utility Generators to maximize their hydro production.

5. Increase Holyrood production to near full capacity.

6. Notify customers taking non-firm power and energy that if they continue to take non-firm power, the energy will be charged at higher standby generation rates.

7. Ask Newfoundland Power to curtail any interruptible loads available.

8. Start and load standby generators, both Hydro and Newfoundland Power units, in order of increasing average energy production cost with due consideration for unit start-up time.

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 1992-07-16 |
|---|---|---|
| Robert Butler | | **REV. DATE:** 2009-04-29 |

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | GENERAL | **Inst. No.** | T-001 |
| **TITLE:** | GENERATION LOADING SEQUENCE AND GENERATION SHORTAGES | **Rev. No.** | 07 |
| | | **Page** 2 | **of** 2 |

**PROCEDURE** (cont'd.)

9. Cancel all non-firm power delivery to customers and ensure all industrial customers are within contract limits.

If load is still increasing and it is apparent that a generation shortage may occur, proceed as follows:

10. Ensure that steps A1 to A9 above have been followed and implemented.

11. Inform Newfoundland Power of Hydro's need to reduce supply voltage at Hardwoods and Oxen Pond and other delivery points to minimum levels to facilitate load reduction. Begin voltage reduction.

12. Request industrial customers to shed non-essential loads and inform them of system conditions.

13. Request industrial customers to shed additional load.

14. Request Newfoundland Power to shed load by rotating feeders. At the same time, shed load by rotating feeders in Hydro's Rural areas where feeder control exists.

Note:

Generation from Wind Farms may shutdown with little notice.

* Part of the Environmental Plan
** Part of the Emergency Response Plan

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 1992-07-16 |
|---|---|---|
| Robert Butler | | **REV. DATE:** 2009-04-29 |

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | **Holyrood, Hardwoods and General** | **Inst. No.** | T-007 |
| **TITLE:** | **Holyrood Black Start Restoration Using Hardwoods Gas Turbine**** | **Page** 1 | **of** 4 |

## Introduction

The Avalon Peninsula may become separated from Bay d'Espoir and the remainder of the power system during ice, wind or other storm events. When this happens, Holyrood generation will likely trip due to an imbalance between area load and on-line generation. Customers will be without power until the Hardwoods Gas Turbine and Holyrood fossil units are placed in-service and the load is reconnected.

The goal of this instruction is to supply the necessary black start load (5-10 MW) of the Holyrood Generating Plant using the Hardwoods gas turbine via TL242.

## Guidelines

*Hardwoods Terminal Station*

- Use the "Black Start - Open Breakers" command button to open the following breakers at HWD TS to facilitate energizing a dead bus:
  - B2L42
  - B1B2
  - B7C1
  - B7T1
  - B7T2
  - B8T4
  - B8T3
  - B8B9
  - B8C2
  - B7T5
- Confirm open the breakers listed above

*Newfoundland Power Operations*

- Consult with the Newfoundland Power Control Centre; inform them a black start will be initiated via the Hardwoods Gas Turbine. Request that they open all breakers associated with their 66kV Bus 6:
  - HWD-54L-B
  - HWD-5L-B
  - HWD-19L-B

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | **Holyrood, Hardwoods and General** | **Inst. No.** | T-007 |
| **TITLE:** | **Holyrood Black Start Restoration Using Hardwoods Gas Turbine**** | **Page** 2 | **of** 4 |

**Guidelines** (cont'd.)

*Newfoundland Power Operations* (cont'd.)

HWD-79L-B
HWD-72L-B
HWD-T2-B
HWD-T1-B

- With Newfoundland Power, confirm open the breakers listed above

*Hardwoods Gas Turbine*

- Request Hardwoods Gas Turbine to be started locally (Both Ends A & B, if available) in Black Start Operation as per Instruction T-075.

*Holyrood Operations*

- Consult with the Holyrood Control Room; inform them a black start will be initiated via the Hardwoods Gas Turbine. Request that they confirm open HRD B2L42 and HRD ST34. Have them standby until ECC is ready to energize their station service boards via transformer SST-34.

*Holyrood Terminal Station*

- Use the "Black Start - Open Breaker" command button to open the following breakers at HRD TS to facilitate energizing a dead bus:

B12B15
B12L18
B12L17
B6T10
B6L3
B7L2
B7T5
B7L38

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | **Holyrood, Hardwoods and General** | **Inst. No.** | T-007 |
| **TITLE:** | **Holyrood Black Start Restoration Using Hardwoods Gas Turbine**** | **Page** 3 | **of** 4 |

**Guidelines** (cont'd.)

*Energizing TL242*

- The present operating philosophy requires that a local operator is required to close the Gas Turbine breaker, G1T5 at Hardwoods, under a black start condition (as per Instruction T-075). Have the operator close G1T5. Check closed.
- Energize B8 by closing HWD B7T5. Check closed.
- Adjust the generator output voltage to achieve approximately 67 kV on Bus 8.
- Adjust HWD T3 tap to position 4 and energize B2 by closing HWD B8T3. Check closed.
- Close and/or check closed HRD B12L42.
- Energize HRD B12 via TL242 by closing HWD B2L42. Check closed. If necessary, adjust HWD T3 tap position to achieve acceptable voltage levels on HRD B12.

*Energizing Holyrood Station Service Boards*

- Close and/or check closed HRD B12T10. Note that B12T10 must be closed before B6T10 as they are interlocked (described in instruction T-048).
- Energize B6 by closing DRD B6T10. Check closed.
- HRD T10 tap position can't be adjusted without station service power, which is provided by the Holyrood Plant. Without station service available, HWD T3 tap position can be adjusted to achieve acceptable voltage levels on HRD B6. Once the Holyrood Plant energizes their Unit Service and Station Service Boards, station service power should become available in the Holyrood Terminal Station. Once station service power is available, HRD T10 tap changer can be used to achieve acceptable voltage levels on HRD B6.

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | **Holyrood, Hardwoods and General** | **Inst. No.** | T-007 |
| **TITLE:** | **Holyrood Black Start Restoration Using Hardwoods Gas Turbine**** | **Page** 4 | **of** 4 |

**Guidelines** (cont'd.)

*Holyrood Operations*

- Inform the Holyrood Control Room their station service boards are ready to be energized. When they are ready, energize transformer SST-34 by closing HRD B6L3. Check closed. They may close ST34 and proceed with their Black Start procedure.

*ECC Operations*

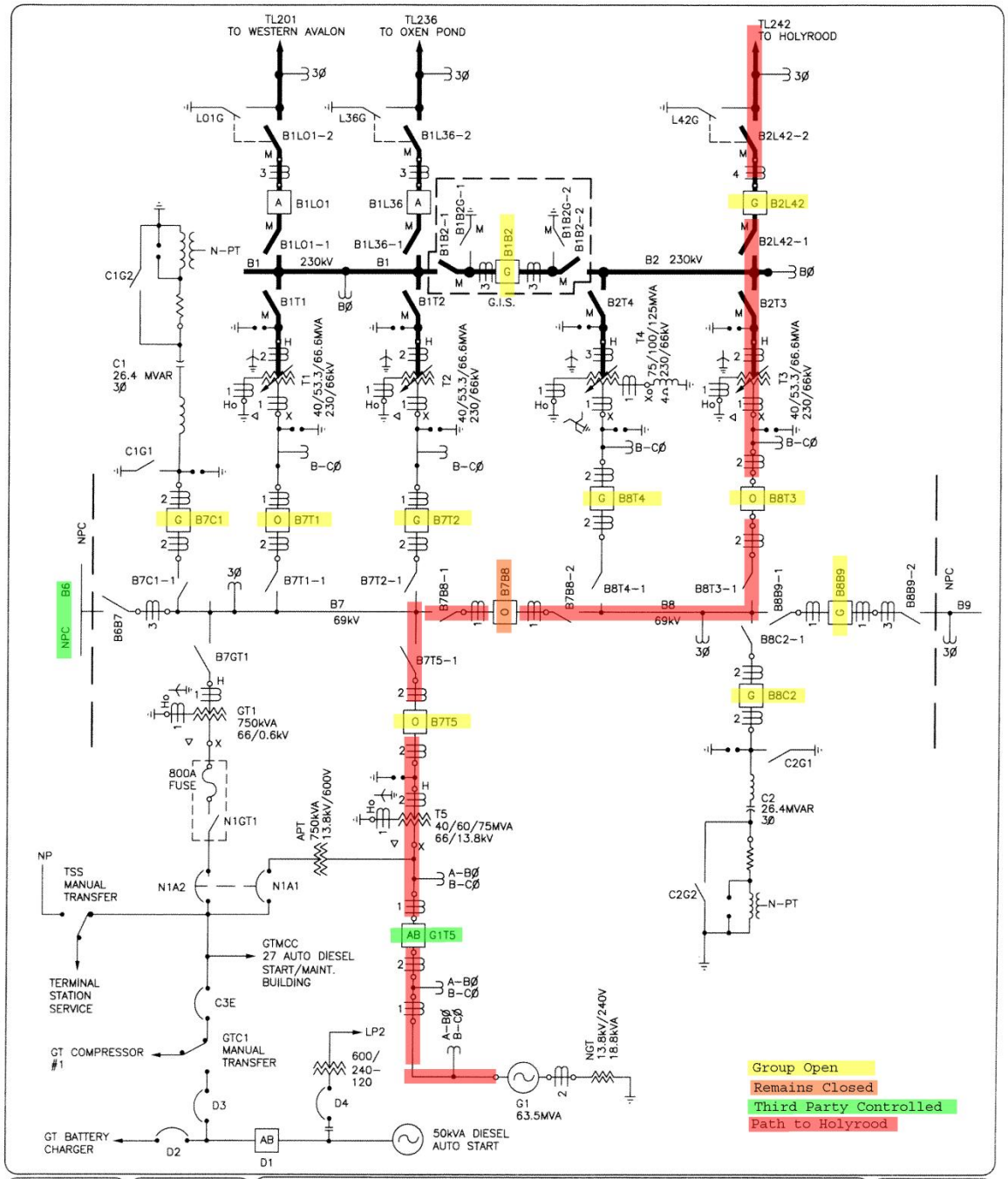
- Proceed with Instruction T-022 Restoration Of The Avalon Peninsula When Isolated From Bay d'Espoir.

** Part of the Emergency Response Plan

**REVISION HISTORY**

| Version Number | Date | Description of Change |
|---|---|---|
| 0 | 2012-06-07 | Original Issue |
| 1 | 2013-10-31 | Updates |

| | |
|---|---|
| **PREPARED: R. Coish** | **APPROVED:** |

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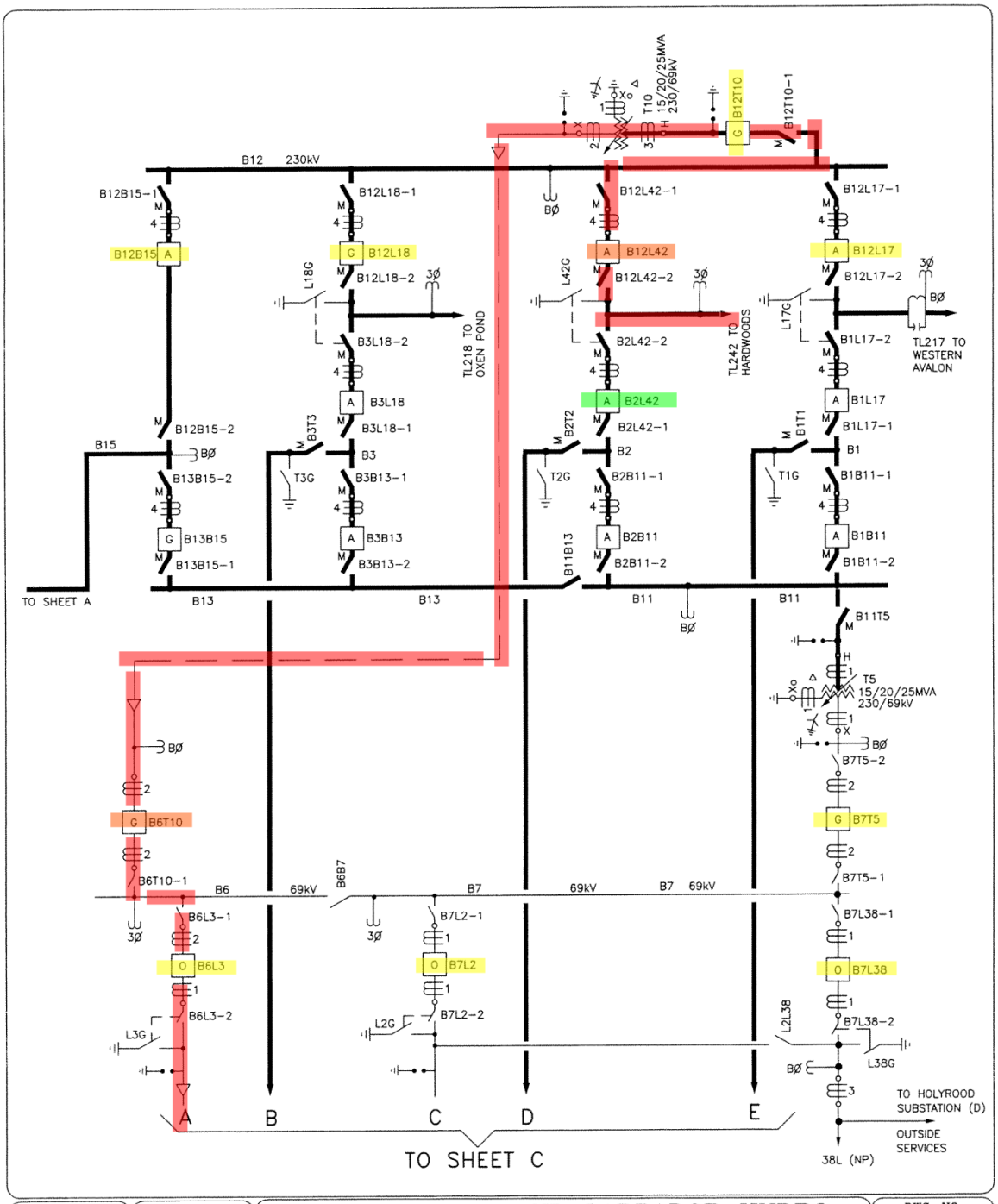
| DRAWN BY: J.T. | REVISED BY: D.R. | NEWFOUNDLAND AND LABRADOR HYDRO | DWG NO HWD-1 |
| APPROVED BY R. STOYLES | | SYSTEM OPERATING DIAGRAM<br>HARDWOODS TERMINAL STATION | REV NO 18 |
| DATE 2007/10/25 | | | |

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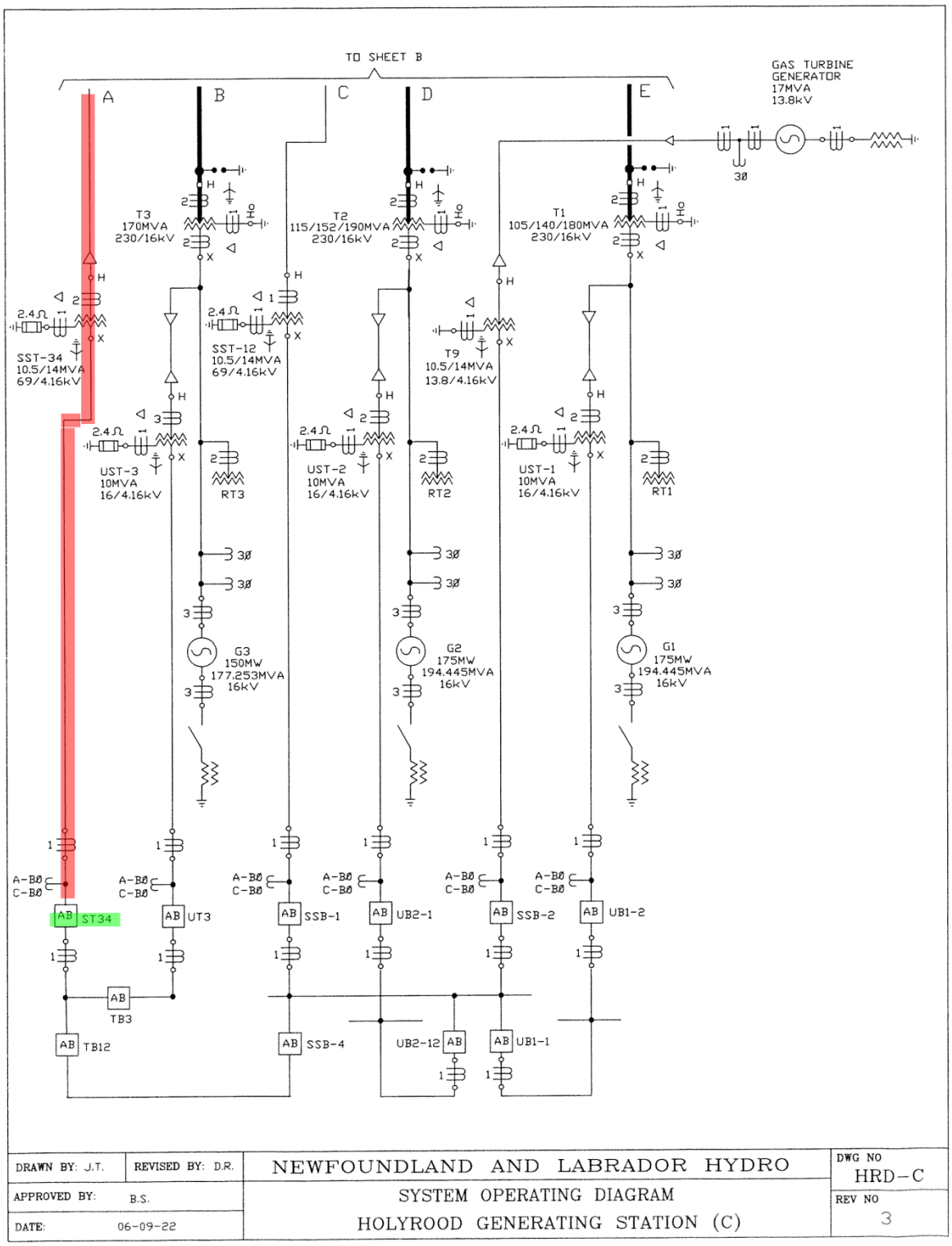
| DRAWN BY: J.T. | REVISED BY: D.R. | NEWFOUNDLAND AND LABRADOR HYDRO | DWG. NO. HRD-B |
| APPROVED BY: J.F. | | SYSTEM OPERATING DIAGRAM<br>HOLYROOD TERMINAL STATION (B) | REV. NO. 10 |
| DATE: 05-03-16 | | | |


TO SHEET B
A
B
C
D
E
GAS TURBINE
GENERATOR
17MVA
13.8kV
T3
170MVA
230/16kV
T2
115/152/190MVA
230/16kV
T1
105/140/180MVA
230/16kV
SST-34
10.5/14MVA
69/4.16kV
SST-12
10.5/14MVA
69/4.16kV
T9
10.5/14MVA
13.8/4.16kV
UST-3
10MVA
16/4.16kV
UST-2
10MVA
16/4.16kV
UST-1
10MVA
16/4.16kV
RT3
RT2
RT1
G3
150MW
177.253MVA
16kV
G2
175MW
194.445MVA
16kV
G1
175MW
194.445MVA
16kV
ST34
UT3
SSB-1
UB2-1
SSB-2
UB1-2
TB3
TB12
SSB-4
UB2-12
UB1-1
DRAWN BY: J.T.
REVISED BY: D.R.
APPROVED BY: B.S.
DATE: 06-09-22
NEWFOUNDLAND AND LABRADOR HYDRO
SYSTEM OPERATING DIAGRAM
HOLYROOD GENERATING STATION (C)
DWG NO
HRD-C
REV NO
3

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | Energy Control Centre | **Inst. No.** | T-032 |
| **TITLE:** | Restoration Plan for Loss of TL202 and TL206 | **Page** 1 | **of** 3 |

This plan is devised to assist in the restoration of the power system should TL202 and TL206 trip simultaneously. Newfoundland and Labrador Hydro's Energy Control Centre Shift Supervisor will direct all actions necessary to restore the power system to its normal operating state. Upon loss of both 230 kV transmission lines from Bay d'Espoir to Sunnyside, Hydro's automatic restoration scheme will activate. The goal of the scheme is to restore power to TL207 from either TL202 or TL206. A number of items can be performed while the auto-restoration program is running. If unsuccessful, the program will timeout after 1½ to 2 minutes. Complete the following items in preparation of restoring the system.

***Note*- Maintain Contact with Newfoundland Power throughout this Restoration Procedure.**

| Newfoundland Hydro (NLH) | | Comments |
|---|---|---|
| 1. | Upon loss of TL 202/TL 206 auto-restoration program will execute. | ***Check program status - Come -by-Chance (CBC) display set. (T-023)*** |
| 2. | Restore lines and customer load tripped due to underfrequency load shedding (TL 226, TL 220, GBK L1, St. Alban's, etc.) | ***Reminder: - AGC has tripped to Monitor.*** |
| 3. | Monitor and Control West Coast voltage. | ***Follow Guidelines for West Coast Voltage Control.*** |
| 4. | Request Bay d'Espoir Plant to take local control. | ***Have Bay d'Espoir staff monitor and regulate frequency.*** |
| 5. | Notify North Atlantic Refining Ltd and Vale. | ***NARL – 463-8811 ext.487<br>Vale – 758-8778 or 697-1102*** |
| 6. | Notify System On-Call and Corporate Relations. | |
| 7. | Execute Group Breaker openings in OPD, HWD, HRD and WAV. | ****NLH will verify group breakers open completed.<br>*NP will verify Avalon feeders Open.*** |
| 8. | Check CBC, HWD, OPD Cap Banks Open. | ****Verify all Avalon Capacitor Banks Open.*** |

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
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| **TITLE:** | Restoration Plan for Loss of TL202 and TL206 | **Page** 2 | **of** 3 |

| Newfoundland Hydro (NLH) | | Comments |
|---|---|---|
| 9. | If HRD Unit(s) tripped, Request Holyrood's Control Room to open all unit breakers. | ***ECC will verify Holyrood unit breakers open.*** |
| 10. | Execute SSD Group Breaker opening. | ***Separate 138 kV from 230 kV at Sunnyside and verify group breaker open completed.*** |
| 11. | Restore TL 202 and/or TL 206 (If not already done by auto-restoration). If TL202 and TL206 remain out, consider HRD Blackstart from either Newfoundland Power's Mobile Generation at HRD or HWD TL242 (refer to Instruction T-007 and T-023). | ***TL 202 preferred to avoid energizing TL 203 when restoring SSD 138 kV bus. Adjust SSD LTC's to acceptable voltage levels.*** |
| 12. | Restore TL 207 (If not already done by auto-restoration) and restore TL 237 to WAV. | ***Notify NARL to restore (30 MW). *May require adjusting all online generating units to achieve acceptable Avalon voltage levels.*** |
| 13. | Restore Sunnyside 138 kV bus. Monitor and Control Voltages.<br>*Note:* ****Use of CBC caps will result in excessive Voltage spikes**** | ***Restore TL212 and TL219. Notify Newfoundland Power to restore Burin and SSD Feeders.<br>*If required the removal TL219 (SSD-SPO) will help lower the Avalon voltage.*** |
| 14. | Restore second line from Bay d'Espoir to Sunnyside, if possible. | ***Monitor and control voltage to acceptable levels.*** |
| 15. | Restore TL237 at WAV, adjust WAV LTC's to acceptable levels (142 kV) and notify Newfoundland Power to restore WAV Loads. | ***64L, B2T1, B2T2, and 86L loads.*** |
| 16. | Close WAV L01L37 to energize TL201 to HWD via B1L01.<br>Adjust HWD LTC's to acceptable levels (68 kV) and notify Newfoundland Power to restore HWD Loads. | ****Use HWD Cap Banks after LTC's usage exhausted.<br>*Start Hardwoods GT, if not already started.*** |

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**SYSTEM OPERATING INSTRUCTION**

| | | | |
|---|---|---|---|
| **STATION:** | Energy Control Centre | **Inst. No.** | T-032 |
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| Newfoundland Hydro (NLH) | | Comments |
|---|---|---|
| 17. | Close HWD B2L42 to energize TL242 to HRD. *If not completed through Black Start T-007* Close HRD B12L42. | ***HRD station service restored. Notify NP and restore 39L and 38L (If not already completed).*** |
| 18. | Close HRD B12L18 to energize TL218 to OPD. Close OPD B1L18. Adjust OPD LTC's to acceptable levels (68KV) and notify Newfoundland Power to restore OPD Loads. | ****Use OPD Cap Banks after LTC's usage exhausted.*** |
| 19. | When HRD Unit(s) are Online, restore all remaining loads. Use CBC Cap Banks as required. | |
| 20. | Restore all remaining 230kV Transmission Lines, TL203, TL217, & TL236. | ***Monitor and control voltage to acceptable levels.*** |

*Notes:*

- To secure the system after load has been restored, place remaining 230 kV transmission lines in-service and start Paradise River plant. Newfoundland Power will restore the remainder of their system, picking up load in consultation with Hydro (ECC).
- The Wind Farms should not be re-connected to the system until the Holyrood plant is in a stable mode of operation and the load is restored. When connected, the output of the wind farm(s) should be limited to the total pick-up capability of the Holyrood plant in the event that the wind generation is suddenly lost or rejected.
- Under extenuating circumstances (HRD offline for extended period), the Wind Farms could possibly supply load to Newfoundland Power's system and help maximize the available Avalon Generation capacity.

**REVISION HISTORY**

| Version Number | Date | Description of Change |
|---|---|---|
| 0 | 2013-04-11 | Original Issue |

| | |
|---|---|
| **PREPARED: Jason Dean** | **APPROVED:** |

# *EAST COAST*

# *POWER SYSTEM*

# *RESTORATION PLAN*

## *(Loss of TL202 and TL206)*

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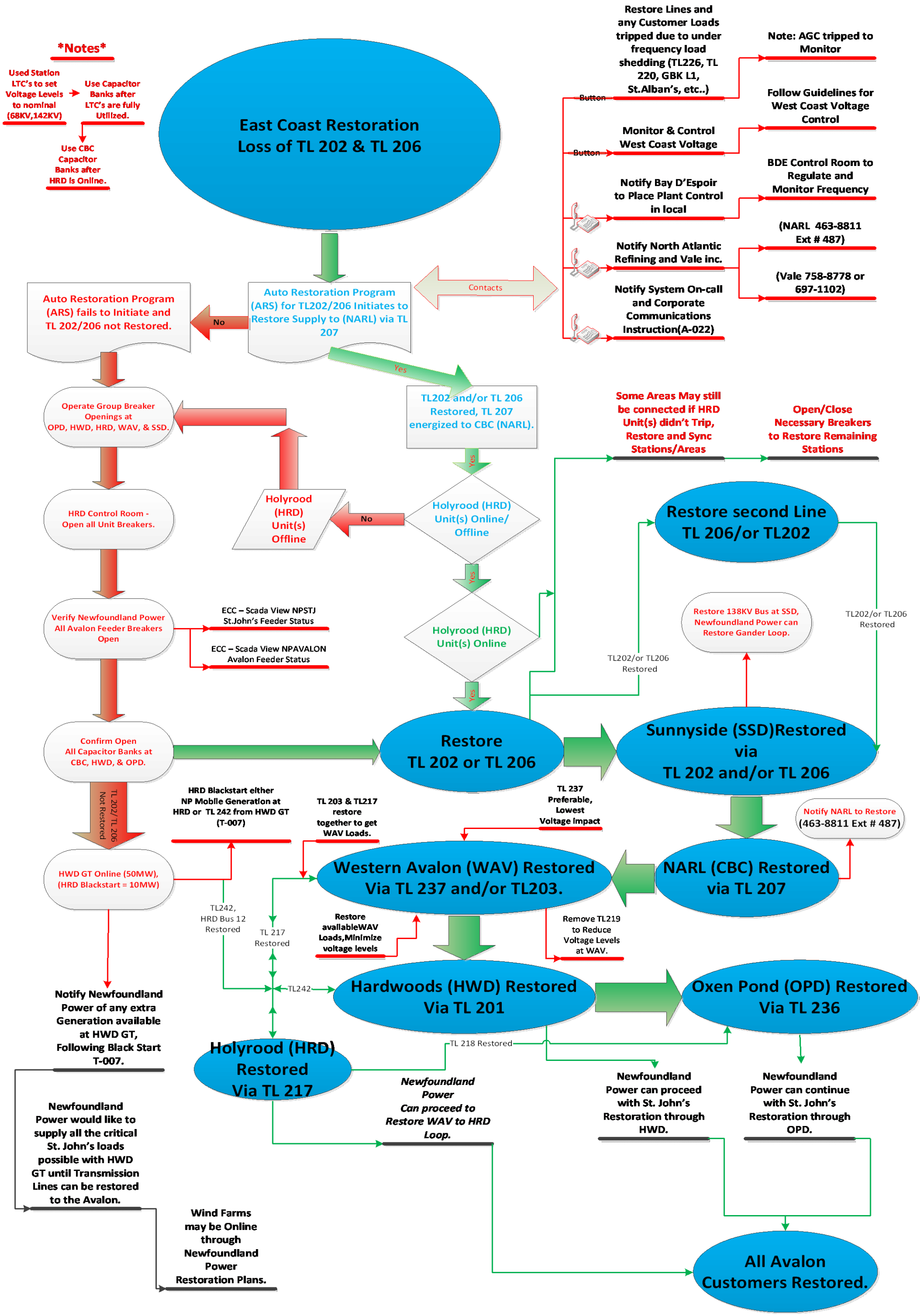
***Newfoundland and Labrador Hydro*** _____

***Newfoundland Power*** _____

***Revision 0*** ***2013-04-09***

# Instruction T-032 – Newfoundland Hydro's East Coast Restoration Plans

# Appendix – Newfoundland Power's East Coast Restoration Plans


*Notes*
Used Station LTC's to set Voltage Levels to nominal (68KV,142KV)
Use Capacitor Banks after LTC's are fully Utilized.
Use CBC Capacitor Banks after HRD is Online.
East Coast Restoration
Loss of TL 202 & TL 206
Restore Lines and any Customer Loads tripped due to under frequency load shedding (TL226, TL 220, GBK L1, St.Alban's, etc..)
Note: AGC tripped to Monitor
Button
Follow Guidelines for West Coast Voltage Control
Monitor & Control West Coast Voltage
Button
BDE Control Room to Regulate and Monitor Frequency
Notify Bay D'Espoir to Place Plant Control in local
(NARL 463-8811 Ext # 487)
Notify North Atlantic Refining and Vale inc.
(Vale 758-8778 or 697-1102)
Notify System On-call and Corporate Communications Instruction(A-022)
Contacts
Auto Restoration Program (ARS) for TL202/206 Initiates to Restore Supply to (NARL) via TL 207
No
Auto Restoration Program (ARS) fails to Initiate and TL 202/206 not Restored.
Yes
TL202 and/or TL 206 Restored, TL 207 energized to CBC (NARL).
Some Areas May still be connected if HRD Unit(s) didn't Trip, Restore and Sync Stations/Areas
Open/Close Necessary Breakers to Restore Remaining Stations
Operate Group Breaker Openings at OPD, HWD, HRD, WAV, & SSD.
HRD Control Room - Open all Unit Breakers.
Holyrood (HRD) Unit(s) Offline
No
Holyrood (HRD) Unit(s) Online/ Offline
Yes
Restore second Line TL 206/or TL202
Verify Newfoundland Power All Avalon Feeder Breakers Open
ECC – Scada View NPSTJ St.John's Feeder Status
ECC – Scada View NPAVALON Avalon Feeder Status
Holyrood (HRD) Unit(s) Online
Yes
Restore 138KV Bus at SSD, Newfoundland Power can Restore Gander Loop.
TL202/or TL206 Restored
TL202/or TL206 Restored
Confirm Open All Capacitor Banks at CBC, HWD, & OPD.
Restore TL 202 or TL 206
Sunnyside (SSD)Restored via TL 202 and/or TL 206
TL 202/ TL 206 Not Restored
HRD Blackstart either NP Mobile Generation at HRD or TL 242 from HWD GT (T-007)
TL 203 & TL217 restore together to get WAV Loads.
TL 237 Preferable, Lowest Voltage Impact
Notify NARL to Restore (463-8811 Ext # 487)
HWD GT Online (50MW), (HRD Blackstart = 10MW)
Western Avalon (WAV) Restored Via TL 237 and/or TL203.
NARL (CBC) Restored via TL 207
TL242, HRD Bus 12 Restored
TL 217 Restored
Restore availableWAV Loads,Minimize voltage levels
Remove TL219 to Reduce Voltage Levels at WAV.
TL242
Hardwoods (HWD) Restored Via TL 201
Oxen Pond (OPD) Restored Via TL 236
Notify Newfoundland Power of any extra Generation available at HWD GT, Following Black Start T-007.
Holyrood (HRD) Restored Via TL 217
TL 218 Restored
Newfoundland Power can proceed with St. John's Restoration through HWD.
Newfoundland Power can continue with St. John's Restoration through OPD.
Newfoundland Power would like to supply all the critical St. John's loads possible with HWD GT until Transmission Lines can be restored to the Avalon.
Wind Farms may be Online through Newfoundland Power Restoration Plans.
Newfoundland Power Can proceed to Restore WAV to HRD Loop.
All Avalon Customers Restored.

Appendix A

# Newfoundland Power Restoration Plan

**East Coast Restoration (Loss of TL-202 & TL-206)**

Overview

NLH will open all 230 kV Breakers at SUN OXP and HWD and HRD (Duff's) to disconnect the 230 kV network from the sub transmission components. NLH will operate breakers at SUN and WAV to attempt to energize NARL from one 230 kV line from Sunnyside

NP will begin the process of separating all NP lines and loads from the NLH system to allow NLH to restore voltage to the 230 KV at WAV. NP will then pickup load from the Western Avalon System to provide sufficient load to mitigate the effects of the charging assocated with the 230 kV network. NLH will decide when we have picked up enough load to allow them to energize the 230 kV system to HRD and on to HWD and OXP.

NP SCC operators will contact the following and inform them that we are implementing the East Coast Restoration Plan.

1. Systems On-Call
2. On-Call Supervisor - St. John's,
3. On-Call Supervisor - Avalon,
4. MUN – Electrical Maintenance, and request that an operator stands by at MUN substation to operate feeder breakers if required.

Each of these will be responsible for contacting the following and or dispatching field staff to the locations identified for each area.

Systems On-Call,

1. Contact the following:
2. Manager of Operations
3. Corporate Communications.
4. Superintendent of Generation (or designate).

St. John's On- Call

1. Contact Manager St. John's Region.
2. Dispatch staff to RRD, BIG, CAB, FER, SCV to contact SCC and operate feeders as directed.

Avalon On-Call

1. Contact Manager Eastern Region
2. Dispatch Staff to HOL, COL, SPF, WAV, DUN, CAR, ILC, HGR, HCT,OPL & RVH to contact SCC and operate feeders as directed.

Superintendent of Generation (or designate)

Arrange to have operators visit each of the hydro plants that locked out to reset plants that should be made available to go online. Refer to the Southern Shore restoration plan for details of the Southern Shore system.

Prepare to run GRT, and WES GTs if requested.

Dispatch staff to SCV and TOP, PHR, SCV and PHR operators should be familiar with feeder recloser operation if needed to manage loading.

NP SCC

Preparation for Restoration

NP SCC Operators will disconnect the NP system from the NLH system by opening the following Circuit Breakers

Table 1

| | |
|---|---|
| HWD-T3-B | OXP-34L-B |
| HWD-49L-B | OXP-70L-B |
| HWD-73L-B | OXP-01-B |
| HWD-54L-B | OXP-32L-B |
| HWD-5L-B | OXP-31L-B |
| HWD-19L-B | OXP-35L-B |
| HWD-79L-B | OXP-67L-B |
| HWD-72L-B | OXP-58L-B |
| HWD-T1-B | |
| HWD-T2-B | WAV-86L-B (NLH) |

NP will breakup its 66 kV and 138 kV sub-transmission networks into sections to prepare for restoration by opening the following breakers.

Table 2 – Avalon Transmission

| | |
|---|---|
| BRB-39L-B | BLK-55L-B |
| BRB-56L-B | BLK-94L-B |
| BRB-57L-B | BLK-80L-B |
| CAR-40L-B | BLK-86L-B |
| CAR-41L-B | |
| CAR-68L-B | HCT-43L-B |
| HGR-57L-B | |

Table 3- St. John's Transmission

| | |
|---|---|
| KEL-52L-B | SLA-13L-B |
| | SLA-15L-B |
| GOU-17L-B1 (or B2) | SLA-69L-B |
| PHR-3L-B | |
| MOB-24L-B | KBR-16L-B |
| | KBR-12L-B |

NP will open all remote controlled distribution feeders in St. John's and Avalon from the Feeder Summary Screen using the group Commands where available. Any feeders that cannot be opened via the Group Commands due to tagging or configuration must be accessed by Individual feeder control from the substation SLD.

Open the following Bus Tie and Transformer Breakers to Drop the feeders at RRD and MUN

Table 4 St. John's Distribution

| | |
|---|---|
| RRD-TB-2-3 | MUN-TB-1-2 |
| RRD-T2-B | MUN-T1-B |
| RRD-T3-B | MUN-T2-B |

**System Restoration**

WAV 230 kV Bus Energized

Close the following Breakers monitoring voltage and loading with NLH

Use Group Feeder Group Close Commands when picking up large blocks is load is acceptable. There will be a slight delay between feeder close commands. If there is a need to pickup load slower or in smaller blocks use the individual feeder controls at these locations.

Table 5 Western Avalon Restoration

| **Breaker / Control** | **Subsystem Energized** | **Peak Load (MVA)** |
|---|---|---|
| WAV-B2T1 (NLH) | WAV Feeders (3) | 12.0 |
| WAV-B2T2 (NLH) | | |
| WAV-B4L64 (NLH) | BLK - BRB 138 & 66 kV | |
| BRB-Group-1 | BRB Feeders (5) | 20.4 |
| BRB-39L-B | SPF-COL_HOL | 16.5 |
| BLK-Group-1 | BLK Feeders (2) | 10.2 |
| BLK-55L-B | PJN-QTZ-DUN Feeders & CLK 66 kV | 7.9 |
| CLK-Group-1 | CLK Feeders (3) | 8.6 |
| BLK-94L-B | SCT- RVH-TRP | 8.9 |
| BLK-80L-B | NHR-ISL-HCT | 11.4 |
| BRB-56L-B | CAR Feeders (4) | 16.5 |
| BRB-57L-B | ILC Feeders (2) | 11.1 |
| HGR-57L-B | HGR Feeders (3) | 9.5 |
| CAR-40L-B | VIC Feeders (2) | 8.6 |

| | | |
|---|---|---|
| CAR-41L-B | Complete 66 kv Loops BRB-BLK Systems | |
| CAR-68L-B | | |
| HCT-43L-B | NCH & OPL Feeders (6) | 12.6 |
| WAV-86L-B (NLH) | Complete WAV-BLK 66 kV Loop | |
| BLK-86L-B | | |

**System Restoration**

HWD 230 kV and 66 kV Buses Energized

Close the following Breakers monitoring voltage and loading with NLH

Use Group Feeder Group Close Commands when picking up large blocks is load is acceptable. There will be a slight delay between feeder close commands. If there is a need to pickup load slower or in smaller blocks use the individual feeder controls at these locations.

Table 6 Hardwoods Restoration

| Breaker / Control | Subsystem Energized | Peak Load (MVA) |
|---|---|---|
| HWD-T3-B | HWD 25 kV Bus | |
| HWD-07-B and HWD-08-B | HWD 25 kV Feeders | 24.9 |
| HWD-T1-B | HWD 12.5 kV Bus | |
| HWD-T2-B | | |
| HWD-Group-1 | HWD 12.5 kV Feeders (5) | 38.4 |
| HWD-72L-B | GDL-GOU-SJM 66 kV & Distribution Busses | |
| HWD-73L-B | | |
| GDL-Group-1 | GDL-12.5 kV Feeders (6) | 45.1 |
| GOU-Group-1 | GOU-12.5 kV Feeders (3) | 32.3 |
| SJM-Group-1 | SJM-12.5 kV Feeders (4) | 14.5 |
| SJM-Group-2 | SJM-12.5 kV Feeders (4) | 16.5 |
| SJM-Group-3 | SJM-12.5 kV Feeders (3) | 11.0 |
| SJM-12-B | SJM-4.16 kV Feeder | 2.7 |
| PHR-3L-B | PHR 33 kV & 4.16 kV Feeder | 2.5 |
| GOU-17L-B1 | BIG 66 kV and 12.5 kV Feeders | 10.1 |
| HWD-19L-B | MOL-66 kV and 12.5 kV | |
| MOL-Group-1 | MOL-12.5 kV Feeders (8) | 47.1 |
| HWD-54L-B | KEN-66 kV and 25 kV | |
| KEN-Group-1 | KEN-25kV Feeders (4) | 49.2 |

Table 6 (cont'd) Hardwoods Restoration

| | | |
|---|---|---|
| HWD-49L-B<br>HWD-79L-B | CHA-KEL 66 kV and Distribution Busses | |
| CHA-Group-1 | CHA 25 kV Feeders (3) | 48.9 |
| KEL-01-B & KEL-02-B | KEL 12.5 kV Feeders | 22.2 |
| KEL-52L-B | SCV-66 kV and SCV Feeders (2) | 10.4 |
| HWD-5L-B | BCV 66 kV and 12.5 kV | |
| BCV-Group-1 | BCV 12.5 kV Feeders (4) | 21.5 |
| MOB-17L-B | MOB-66 kV-FER 66KV, CAB-01 & FER-01 Feeders | 7.5 |
| MOB-01-R, MOB-02-R | MOB 12.5 kV Feeders | 10.2 |

**System Restoration**

OXP 230 kVand 66 kV Buses Energized

Close the following Breakers monitoring voltage and loading with NLH

Use Group Feeder Group Close Commands when picking up large blocks is load is acceptable. There will be a slight delay between feeder close commands. If there is a need to pickup load slower or in smaller blocks use the individual feeder controls at these locations.

Table 7 Oxen Pond Restoration

| **Breaker / Control** | **Subsystem Energized** | **Peak Load (MVA)** |
|---|---|---|
| OXP-01-B | OXP 12.5 kV Feeder | 10.7 |
| OXP-31L-B<br>OXP-70L-B | SLA 66 kV and Distribution Busses & MUN 66 kV | |
| SLA-Group-1 | SLA-4.16 kV Feeders (5) | 11.6 |
| SLA-Group-2 | SLA 12.5 kV Feeders (3) | 20 |
| SLA-Group-3 | SLA 12.5 kV Feeders (3) | 20 |
| MUN-T2-B | MUN 12.5 kV Feeders (3) | 5.5 |
| MUN-T1-B | MUN-12.5 kV Feeders (6) | 11.1 |

| | | |
|---|---|---|
| MUN-TB-1-2 | | |
| OXP-32L-B | RRD-66 kV KBR 66 kV and Distribution Busses | |
| OXP-67L-B | | |
| RRD-T2-B | RRD-12.5 kV Feeders (4) | 17.6 |
| RRD-T3-B | RRD-12.5 kV Feeders (4) | 17.6 |
| RRD-TB-2-3 | | |
| KBR-Group-1 | KBR-4.16 kV feeders (8) | 15.5 |
| KBR-Group-2 | KBR-12.5 kV Feeders (4) | 24.0 |
| OXP-35L-B | VIR-PEP-PUL 66 kV and Distribution Busses | |
| OXP-58L-B | | |
| VIR-Group-1 | VIR 12.5 kV Feeders (8) | 65.8 |
| PEP-Group-1 | PEP 12.5 kV feeders (4) | 22.3 |
| PUL-Group-1 | PUL 12.5 kV Feeders (4) | 34.1 |

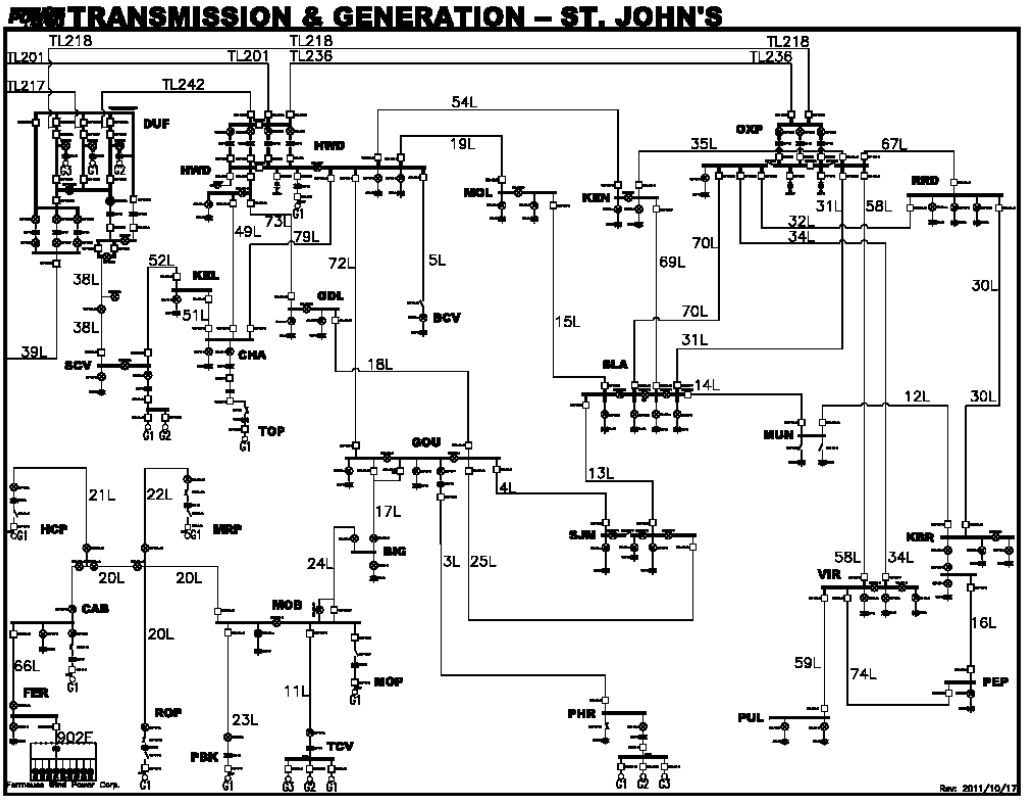
Completion of Restoration

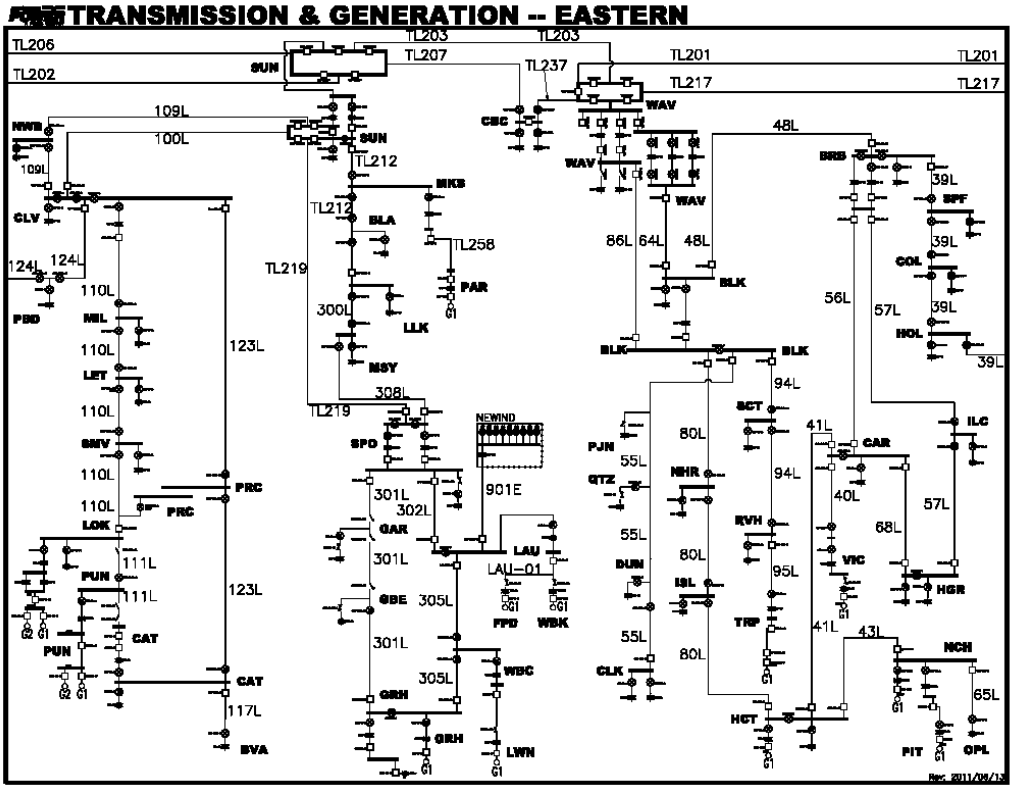
Close the following breakers to restore all loops in the St. John's 66 kV transmission system.

Table 8 Transmission Loops

| | |
|---|---|
| SLA-13L-B | KBR-16L-B |
| SLA-15L-B | KBR-12L-B |
| SLA-69L-B | HRD-B7L38 (NLH) |
| OXP-35L-B | HRD-B8L39 (NLH) |

## Newfoundland Power Schematics:



HYDRO
THE POWER OF COMMITMENT

# SYSTEM OPERATING INSTRUCTION

| | | | |
|---|---|---|---|
| **STATION:** | **Hardwoods and Oxen Pond** | **Inst. No.** | T-078 |
| **TITLE:** | **Hardwoods and Oxen Pond Restoration **** | **Rev. No.** | |
| | | **Page** 1 | **of** 6 |

Introduction:

Newfoundland and Labrador Hydro (**NLH**) supplies Newfoundland Power (**NP**) customers in the St. John's and surrounding areas using three delivery points

- Hardwoods 66 kV (busses 7 and 8);
- Oxen Pond 66 kV (busses 2 and 5); and
- Holyrood 69 kV (38L).

During one peak (on February 15, 2003 at 1800 hours) when the system load was 1402 MW, the total area load was approximately 520 MW. Hardwoods station, including its gas turbine, supplied 216 MW, Oxen Pond supplied 222 MW and Holyrood 38L, 36 MW. The remaining 46 MW was supplied by Newfoundland Power's generation.

The Newfoundland Power's 66 kV system is configured with connections between the three delivery points. Hardwoods is connected to Holyrood via two lines, 49L and 79L, which run from Hardwoods to Chamberlains. Real power normally flows from Hardwoods to Chamberlains. Oxen Pond does not directly connect into Holyrood. Hardwoods and Oxen Pond are connected via three lines, 13L (St. John's Main to Stamp's Lane), 15L (Molloy's to Stamp's Lane) and 54L (Hardwoods to Kenmount). The net real power flow across all three lines, under normal conditions, is relatively low. Most of Newfoundland Power's generation is located in the Hardwoods systems, with a small amount of generation in the Holyrood system.

Capacity:

It is important to understand the capacity of transmission and terminal equipment when meeting customers load requirements, especially under a contingency situation. These physical capabilities, or limits, shall always be respected.

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 2003-03-19 |
|---|---|---|
| B. Butler | | **REV. DATE:** |

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## SYSTEM OPERATING INSTRUCTION

| | | | |
|---|---|---|---|
| **STATION:** | **Hardwoods and Oxen Pond** | **Inst. No.** | T-078 |
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| | | **Page** 2 | **of** 6 |

Introduction (cont'd.)

The transmission line capacity into Hardwoods and Oxen Pond stations are provided below for different ambient temperatures.

| Hardwoods (MVA) | 25°C | 15°C | 0°C | SCADA Alarm |
|---|---|---|---|---|
| TL201 | 208 | 260 | 322 | User shall |
| TL236 | 237 | 298 | 370 | define |
| TL242 | 330 | 420 | 524 | limits * |
| | 775 | 978 | 1216 | |

| Oxen Pond (MVA) | 25°C | 15°C | 0°C | SCADA Alarm |
|---|---|---|---|---|
| TL218 | 237 | 298 | 370 | User shall |
| TL236 | 237 | 298 | 370 | define |
| | 474 | 596 | 740 | limits * |

* seasonally adjusted

Terminal station transformer capacities at Hardwoods and Oxen Pond, assuming all cooling mechanisms are functioning properly, are provided. Normal operating and firm capacities are included. Firm indicates capacity under the largest single contingency, the loss of the biggest transformer.

| **Hardwoods** | Capacity | Trip Setting | SCADA Alarm |
|---|---|---|---|
| Transformer T1 | 67 MVA | 95 MVA | 60 MVA |
| Transformer T2 | 67 MVA | 95 MVA | 60 MVA |
| Transformer T3 | 67 MVA | 95 MVA | 60 MVA |
| Transformer T4 | 125 MVA | 175 MVA | 115 MVA |
| Gas turbine | 50 MVA | | |
| Station | 376 MVA | | |
| | 358 MW (95% pf) | | |
| Firm | 251 MVA | | |
| | 240 MW (95% pf) | | |

| | | |
|---|---|---|
| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 2003-03-19 |
| B. Butler | | **REV. DATE:** |

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## SYSTEM OPERATING INSTRUCTION

| | | | |
|---|---|---|---|
| **STATION:** | **Hardwoods and Oxen Pond** | **Inst. No.** | T-078 |
| **TITLE:** | **Hardwoods and Oxen Pond Restoration** | **Rev. No.** | |
| | | **Page** 3 | **of** 6 |

Introduction (cont'd.)

| **Oxen Pond** | Capacity | Trip Setting | SCADA Alarm |
|---|---|---|---|
| Transformer T1 | 67 MVA | 95 MVA | 60 MVA |
| Transformer T2 | 125 MVA | 191 MVA | 115 MVA |
| Transformer T3 | 125 MVA | 191 MVA | 115 MVA |
| Station | 317 MVA | | |
| | 300 MW (95% pf) | | |
| Firm | 192 MVA | | |
| | 182 MW (95% pf) | | |

| **Oxen Pond & Hardwoods** | Capacity |
|---|---|
| Firm | 568 MVA |
| | 540 MW (assume 95% pf) |

| **Holyrood** | Capacity | Trip Setting | SCADA Alarm |
|---|---|---|---|
| Transformer T5 | 25 MVA | 38 MVA | 22 MVA |
| Transformer T10 | 25 MVA | 33 MVA | 22 MVA |
| Station | 50 MVA | | |
| | 48 MW (95% pf) | | |

Reliability

Newfoundland Power operates its 66 kV transmission in the St. John's and surrounding area as a system, connecting the Hardwoods 66 kV, Oxen Pond 66 kV and Holyrood 69 kV delivery points. Interruption of one or two of these three delivery points may affect customers, however, it depends on the time of year, time of day, which particular delivery points are affected, configuration of the Newfoundland Power system and other related conditions.

Interruption of the Holyrood 38L delivery point should not affect customer service as customers will be supplied through the Hardwoods delivery point via 49L and 79L.

| **PREPARED BY:** | **APPROVED/CHECKED BY:** | **ISSUED DATE:** 2003-03-19 |
|---|---|---|
| B. Butler | | **REV. DATE:** |

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## SYSTEM OPERATING INSTRUCTION

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Reliability (cont'd.)

Interruption of Oxen Pond or Hardwoods may result in service outages to some of Newfoundland Power's customers. During heavier load periods customers will be affected when all the load switches to the in-service delivery point and overloads Newfoundland Power's transmission. During lighter load periods, Newfoundland Power may be able to supply all their customers through the remaining delivery point. However, voltage remains a concern when supplying Newfoundland Power without Hardwoods or Oxen Pond available, due mainly to the lack of regulation on their system.

Restoration Guidelines

Perform the following steps after the loss of Hardwoods or Oxen Pond, resulting in customer interruption

1. NLH will monitor the system frequency and ensure AGC status is ON and the frequency stable. At the same time NLH will contact NP to initiate this restoration procedure.
2. If required, NLH will direct personnel to the problem station to investigate. TRO personnel will normally be contacted first, however, ECC staff are available should the need arise.
3. If applicable, NLH will isolate problem and restore remaining station equipment to service. The fully capable station will be used to restore as many customers as possible to service while personnel attend to and isolate the problem area.
4. Supply as many NP customers in the Holyrood – Seal Cove area from 38L by opening the loop near the Hardwoods end. The objective is to offload as much as possible the load on 49L and 79L at Hardwoods.

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## SYSTEM OPERATING INSTRUCTION

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Restoration Guidelines (cont'd.)

5. NP will isolate their substations in preparation for the restoration process. Depending on the load and if not already tripped, NP shall be prepared to separate OPD and HWD systems to facilitate the restoration process. During restoration, NLH will approve the connection of OPD and HWD into one system.
6. NLH will secure generation requirements. Have as many generating units on-line as possible to assist with frequency regulation during the restoration process. Start the Hardwoods gas turbine using both gas engines. Ensure both Cat Arm units are placed in speed mode. If possible, place Holyrood units at an output level that will assist with frequency regulation. Units are at their maximum shall be reduced by about 15 to 20 MW each, depending on the unit load and if there is sufficient other generation. Ensure the Holyrood units are in speed load control. These steps shall not slow greatly the restoration of customers and should be done co-incidentally if these actions have a long duration.
7. NP will start their generation, to be ready to be connected to the transmission network as it is restored. This will offload the requirement from NLH.
8. NP will have ready 20- to 40-MW load blocks to restore using their individual or group breaker control schemes. NP will set the priority for customer restoration. NP will provide to NLH reasonably accurate measures of the load being restored and will, if necessary, apply appropriate cold load pickup relationships.
9. NLH will schedule the frequency setpoint to 60.05 Hertz.
10. Establish and maintain between NLH and NP control centres a continuous and dedicated voice communications channel during customer restoration.
11. NLH will direct the restoration of NP customer load blocks. NP will begin with their larger load blocks and end with the smaller loads.
12. NP will restore load as directed by NLH.

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Restoration Guidelines (cont'd.)

13. NLH will
    - monitor the frequency level and ensure AGC is ON,
    - check for potential transmission line or station transformer overloading (ALARMS and SCADA displays), and
    - monitor station voltages (ALARMS and SCADA displays).

14. NP will monitor their system for potential equipment overload and low voltages.
15. NLH may adjust Holyrood and other generation output level to assist in frequency regulation. This action should not slow greatly customer restoration.
16. Repeat steps 11 to 15 until all customers are restored to service.
17. Return all system operating parameters to normal.

** Part of the Emergency Response Plan

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