



**Facilities Study Report**

**IR-675**

**112.5 MW Mersey Wind Phase 2**

**Queens County, NS**

Prepared by  
Tim Leopold, P.Eng.

November 28, 2023

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# Facilities Study Report

IR-675 - Mersey Wind – Phase 2

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## EXECUTIVE SUMMARY

This project provides for the establishment of a 138 kV system interconnection for a 112.5 MW wind generation facility (IR-675 – Mersey Wind Phase 2), located in Queens County, Nova Scotia, to Nova Scotia Power Inc (NSPI) 138 kV transmission substation 50W - Milton.

The Point of Interconnection (POI) for IR-675 will be at 50W-Milton Substation via an existing 138 kV single breaker terminal and an existing 138 kV transmission line (L-6554) from 50W-Milton to the Interconnection Customer's substation (112W-Mersey Wind). The Point of Change of Ownership (PCO) will be at the line L-6554 termination point in the Interconnection Customer's substation. The Point of Interconnection and the Point of Change of Ownership between NSPI and the Interconnection Customer are labelled on the Interconnection Overview diagram provided in Appendix B.

The scope of work includes the following Transmission Provider Interconnection Facilities (TPIF):

- Modification of the protection, control, telecommunication, and metering equipment at 112W-Mersey Wind substation.

The scope of work includes the following Network Upgrades:

- Transmission Line L-6006 re-termination at 99W-Bridgewater substation and associated bus protection modifications.
- Replacement of transformer 9W-T63 at 9W-Tusket with a larger 60/80/100 MVA unit.
- Relocation and replacement of transformer 30W-T62 at 30W-Souriquois with the 9W-T63 unit removed from 9W-Tusket substation.
- Modification of the Milton/Tusket Automatic Action Scheme (AAS).
- Modification of the L-5026 metering at 13V-Gulch and 11V-Paradise substations.
- Expansion of the 138 kV bus and addition of a new 138 kV line terminal at 30W-Souriquois substation.
- Addition of an 8 MVar capacitor bank on the 69 kV bus B51 at 30W-Souriquois substation.

All interconnection facilities must meet NSPI's Transmission System Interconnection Requirements (TSIR), version 1.1 dated February 25, 2021, as published on the NSPI OASIS site.

There are no 'Stand-Alone' Network Upgrades or TPIF associated with Interconnection Request IR-675.

To complete the Network Upgrades identified in this report, outages will be required to NSPI facilities. All planned outages will require NSPI System Operator actions to minimize risks and maintain system stability and reliability. All system outages required to complete the interconnection work shall require advanced planning and coordination with the NS System Operator.

The Revenue Class 138kV voltage and current transformers required for revenue metering of IR-675 shall be supplied and installed by the Interconnection Customer as per NSPI specification.

The total estimated cost to construct the required Network Upgrades and Transmission Provider's Interconnection Facilities is **\$10,606,750**. All Network Upgrades and TPIF have been identified as '*Non-Stand-Alone*'. The estimated cost for the Interconnection Customer funded TPIF is \$81,766. The estimated cost for the Interconnection Customer funded Network Upgrades is \$6,617,696. The estimated cost for the Transmission Provider (NSPI) funded Network Upgrades is \$3,907,288. The detailed cost estimates are provided in Appendix J. All cost estimates exclude allowance for funds used during construction (AFUDC) or any escalations due to timing of project execution. The customer will be responsible for paying NSPI for the actual costs associated with this project, be they higher or lower than the estimate

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provided herein, unless otherwise specified in the Generation Interconnection Agreement (GIA).

The Interconnection Customer’s targeted commercial operation date for **112W-T62** is March 1, 2025, with first-power available January 31, 2025. The Interconnection Customer’s targeted commercial operation date for **112W-T63** is December 1, 2025, with first-power available September 1, 2025. Based on the current supply chain issues and quoted delivery timelines for high voltage primary equipment, particularly the new transformer for 9W-Tusket and the 138kV circuit breaker for 30W-Souriquois, not all the required Network Upgrades can be completed by the Interconnection Customer’s targeted in-service dates. The required TPIF can be completed by the targeted in-service dates, but a level of curtailment or restrictions will be required until all Network Upgrades are completed. Further assessment will be required to determine the curtailment levels required until all Network Upgrades are completed.

The schedules provided in this study are based on an estimated delivery of 24 months for circuit breakers and transformers. Current market indications are that these deliveries may extend even further. Schedules may need to be reviewed prior to the execution of the GIA.

Part 2 of the SIS is still in progress and if any additional requirements are identified in the Part 2 Study, the FAC will be updated to reflect those additions as required.

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## 1.0 INTRODUCTION

This Facilities Study Report is based on the System Impact Study Report (SIS) as identified below:

System Impact Study Report (Part 1)  
Report GIP-IR675-SIS-R0  
By John Charlton, P.Eng.  
Dated September 2023

The SIS describes the facilities and modifications required to the Nova Scotia transmission system to add a 112.5 MW Mersey Wind Phase 2 Generating Facility interconnected to NSPI's 138 kV 50W-Milton Substation via a 138 kV transmission line L-6554. It also addresses short circuit, steady state, stability, power flow, and motor start analysis. It provides an overview of the scope of work to be completed and directions to this Facilities Study (FAC).

Part 2 of the SIS is still in progress and if any additional requirements are identified in the Part 2 Study, the FAC will be updated to reflect those additions as required.

The scope of work identified in the Facilities Study outlines the anticipated work requirements for a conceptual level of engineering and design. Detailed design may identify additional requirements or modifications that were not anticipated or captured during the preliminary design phase.

### 1.1 Project Ownership and Responsibilities

Ownership, maintenance, and other commercial operation arrangements will be covered separately in a Generation Interconnection Agreement (GIA) between NSPI and the Interconnection Customer.

The existing Mersey Wind substation 112W will be expanded to include Phase 2 of the Mersey Wind development. This expansion is part of the Interconnection Customer's interconnection facilities and is the responsibility of the Interconnection Customer. The Point of Interconnection (POI) and the Point Change of Ownership (PCO) remains the same as for IR-597 Mersey Wind Phase 1.

The SIS identified the Network Upgrades required for the interconnection of IR-675 Mersey Wind Phase 2. Some of the Network Upgrades have been identified as pre-existing (prior to IR-675) and have been identified as NSPI's responsibility to fund. All other Network Upgrades will be funded by the Interconnection Customer. The distribution of Network Upgrade costs is identified in section 1.2. All network upgrades will be owned by NSPI and are the responsibility of NSPI to complete.

NSPI will also own the revenue metering equipment located in the interconnection substation 112W-Mersey Wind added for Phase 2 as well as the existing NSPI protection, control, and telecommunications equipment.

All interconnection facilities must meet NSPI's Transmission System Interconnection Requirements (TSIR), version 1.1 dated February 25, 2021, as published on the NSPI OASIS site.

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## 1.2 Estimated Cost

The total estimated cost to construct the required Network Upgrades and Transmission Provider's Interconnection Facilities is **\$10,606,750**.

The estimate has been broken down by three categories:

1. Interconnection Customer Funded Transmission Provider Interconnection Facilities (TPIF)
2. Interconnection Customer Funded Network Upgrades
3. Transmission Provider (NSPI) funded Network Upgrades

All Network Upgrades and TPIF have been identified as 'Non-Stand-Alone' (see section 2.6). A description of the complete scope of work has been provided in Section 2.0.

### 1.2.1 Interconnection Customer Funded TPIF

The TPIF funded by the Interconnection Customer include:

- Modification of the protection, control, telecommunication, and metering equipment at 112W-Mersey Wind substation.

The estimated cost for the Interconnection Customer funded TPIF is \$81,766.

### 1.2.2 Interconnection Customer Funded Network Upgrades

The Network Upgrades funded by the Interconnection Customer include:

- Transmission Line L-6006 re-termination at 99W-Bridgewater substation and associated bus protection modifications.
- Replacement of transformer 9W-T63 at 9W-Tusket with a larger 60/80/100 MVA unit.
- Relocation and replacement of transformer 30W-T62 at 30W-Souriquous with the 9W-T63 unit removed from 9W-Tusket substation.
- Modification of the Milton/Tusket Automatic Action Scheme (AAS).
- Modification of the metering at 13V-Gulch and 11V-Paradise substations.

The estimated cost for the Interconnection Customer funded Network Upgrades is \$6,617,696.

### 1.2.3 Transmission Provider (NSPI) Funded Network Upgrades

The Network Upgrades funded by the Transmission Provider include:

- Expansion of the 30W-Souriquous substation to add a new breaker terminal for 138 kV transmission line L-6020.
- Addition of a new 8 MVAR Capacitor Bank on the 69 kV bus at 30W-Souriquous.

The estimated cost for the Transmission Provider (NSPI) funded Network Upgrades is \$3,907,288.

The detailed breakdown of the cost estimates is provided in Appendix J. The cost estimates are based on the scope of work outlined in Section 2.0 of this Facilities Study Report. The cost estimate provided in Appendix J are estimates only based on 2023 budgetary dollars. The Interconnection Customer will be responsible for paying NSPI for the actual costs associated with this project, be they higher or lower than the estimate provided herein, unless otherwise specified in the Generation Interconnection Agreement (GIA). *All cost estimates exclude allowance for funds used during*

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*construction (AFUDC) or any escalations due to timing of project execution.*

The cost estimate in this report is valid for one hundred eighty (180) days.

The project cannot commence until the customer delivers to NSPI the balance of the cost estimate for the project in a form acceptable to NSPI, or as per the terms of the GIA. The costs associated with the Transmission Provider (NSPI) Network Upgrades are subject to Nova Scotia Utility and Review Board (NSUARB) approval.

## 1.3 Project Schedule

The estimated project duration includes all scope of work required for the transmission interconnection as outlined in Section 2.0.

The Interconnection Customer's targeted commercial operation date for **112W-T62** is March 1, 2025, with first-power available January 31, 2025. The Interconnection Customer's targeted commercial operation date for **112W-T63** is December 1, 2025, with first-power available September 1, 2025.

An outline of major project milestones is provided in Section 5.0 and a preliminary project schedule outlining the major components of this project is provided in Appendix K.

Based on the current supply chain issues and quoted delivery timelines for high voltage primary equipment, particularly the new transformer for 9W-Tusket and the 138kV circuit breaker for 30W-Souriquois, not all the required Network Upgrades can be completed by the Interconnection Customer's targeted in-service dates. The required TPIF can be completed by the targeted in-service dates, but a level of curtailment or restrictions will be required until all Network Upgrades are completed. Further assessment will be required to determine the curtailment levels required until all Network Upgrades are completed. All milestone dates and schedules provided in this study are based on an executed GIA in Q1/2024.

*The schedules provided in this study are based on an estimated delivery of 24 months for circuit breakers and transformers. Current market indications are that these deliveries may extend even further. Schedules may need to be reviewed prior to the execution of the GIA.*

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## 2.0 SCOPE OF WORK

### 2.1 Interconnection Overview

An interconnection overview diagram of the 112.5 MW Mersey Wind Phase 2 interconnection is provided in Appendix B. The Point of Interconnection (POI) is at the 138 kV bus B4 at 50W-Milton Substation, and the Point of Change of Ownership (PCO) is at the termination point of 138 kV line L-6554 at the Interconnection Customer's substation 112W-Mersey Wind. The network upgrades identified in the IR#675 System Impact Study for the facility to operate at the requested capacity are addressed in section 2.4 of this report.

### 2.2 Mersey Wind Phase 2 Generation Interconnection Substation (112W)

#### 2.2.1 Basic One Line – 112W – Mersey Wind Phase 2

The developmental one line for 112W-Mersey Wind Phase 2 substation expansion is provided in Appendix D and the conceptual overall plan view for 112W-Mersey Wind Phase 2 substation is provided in Appendix E (both as provided by the Interconnection Customer). The 112W-Mersey Wind substation will be expanded to include the phase 2 Interconnection Facilities. The proposed Interconnection Facility addition consists of two generator step-up transformers rated 40/52/63 MVA, 34.5 kV (wye) to 138 kV (wye), with each transformer having two 34.5 kV collector circuits (total four) and twenty-five 4.5 MW wind energy converters totaling 112.5 MW. Both IR-675 (Mersey Wind Phase 2) and IR-597 (Mersey Wind Phase 1) will connect to the 138 kV Bus B4 at 50W-Milton via a 7 km transmission line L-6554.

#### 2.2.1 Generation Interconnection Substation Additions – 112W Mersey Wind Phase 2

The layout and electrical design of the Interconnection Customer's substation shall be the responsibility of the Interconnection Customer.

Mersey Wind Phase 2 is a physical addition to the 112W-Mersey Wind Substation constructed for Phase 1. The 138 kV bus will be extended to provide physical terminals to connect the two additional 34.5 kV to 138 kV step-up transformers. NSPI's revenue metering for Phase 2 will be installed at a common 138 kV bus interface serving both new step-up transformers for Phase 2.

The Interconnection Customer shall be responsible to supply and install the revenue metering system to Nova Scotia Power specifications as outlined in Section 2.7.

The Point of Change of Ownership will remain the same point as per IR-597 Mersey Wind Phase 1.

The Interconnection Customer shall provide the Protection and Instrumentation One Line and Substation Layout drawings to NSPI for review to ensure protection & control systems and physical line tap arrangements align with NSPI designs.



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The facility must meet NSPI's Transmission System Interconnection Requirements (TSIR) as published on the NSPI OASIS site.

## 2.2.2 Protection and Control Modifications – 112W-Mersey Wind

The existing protection and control equipment at 112W-Mersey Wind substation will be modified to add the two new 138kV circuit breakers being installed with Phase 2 as part of the line protection targeted tripping. Additional Supervisory and Data Acquisition (SCADA) points will be added to the Remote terminal Unit (RTU) as required for the Phase 2 additions.

A preliminary list of the additional SCADA points has been provided in Appendix F. The actual list of SCADA points may change during detailed design.

## 2.2.3 Station Service

The Interconnection Customer shall provide dedicated 120 V AC and 125 V DC circuits from Interconnection Customer's substation building AC distribution and DC distribution panels to supply the NSPI owned protection and control panels as noted for IR 597 Mersey Wind Phase 1.

## 2.2.4 Revenue Metering

Revenue metering shall be installed at 112W-Mersey Wind Phase 2 as detailed in section 2.5. The Interconnection Customer will supply the 138 kV revenue class current and voltage transformers, supporting structures, test switch, and meter base. The supply and installation of revenue metering equipment is considered part of the Interconnection Customers' Terminal Station and is not included in the cost estimates in this Facilities Study.

## 2.2.5 Permits, Approvals, and Standards

The Interconnection Customer is responsible to obtain all permits and approvals associated with the construction of Mersey Wind Phase 2.

The Nova Scotia Electrical Inspection Act requires that electrical work be performed under permit. Contractors must take out permits for work at voltage levels below and above 750V – including work on customer owned substations. Plans must be submitted for review and all equipment must be approved by a recognized certification authority (CSA, ULC, etc.).

The customer facilities are subject to the minimum requirements of the latest edition of the Canadian Electrical Code, CSA C22.1, for the purpose of electrical inspection. The cost associated with acquiring wiring permits and the associated electrical inspections are the responsibility of the customer. No equipment will be connected or energized without authorization of the electrical inspector.

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The interconnection substation installation will be subject to the review and acceptance by Nova Scotia Power to ensure coordination of the Nova Scotia Power and Interconnection Customer's scopes of work.

## 2.2.6 Canadian Electrical Code

The customer owned substation 112W-Mersey Wind shall be designed and constructed to comply with Canadian Electrical Code requirements.

## 2.3 Transmission Provider Interconnection Facilities (TPIF)

In summary, the TPIF scope of work includes the modifications required to protection, control, telecommunications, and metering located within the Interconnection Customer's substation 112W but owned by NSPI. This scope of work is outlined in section 2.2.2, 2.2.3, and 2.2.4.

NSPI will own, supply, and install and/or modify the protection and control equipment.

## 2.4 Network Upgrades

### 2.4.1 50W – Milton Substation

The existing 138 kV line terminal at 50W-Milton for L-6554 to IR-597 Mersey Wind Phase 1 has been designed to accommodate the addition of Mersey Wind Phase 2. The IR-597 Mersey Wind Phase 1 modifications at 50W-Milton are sufficient to accommodate IR 675 Mersey Wind Phase 2 and no additional Network Upgrades at 50W-Milton will be required. A One-Line drawing for 50W-Milton is provided in Appendix C.

### 2.4.2 99W – Bridgewater Substation

The SIS identified the requirement to re-terminate L-6006 from 138 kV Bus B61 to B62 to resolve the contingency overload on L-6531.

#### 2.4.2.1 Developmental One-Line

The developmental one line for the required 99W-Bridgewater substation modifications is provided in Appendix H-1. The 138 kV transmission lines L-6006 and L-6002 termination will be relocated from B61 to B62.

#### 2.4.2.2 Substation Layout

The developmental plan view for the required 99W-Bridgewater substation modifications is provided in Appendix H-2. The common drop leads for L-6006 and L-6002 on B61 will be removed and replaced with bolted bus connectors on B62.

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### 2.4.2.3 Protection and Control Modifications

The bus protection panels for 138 kV busses B61 and B62 will be field modified to move L-6006 and L-6002 to the 138 kV Bus B62 protection.

### 2.4.3 9W – Tusket Substation

The SIS identified the requirement to replace transformer 9W-T63 with a larger unit (60/80/100 MVA) to resolve contingency overload conditions and upgrade the 69 kV breaker 9W-563 and the associated disconnect switch 9W-563A.

#### 2.4.3.1 9W-T63 Transformer Replacement

The existing 138 kV – 69 kV transformer 9W-T63 will be replaced with a new larger 60/80/100 MVA unit. The existing transformer also has a 13.2 kV tertiary winding that supplies an existing reactor bank 9W-R311. The specification for the new transformer shall reflect the physical dimension restrictions and orientation of windings and transformer accessories such the new unit physically aligns with the existing transformer layout and connections.

The Tusket substation site has limited access and space to perform the removal of existing transformer and placement of the new transformer. A detailed logistical plan will be required in coordination with heavy hauling specialists.

#### 2.4.3.2 9W-563 Circuit Breaker Replacement

The network upgrade of 69 kV circuit breaker 9W-563 has been previously identified as part of NSPI's routine breaker replacement program and will be completed separately from the required network upgrades for IR-675. The disconnect switch 9W-563A has been confirmed to be rated 1200A (72 MVA) and does not require to be upgraded. The estimated cost of the circuit breaker upgrade has not been included in the cost estimates associated with this Interconnection Request IR-675.

#### 2.4.3.3 Protection and Control

No modifications to the existing protection and control will be required due to the replacement of transformer 9W-T63.

### 2.4.4 30W – Souriquois Substation

The SIS identified the requirement to replace transformer 30W-T62 with the transformer unit removed from Tusket 9W-T63, expand the 138 kV bus and add a new 138 kV line terminal, and add an 8 MVAR capacitor bank on the 69 kV bus B51 to address contingency undervoltage conditions for loss of L-6020.

#### 2.4.4.1 Developmental One-Line

The developmental one line for the required 30W-Souriquois substation modifications is provided

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in Appendix G-1. A new 138 kV line terminal will be created for transmission line L-6021 and the existing 138 kV circuit breaker will become dedicated to transmission line L-6020. The existing transformer 30W-T62 will be replaced with the larger unit being removed from 9W-Tusket. An 8 MVar capacitor bank will be added to the 30W-Souriquois 69 kV bus.

## 2.4.4.2 Substation Layout and Primary Equipment

The developmental overall plan view for the required 30W-Souriquois substation modifications is provided in Appendix G-2.

The northwest side of the 30W-Souriquois substation will be expanded to accommodate:

- the termination of transmission line L-6021.
- the addition of a 138 kV circuit breaker terminal.
- a new control building.
- the addition of an 8 MVar Capacitor Bank and associated 69 kV breaker terminal.

All equipment shall conform with Nova Scotia Power standard equipment specifications.

### 138 kV Circuit Breaker 30W-621

- 138 kV, 2000 A, 650 kV BIL, 3 cycle, 25 kA mom., SF6 dead-tank circuit breaker.
- Complete with two sets (each side) of 2000/16/8/6-5A multi-ratio bushing current transformers.
- As per NSPI Standard Circuit Breaker Specification SE-14.

### 138 kV Disconnects (30W-621A and 30W-621B)

- 138 kV, 2000 A, 650 kV BIL, 40 kA mom.
- Line disconnect 30W-621B will also include an integral key interlocked ground switch 30W-621E.
- As per NSPI Standard Specification SE-8 (Outdoor Air Switches).

### 138 kV Voltage Transformer (30W-P6021)

- 700/1200:1:1 with two 115/67V secondaries, 3000 VA, 0.3 WXYZ, 650 kV BIL
- As per NSPI Standard Specification SE-4

### 138 kV Line Terminal Surge Arresters (1 set)

- Station Type, Metal Oxide, 120 kV rated, 98 kV MCOV.
- As per NSPI Standard Specification SE-20.

### 138 kV – 69 kV, 33.6/44.8/56 MVA Autotransformer (relocated from 9W-T63)

### 69 kV Circuit Breaker 30W-520

- 69 kV, 1200 A, 31.5 kA, 5 cycle, SF6 dead-tank circuit breaker.
- As per NSPI Standard Circuit Breaker Specification SE-14.

### 69 kV Disconnect 30W-520A

- 69 kV, 1200 A, 350 kV BIL, 61 kA momentary, key interlocked with 30W-520E.
- As per NSPI Standard Specification SE-8 (Outdoor Air Switches).

### 69 kV Independent Grounding Switch 30W-520E

- 69 kV, 1200 A, 350 kV BIL, key interlocked with 30W-520A

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- As per NSPI Standard Specification SE-8 (Outdoor Air Switches).

69 kV, 8 MVAR Capacitor Bank 30W-C51

- 72.4 kV, 8 MVAR, grounded-wye, 3-phase, 60 Hz.
- As per NSPI Standard Specification SE-16 (Shunt Capacitor Bank).

69 kV Series Reactors 30W-RL1

- Detailed parameters to be specified during detailed design.
- As per NSPI Standard Specification SE-21 (Reactors – Dry Type).

69 kV Surge Arresters (1 set)

- Station Type, Metal Oxide, 60 kV rated, 48 kV MCOV.
- As per NSPI Standard Specification SE-20.

#### 2.4.4.3 Civil Works, Foundations, and Structures

Concrete foundations and steel support structures will be installed for:

- 1 – 138 kV A-Frame dead-end
- 2 – 138 kV disconnect supports
- 1 – 138 kV three-phase surge arrester support
- 1 – single-phase 138 kV potential transformer support
- 3 – 69 kV high bus supports
- 1 – 69 kV low bus support
- 1 – 69 kV disconnect support
- 1 – 69 kV grounding switch / surge arrester support
- 3 – 69kV single phase series reactor supports
- 1 – two phase 69 kV lead support (capacitor bank)

Concrete foundations only will be installed for:

- 1 – 138 kV dead tank circuit breaker
- 1 – 69 kV dead tank circuit breaker
- 1 – 8 MVAR Capacitor Bank
- 1 – expanded oil containment walls for transformer 30W-T63
- 1 – control building foundation

#### 2.4.4.4 Grounding and Conduit

The existing substation ground grid will be evaluated to ensure safe operation for existing fault levels and step/touch potentials. All new structures and equipment will be tied into the existing substation ground grid. The substation ground grid will be extended to all areas where the fenced area is expanded and grounded as per NSPI existing grounding standards.

The existing control cabling is in raised cable trays on wood stub poles. To facilitate construction and the transition from the existing control building to the new control building all new control cables will be installed in buried conduits or cable trench with the raised tray removed once the construction transition is complete. Existing control cables will be replaced.

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## 2.4.4.5 Protection and Control

A new control building is required to house the new protection and control equipment. The existing building is too small and not suitable for expansion. The existing control building could be retained to house the 125 Vdc battery but maintenance on the existing building would be required to extend the life of the building. This option should be assessed during detailed design.

The following new protection and control panels are required:

- 30W-T62 Transformer Protection
- L-6020 Line Protection
- L-6021 Line Protection
- L-5530 Line Protection
- L-5027 Line Protection
- 69 kV and 138 kV Bus Protection
- 30W-C51 Capacitor Bank Protection
- Breaker Backup Protection
- Telecommunications Panel
- SCADA RTU Panel

The control cabling will be replaced both to facilitate construction and remove the existing raised cable tray.

## 2.4.4.6 Telecommunications

The existing 30W-Souriquois substation communication equipment is insufficient for highspeed protection operation. A leased Bell 1G wavelength communication line will be installed to provide the communication capacity required. One new panel will be installed at the 30W-Souriquois substation for this equipment.

## 2.4.4.7 L-6021 Line Termination

Transmission line L-6021 will be terminated at a new A-Frame dead-end structure at 30W-Souriquois. A new wood pole dead-end structure will be required outside the substation fence to redirect L-6021 to the new termination point.

## 2.4.4.8 Network Upgrade Cost Allocations at 30W-Souriquois

The replacement of 30W-T62 with the existing transformer from Tusket (9W-T63) is necessary due to the contingency overloads on 30W-T62 driven by Interconnection Request IR-675. The estimated cost to replace 30W-T62 has been identified separately and is included with the Network Upgrades that are the responsibility of the Interconnection Customer.

The remaining network upgrades at 30W-Souriquois have been identified as required to address pre-existing conditions on the NSPI transmission system. The estimated cost of these upgrades has been identified separately and included with the Network Upgrades that are the responsibility of the Transmission Provider.

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## 2.4.5 13V – Gulch Substation

The SIS identified the requirement to upgrade disconnects 13V-516A and 13V-516B as well as metering on L-5026. Disconnects 13V-516A and 13V-516B were recently replaced and upgraded to 1200A (142 MVA) and will not require further upgrading for IR-675.

The metering current transformers on L-5026 are 1200/800/300/200-5A multi-ratio and will only require a field wired ratio change to upgrade the L-5026 line metering.

## 2.4.6 70V – Bridgetown Substation

The SIS identified the requirement to upgrade disconnects 70V-503 and 70V-504. After further review it was confirmed that these disconnects are currently rated at 1200A (142 MVA) and will not require further upgrading for IR-675.

## 2.4.7 11V – Paradise Substation

The SIS identified the requirement to upgrade metering on L-5025 at 11V-Paradise. The metering current transformers on L-5025 are 1200/800/300/200-5A multi-ratio and will only require a field wired ratio change to upgrade the L-5025 line metering.

## 2.4.8 Milton/Tusket Automated Action Scheme (AAS)

With the addition of Interconnection Request IR-675, the Milton/Tusket Automated Action Scheme (AAS) is no longer sufficient to offload transformer 9W-T63 for some winter and summer dispatch scenarios. As a result, transformer 9W-T63 will be replaced by a larger unit and the AAS will be repurposed to protect transformer 9W-T2 from contingency overloads following the loss of transmission line L-6024. The AAS will need to be assessed and reconfigured (re-programmed) to accommodate the updated conditions. This will be completed during detailed design.

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## 2.5 Revenue Metering

A 138 kV revenue metering system, owned by NSPI, shall be installed at the Interconnection Customer's substation (112W-Mersey Wind) for the Phase 2 addition.

138 kV revenue class current and voltage transformers (or combined Potential/Current metering unit) will be supplied and installed by the Customer complete with supporting structures, test switch, and meter base as per Nova Scotia Power metering standard STD 5.12 (attached as Appendix L: Revenue Metering).

The revenue metering class potential and current transformers shall not be embedded in any other piece of equipment and shall be certified by Measurement Canada for three element metering. Nova Scotia Power shall provide the technical specifications for the required current and voltage transformers to the Interconnection Customer.

Nova Scotia Power will install the revenue meter at the Interconnection Customer's substation once the commissioning is complete and the system is ready for energization.



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## 2.6 Stand Alone Upgrades Categorization

In the event NSPI cannot meet the Interconnection Customer’s schedule expectation or as agreed in the terms of the Generation Interconnection Agreement (GIA), the Interconnection Customer may take responsibility for design, procurement, and construction activities associated with NSPI owned assets.

These design, procurement, and construction activities are limited to upgrades deemed to be ‘Transmission Providers Interconnection Facilities (TPIF)’ or ‘Stand Alone Network Upgrades’, defined as:

*Transmission Provider's Interconnection Facilities shall mean all facilities and equipment owned, controlled, or operated by the Transmission Provider from the Point of Change of Ownership to the Point of Interconnection as identified in Appendix A to the Standard Generator Interconnection and Operating Agreement, including any modifications, additions or upgrades to such facilities and equipment.*

*Stand Alone Network Upgrades shall be defined as Network Upgrades that the Interconnection Customer may construct without affecting day-to-day operations of the Transmission System during their construction.*

The Mersey Wind Phase 2 transmission interconnection includes both Network Upgrades and Transmission Provider Interconnection Facilities. Should the Interconnection Customer decide to exercise their ‘Option to Build’, NSPI have defined the upgrades in terms of what would be considered stand-alone facilities and may be constructed without affecting day-to-day operations of the Transmission System.

### 2.6.1 ‘Stand-Alone’ Network Upgrades and ‘Stand-Alone’ TPIF

The following scope of work meets the defined criteria for ‘Stand Alone’ Network Upgrades or Stand-Alone TPIF:

- Stand-Alone Network Upgrade:
  - There are no ‘stand-alone’ network upgrades associated with Interconnection Request IR-675.
- Stand-Alone TPIF
  - There are no ‘stand-alone’ TPIF associated with Interconnection Request IR-675.

### 2.6.2 Non-Stand-Alone Network Upgrades and Non-Stand-Alone TPIF

Non-stand-alone network upgrades include all other elements of the scope of work not identified as stand-alone upgrades:

- Non-Stand-Alone Network Upgrades (Interconnection Customer Responsibility)
  - Transmission Line L-6006 re-termination at 99W-Bridgewater substation and associated bus protection modifications.
  - Replacement of transformer 9W-T63 at 9W-Tusket with a larger 60/80/100 MVA unit.
  - Relocation and replacement of transformer 30W-T62 at 30W-Souriquous with the 9W-T63 unit removed from 9W-Tusket substation.
  - Modification of the Milton/Tusket Automatic Action Scheme (AAS).

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- Modification of the metering at 13V-Gulch and 11V-Paradise substations.
- Non-Stand-Alone Network Upgrades (Transmission Provider Responsibility)
  - Expansion the 138 kV bus and addition of a new 138 kV circuit breaker and line terminal at 30W-Souriquois substation
  - Addition of an 8 MVar capacitor bank on the 69 kV bus B51
- Non-Stand-Alone TPIF
  - Modification of the protection, control, telecommunication, and metering equipment at 112W-Mersey Wind substation.

Interfaces and commissioning activities requiring joint collaboration shall be identified during the detailed design phase and prior to construction.

The cost estimate for each category has been broken out as separate cost estimates (see Section 6.0).

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## 3.0 PERMITS, APPROVALS, AND STANDARDS

The Interconnection Customer is responsible to obtain all permits and approvals required to expand the interconnection substation at 112W-Mersey Wind.

The Nova Scotia Electrical Inspection Act requires that electrical work be performed under permit. Contractors must take out permits for work at voltage levels below and above 750V – including work on customer owned substations. Plans must be submitted for review and all equipment must be approved by a recognized certification authority (CSA, ULC, etc.).

The customer facilities are subject to the minimum requirements of the latest edition of the Canadian Electrical Code, CSA C22.1, and other applicable CSA standards, for the purpose of electrical inspection. The cost associated with acquiring wiring permits and the associated electrical inspections are the responsibility of the customer. No equipment will be connected or energized without authorization of the electrical inspector.

The interconnection substation installation will be subject to the review and approval by Nova Scotia Power to ensure coordination of the Nova Scotia Power and Interconnection Customer's scopes of work.

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## 4.0 DESIGN AND CONSTRUCTION

NSPI will be responsible for the design and engineering drawing production for all aspects of the scope of work from the Point of Interconnection to the Point of Change of Ownership unless otherwise specified and agreed in the Generation Interconnection Agreement (GIA). NSPI will also be responsible for the design of any other associated network upgrades or modifications identified in the Study Impact Study.

NSPI will be responsible for the procurement and construction of all aspects of the scope of work from the Point of Interconnection to the Point of Change of Ownership and any associated network upgrades unless otherwise specified in the Generation Interconnection Agreement (GIA).

Interconnection Customer's responsibility for design, procurement, and construction scope of work shall be limited to Stand-Alone Upgrades as identified in Section 2.6 of this report.

The construction work associated with this interconnection will require planned outages to existing system components. Planned system outages must be coordinated with NSPI System Operations and will be restricted to opportunities when system reliability risks are acceptable.

# Facilities Study Report

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## 5.0 SCHEDULE MILESTONES

The Interconnection Customer’s targeted commercial operation date for **112W-T62** is March 1, 2025, with first-power available January 31, 2025. The Interconnection Customer’s targeted commercial operation date for **112W-T63** is December 1, 2025, with first-power available September 1, 2025.

A preliminary project schedule outlining major components is provided in Appendix K.

A series of milestone target dates (listed below) were assumed based on estimated timelines for the purpose of drafting a schedule for this Facilities Study. The in-service dates provided in this schedule are based on achieving these milestones. Missing any of these milestones increases the risk of not meeting the proposed commercial operation date(s).

Due to expected primary equipment estimated delivery timelines, particularly the new transformer for 9W-Tusket and 138 kV circuit breaker for 30W-Souriquois, not all the required Network Upgrades are expected to be completed prior to the Interconnection Customer’s in-service dates.

The Network Upgrades funded by the Transmission Provider require Nova Scotia Utility and Review Board (UARB) approval in advance of that work proceeding.

Facilities Study Complete	Q4, 2023
Generation Interconnection Agreement Executed	Q1, 2024
Detailed Design Start – TPIF	Q2, 2024
Detailed Design Start – Network Upgrades – IC Funded	Q2, 2024
Procurement of Long Lead Items Start – Network Upgrades – IC Funded	Q2, 2024
Capital Item Submitted to UARB (Network Upgrades – TP Funded)	Q2, 2024
Projected UARB Approval (Network Upgrades – TP Funded)	Q4, 2024
Detailed Design Start – Network Upgrades – TP Funded	Q4, 2024
Procurement of Long Lead Items Start – Network Upgrades – TP Funded (pending NSPI Executive Approval)	Q2, 2024
Construction Start – 50W, 112W (TPIF)	Q3, 2024
Construction Complete – 50W, 112W (TPIF)	January 31, 2025
Construction Start – 99W, 11V, 13V	Q3, 2024
Construction Complete – 99W, 11V, 13V	January 31, 2025
Construction Start – 9W	Q2, 2026
Projected New Transformer for 9W Delivery	Q2, 2026
Construction Complete – 9W	Q3, 2026
Construction Start – 30W	Q2, 2026
Transformer Relocated from 9W to 30W	Q2, 2026
Construction Complete – 30W	Q4, 2026
Targeted First Power Available – T62 (per Interconnection Customer)	January 31, 2025
Targeted Commercial Operation -T62 (per Interconnection Customer)	March 1, 2025
Targeted First Power Available – T63 (per Interconnection Customer)	September 1, 2025
Targeted Commercial Operation – T63 (per Interconnection Customer)	December 1, 2025

# Facilities Study Report

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## 6.0 COST ESTIMATE

The cost estimates have been produced using 2023 budgetary rates. They do not include allowance for funds during construction (AFUDC) or any escalations due to timing of project execution.

The cost estimates are based on the conceptual design outlined in this report and should be considered as a class 3 accuracy level (-20% / +30%).

The cost estimates include project overheads based on NSPI’s typical internal capital administration overhead allocation process.

A contingency of 10% has been included in the estimates to account for unforeseen scope changes or supply chain issues.

Network Upgrade items identified as the responsibility of the Transmission Provider are subject to Nova Scotia Utility and Review Board (NSUARB) approval.

For this Facilities Study the cost estimates have been broken out into three categories:

1. Interconnection Customer Funded Transmission Provider Interconnection Facilities (TPIF)
2. Interconnection Customer Funded Network Upgrades
3. Transmission Provider (NSPI) funded Network Upgrades

All TPIF and Network Upgrades have been identified as ‘Non-Stand-Alone’.

Cost Estimate Summary:

Upgrade Component	Cost Estimate
<b>TPIF – Interconnection Customer Funded</b>	<b>\$81,766</b>
○ Modification of the protection, control, telecommunication, and metering equipment at 112W-Mersey Wind substation.	\$81,766
<b>Network Upgrades (NU) – Interconnection Customer Funded</b>	<b>\$6,617,696</b>
○ Transmission Line L-6006 re-termination at 99W-Bridgewater substation and associated bus protection modifications.	\$135,920
○ Replacement of transformer 9W-T63 at 9W-Tusket with a larger 60/80/100 MVA unit.	\$6,028,586
○ Relocation and replacement of transformer 30W-T62 at 30W-Souriquois with the 9W-T63 unit removed from 9W-Tusket substation.	\$408,371
○ Re-utilization of the Milton/Tusket Automatic Action Scheme (AAS) and Modification of the metering at 13V-Gulch and 11V-Paradise substations.	\$44,819
<b>Sub-Total (Interconnection Customer Funded – TPIF &amp; NU)</b>	<b>\$6,699,462</b>
<b>Network Upgrades – Transmission Provider Funded</b>	<b>\$3,907,288</b>
○ Expansion the 138 kV bus and addition of a new 138 kV line terminal at 30W-Souriquois substation and addition of an 8 MVar capacitor bank on the 69 kV bus B51	\$3,907,288
<b>Sub-Total (Transmission Provider Funded)</b>	<b>\$3,907,288</b>
<b>Total</b>	<b>\$10,606,750</b>

A more detailed breakdown of each cost estimate is provided in Appendix J.

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# Facilities Study Report

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## 7.0 COMMISSIONING / OPERATIONS

NS Power reserves the right to inspect all Interconnection Facilities identified in this study prior to connection to the NS Power Transmission System to ensure the facility design and construction will not adversely affect the reliability of the Transmission System. All Interconnection Facilities are subject to NS Power's review and acceptance of all testing and commissioning requirements and results. Construction, switching, testing, and commissioning schedules that affect the reliable and stable operation of the Transmission System shall be coordinated with the Nova Scotia Power System Operator.

The construction work associated with this interconnection will require planned outages to existing system components. All system outages required to complete the interconnection work shall require advanced planning and coordination with the NS System Operator.

All interconnection facilities must meet NSPI's Transmission System Interconnection Requirements (TSIR), version 1.1 dated February 25, 2021, as published on the NSPI OASIS site as well as NPCC bulk power system facility requirements.

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# Facilities Study Report

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## **Appendices**

**APPENDIX A – INTERCONNECTION FACILITIES STUDY AGREEMENT**

**APPENDIX B – INTERCONNECTION OVERVIEW**

**APPENDIX C – 50W-MILTON ONE LINE**

**APPENDIX D – 112W-MERSEY WIND PHASE 2 STATION ONE LINE**

**APPENDIX E – 112W-MERSEY WIND PHASE 2 STATION OVERALL PLAN VIEW**

**APPENDIX F – 112W-MERSEY WIND PHASE 2 PRELIMINARY SCADA POINTS LIST**

**APPENDIX G – 30W-SOURIQUOIS NETWORK UPGRADES**

Appendix G-1 30W-Souriquois Developmental One Line

Appendix G-2 30W-Souriquois Developmental Overall Plan View

**APPENDIX H – 99W-BRIDGewater NETWORK UPGRADES**

Appendix H-1 99W-Bridgewater Developmental One Line

Appendix H-2 99W-Bridgewater Developmental Plan View

**APPENDIX I – 9W-TUSKET DEVELOPMENTAL ONE LINE**

**APPENDIX J – COST ESTIMATE DETAILS**

Appendix J-1 Transmission Provider Interconnection Facilities (TPIF) Estimate

Appendix J-2 Network Upgrades Estimate – Interconnection Customer Funded

Appendix J-3 Network Upgrades Estimate – Transmission Provider Funded

**APPENDIX K – PRELIMINARY PROJECT SCHEDULE**

**APPENDIX L – REVENUE METERING**

**APPENDIX M – MINUTES OF FACILITIES STUDY REVIEW MEETING**



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## **APPENDIX A – INTERCONNECTION FACILITIES STUDY AGREEMENT**

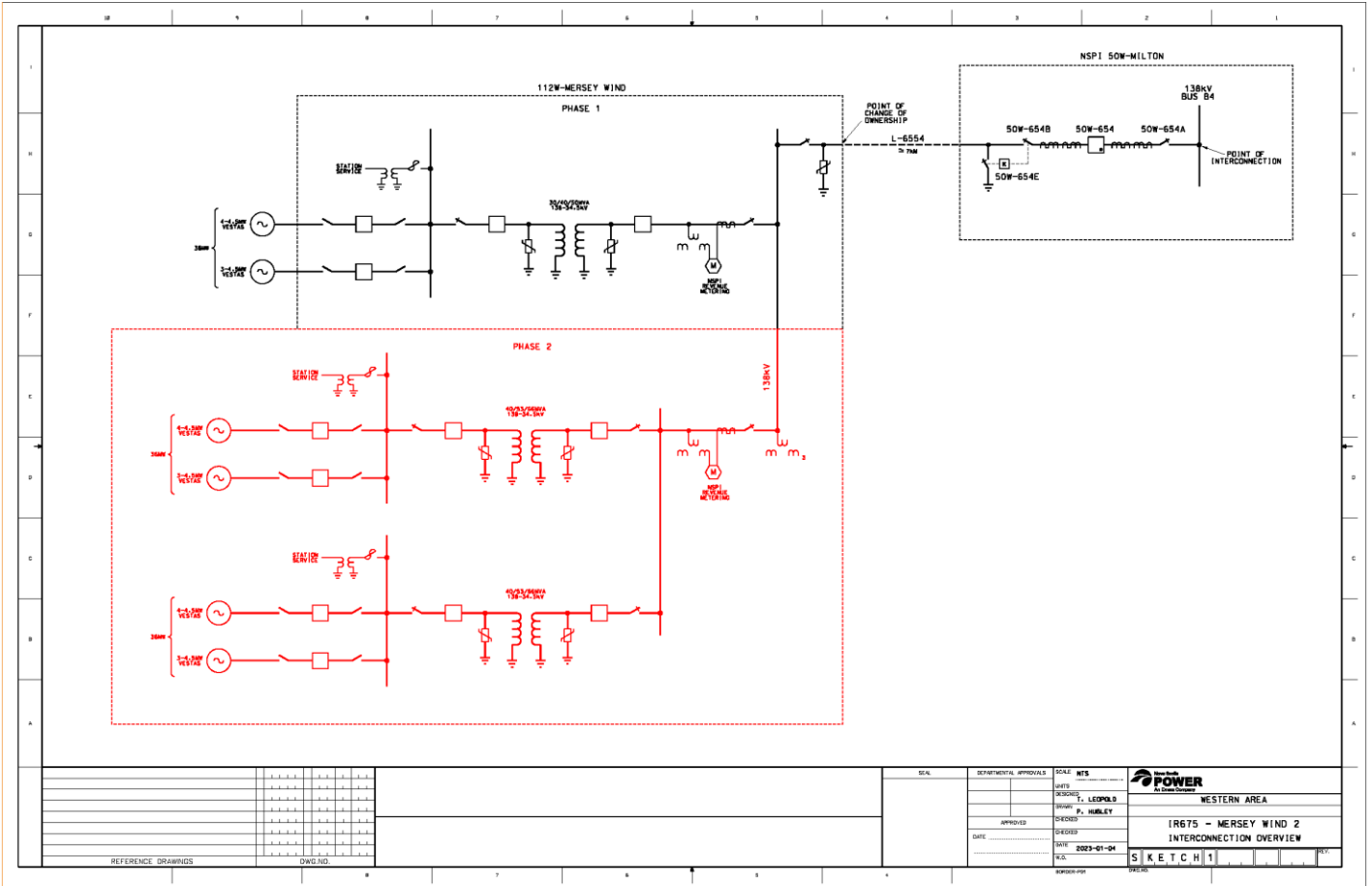
(Attachment 1)

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## APPENDIX B – INTERCONNECTION OVERVIEW

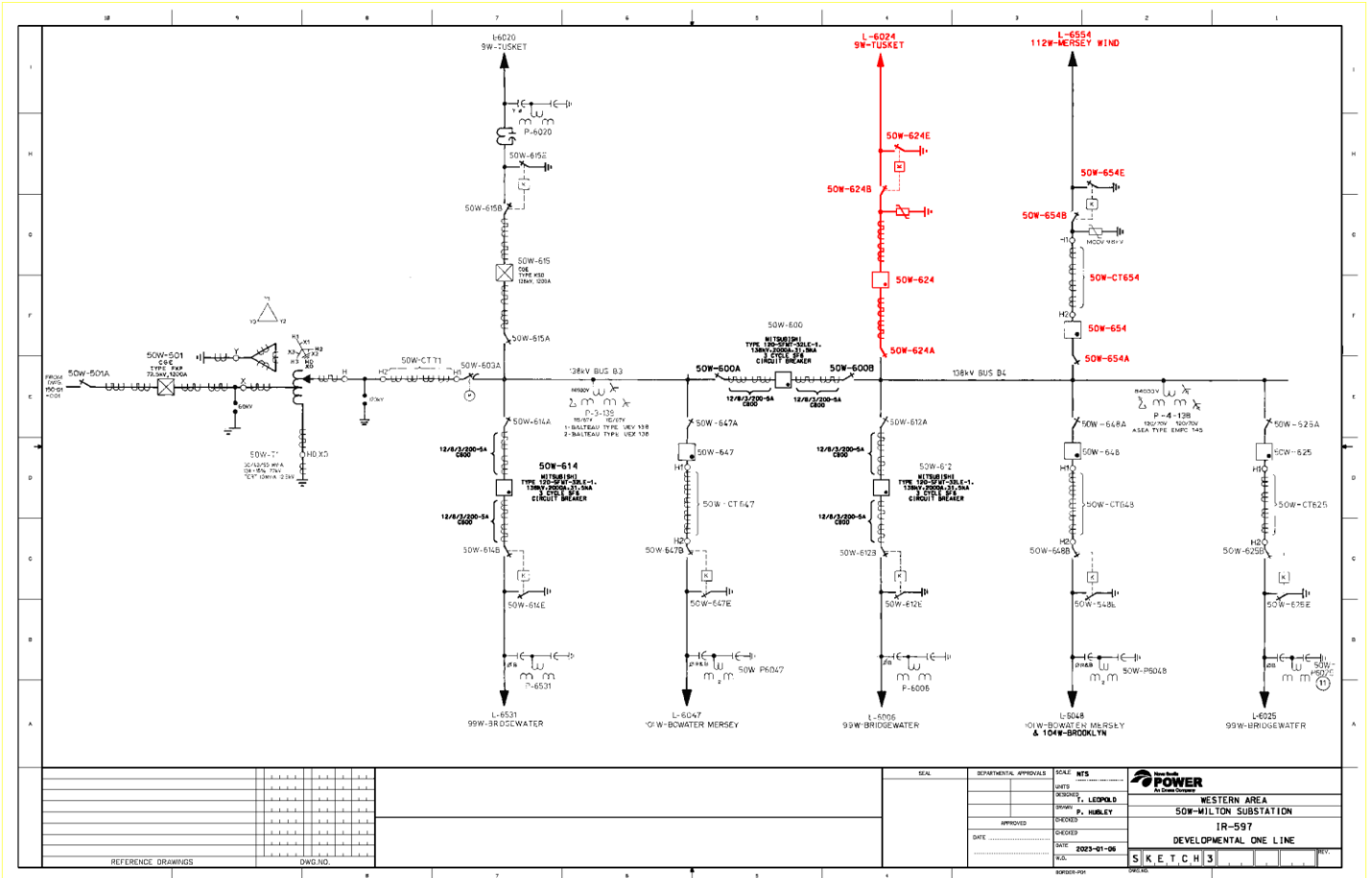


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## APPENDIX C – 50W – MILTON ONE LINE

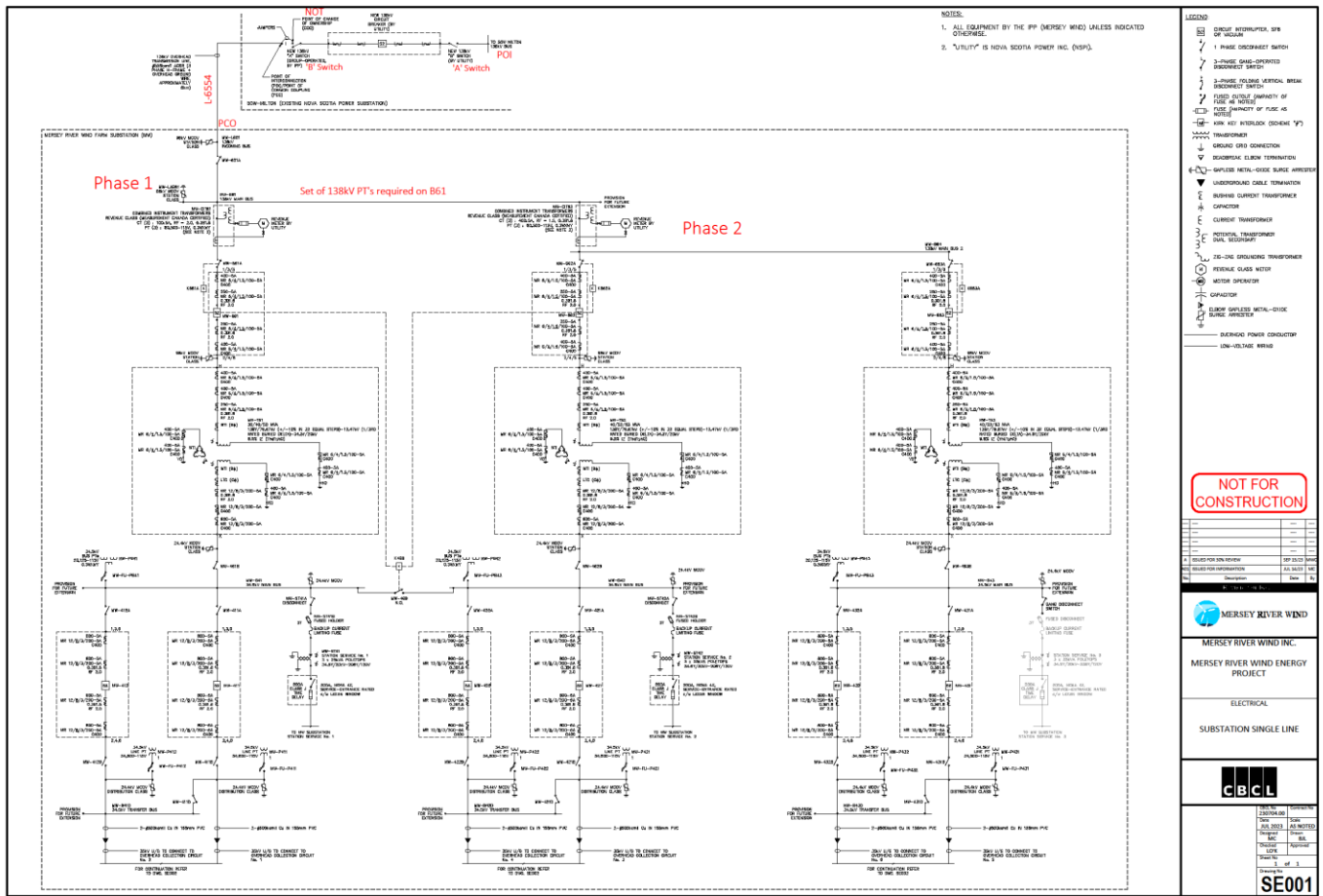


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### APPENDIX D – 112W-MERSEY WIND PHASE 2 STATION ONE LINE



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## APPENDIX E – 112W-MERSEY WIND PHASE 2 STATION OVERALL PLAN VIEW



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## APPENDIX F – 112W-MERSEY WIND PHASE 2 PRELIMINARY SCADA POINTS LIST

112W- Mersey Wind SCADA Points - Phase 2 Additions		
<b>Control</b>	<b>Binary Outputs</b>	<b>Destination</b>
	PERMIT TO OPERATE DENIED - Mersey Wind 2	Comms to WFC
	PERMIT TO OPERATE 33% - Mersey Wind 2	Comms to WFC
	PERMIT TO OPERATE 66% - Mersey Wind 2	Comms to WFC
	PERMIT TO OPERATE FULL - Mersey Wind 2	Comms to WFC
	Control Breaker 112W-662	Hard-wired
	Control Breaker 112W-663	Hard-wired
	<b>Analogue Outputs</b>	
	Active Power Setpoint - Mersey Wind 2	Comms to WFC
Voltage Setpoint - Mersey Wind 2	Comms to WFC	
<b>Status</b>	<b>Binary Inputs</b>	<b>Source</b>
	Status of PERMIT TO OPERATE DENIED - Mersey Wind 2	Comms from WFC
	Status of PERMIT TO OPERATE 33% - Mersey Wind 2	Comms from WFC
	Status of PERMIT TO OPERATE 66% - Mersey Wind 2	Comms from WFC
	Status of PERMIT TO OPERATE FULL - Mersey Wind 2	Comms from WFC
	Status of breaker 112W-662	Hard-wired
	Status of breaker 112W-663	Hard-wired
	Status of Collector Circuit Recloser 421	Hard-wired
	Status of Collector Circuit Recloser 422	Hard-wired
	Status of Collector Circuit Recloser 431	Hard-wired
Status of Collector Circuit Recloser 432	Hard-wired	
<b>Analogs</b>	<b>Analog Inputs</b>	
	112W Net Watts - Mersey Wind 2	Comms from XFMR protection, or revenue meter
	112W Net Vars - Mersey Wind 2	Comms from XFMR protection, or revenue meter
	112W Volts	Comms from XFMR protection, or revenue meter
	Active Power Setpoint confirmation - Mersey Wind 2	Comms from WFC
Expected Wind Output for AGC - Mersey Wind 2	Comms from WFC	

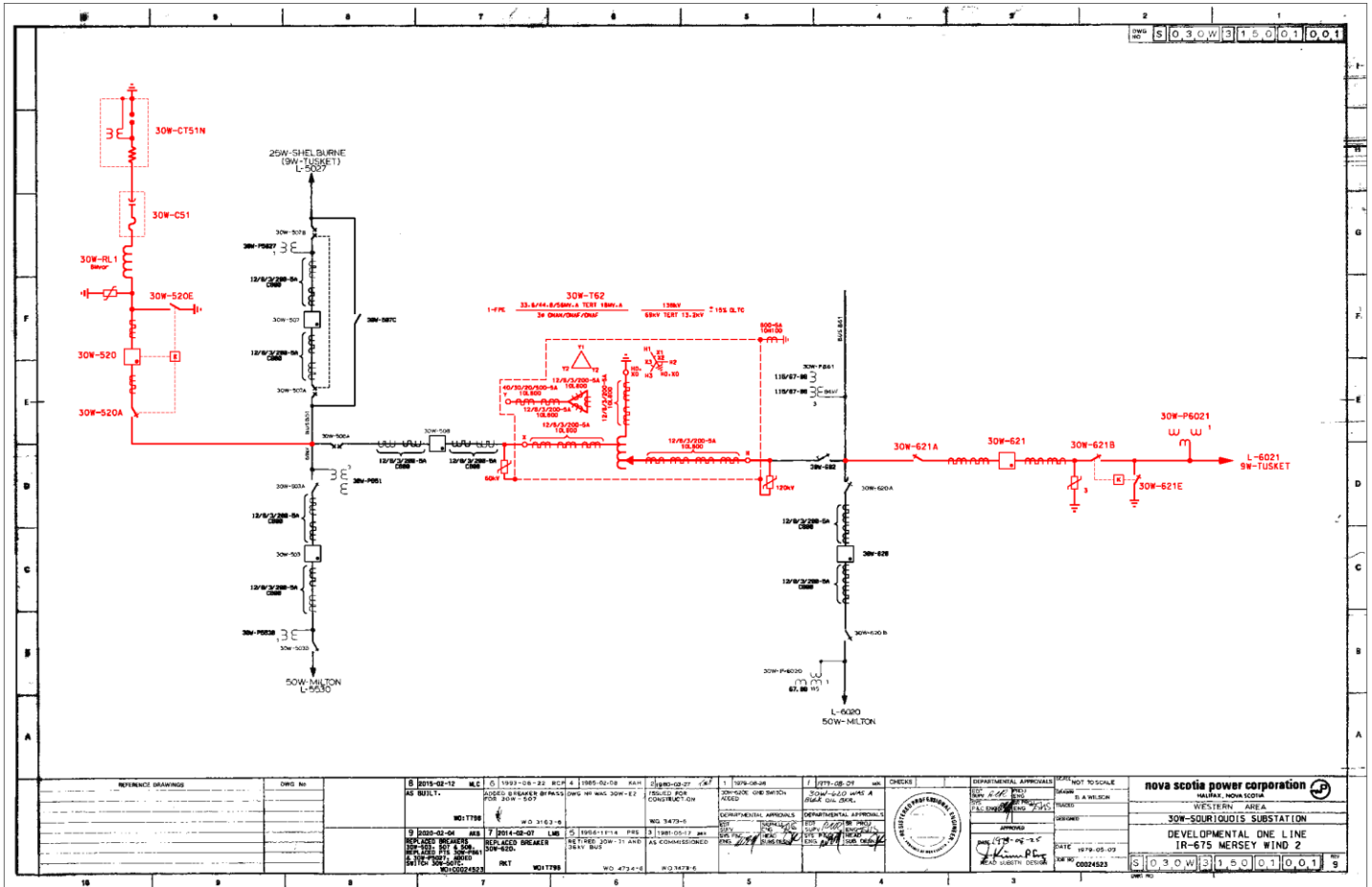
# Facilities Study Report

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## APPENDIX G – 30W-SOURQUOIS NETWORK UPGRADES

### Appendix G-1 – Developmental One Line



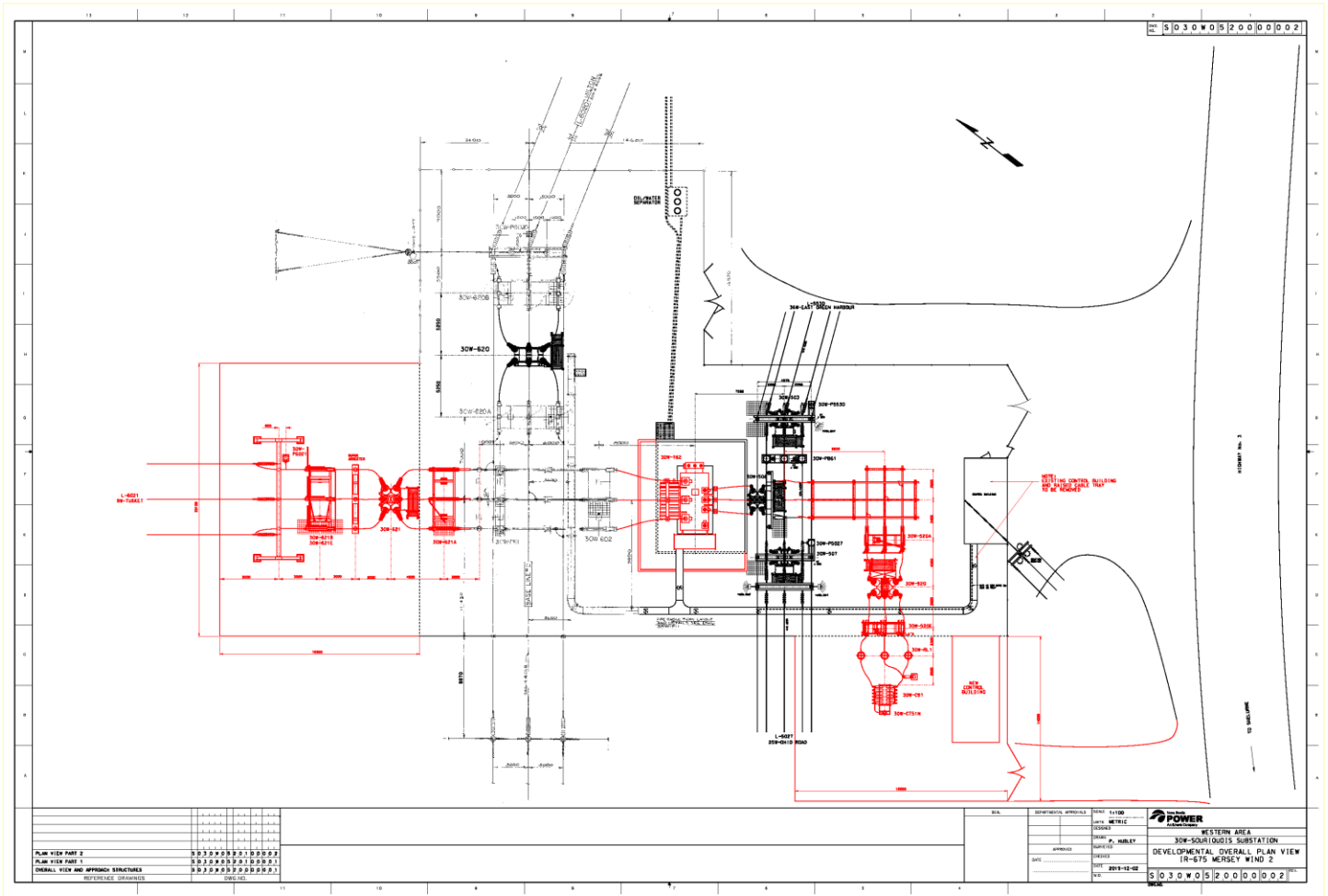
# Facilities Study Report

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## APPENDIX G – 30W-SOURQUOIS NETWORK UPGRADES

### Appendix G-2 – 138 kV Developmental Overall Plan View





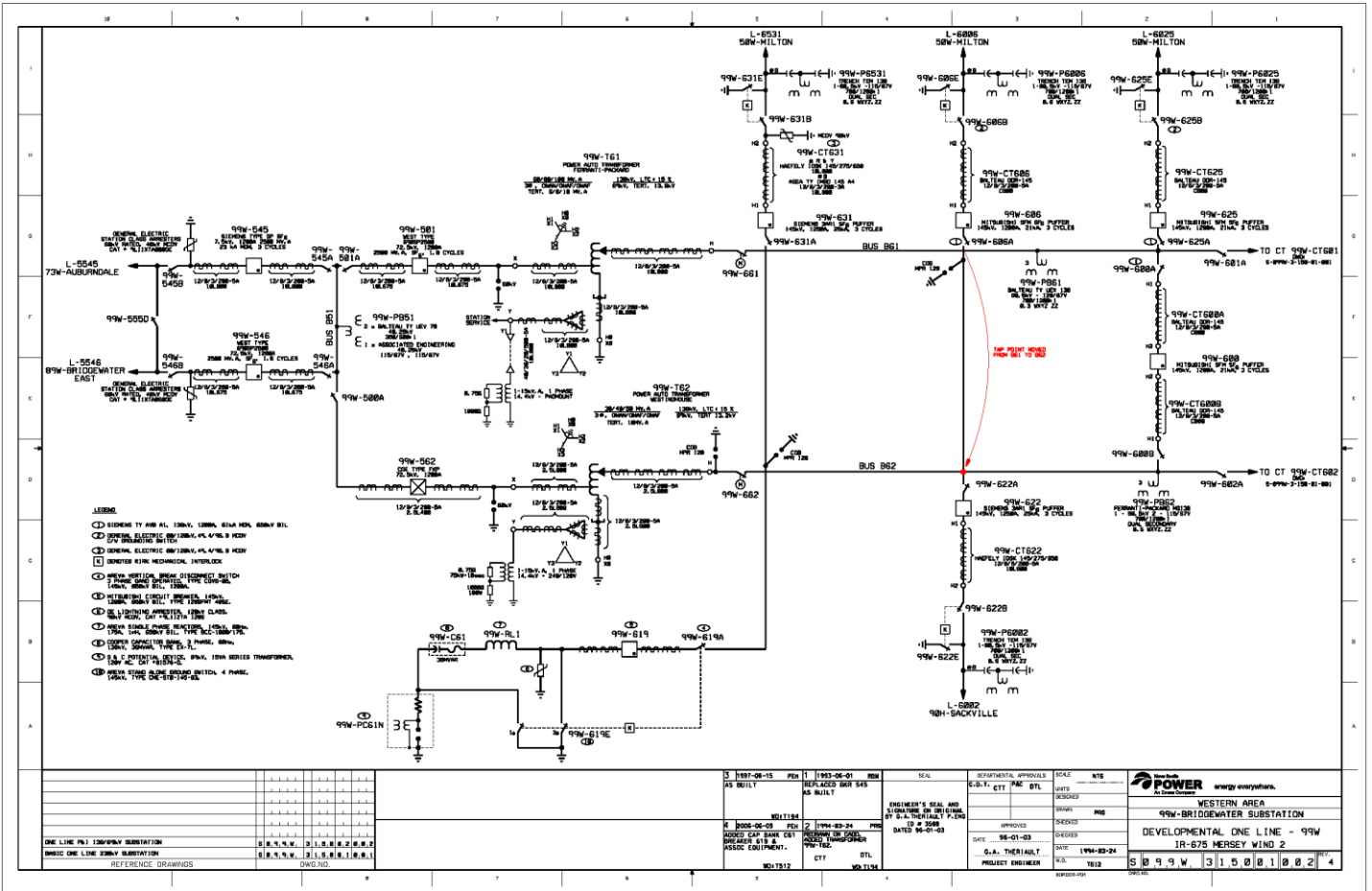
# Facilities Study Report

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## APPENDIX H - 99W-BRIDGEWATER NETWORK UPGRADES

### Appendix H-1- Developmental One Line



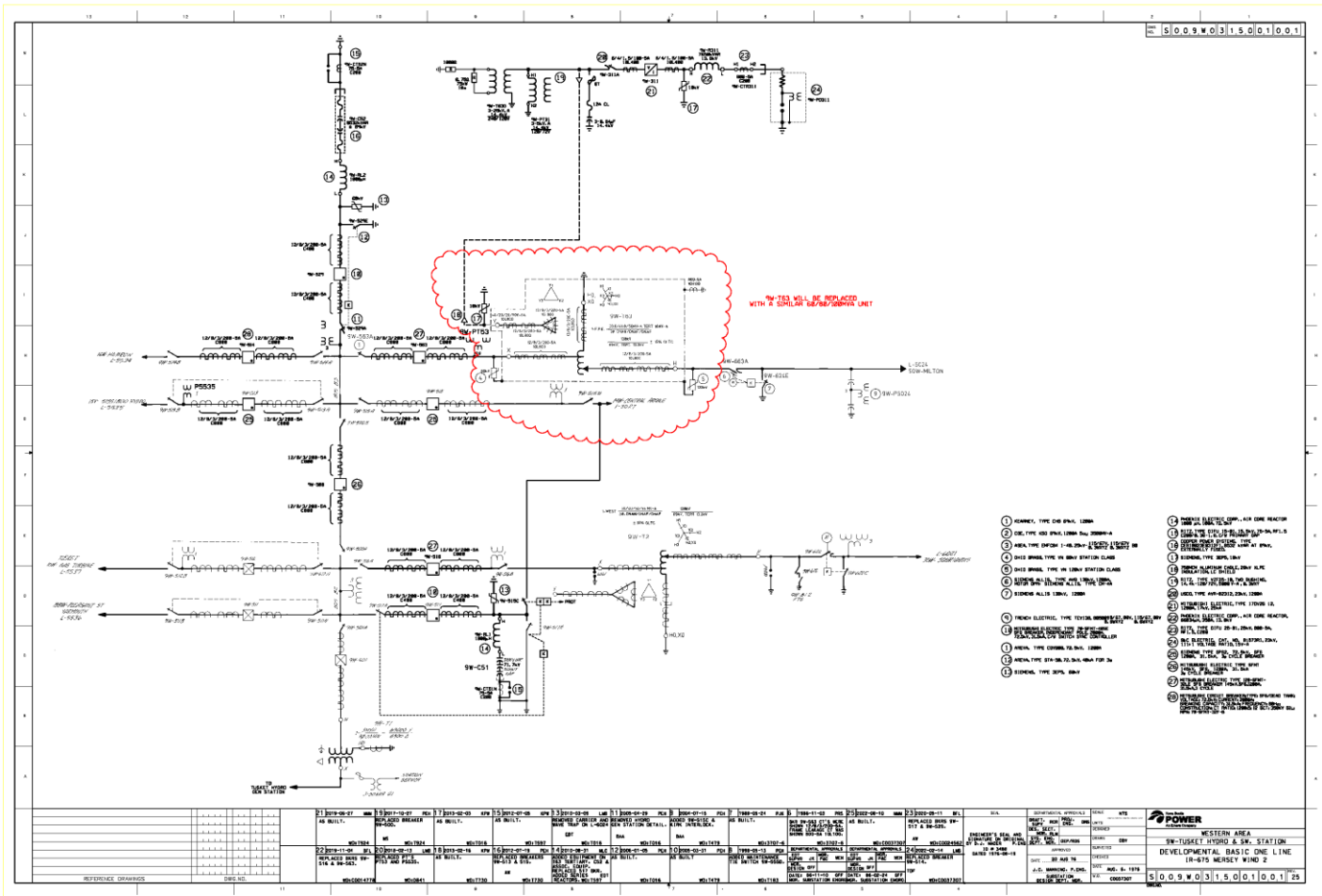


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## APPENDIX I – 9W-TUSKET DEVELOPMENTAL ONE LINE



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## APPENDIX J – COST ESTIMATE DETAILS

### Appendix J-1 Transmission Provider Interconnection Facilities (TPIF) Estimate

112W-Mersey Wind - Phase 2 TPIF IR#675		CI Number:									
		Project Number:									
		Cost Centre:		900							
Activity	Accounts -->	Labour	Material	Expenses			Contracts	Consulting	Totals		
		535050	535200	531400	530950	533410	533400	531550	532500		
022	Electrical Control Equipment	4,760	2,929	1,500	0	0	0	0		9,190	
085	Design (i.e. Engineering)	18,866		500	296		0	0	0	19,662	
086	Commissioning	3,296	1,465	0	0	0	0	0		4,760	
087	Field Supervision and Operations	4,376	0	0	1,144		0	0		5,520	
	<b>Sub-Total (New Capital)</b>	<b>31,297</b>	<b>4,394</b>	<b>2,000</b>	<b>1,440</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>39,131</b>	
085	Contingency	3,130	439	200	144	0	0	0	0	3,913	
	<b>Sub-Total</b>	<b>34,427</b>	<b>4,834</b>	<b>2,200</b>	<b>1,584</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>43,045</b>	
005	Vehicle Allocation (Labour & Eng'g)				12,957					12,957	
005	Construction Overhead (Labour)							25,764		25,764	
005	Construction Overhead (Eng. Labour)							0		0	
005	Construction Overhead (Contracts)							0		0	
	<b>Sub-Total</b>				<b>12,957</b>			<b>25,764</b>		<b>38,721</b>	
	<b>Grand Total</b>	<b>34,427</b>	<b>4,834</b>	<b>2,200</b>	<b>14,541</b>	<b>0</b>	<b>0</b>	<b>25,764</b>	<b>0</b>	<b>81,766</b>	

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## Appendix J-2 Network Upgrades Estimate – Interconnection Customer Funded

### 99W-Bridgewater L-6006 Node Swap

99W-Bridgewater L-6006 Node Swap Mersey Wind - Phase 2 IR#675		CI Number:									
		Project Number:									
		Cost Centre:		900							
		Labour		Material		Expenses		Contracts		Consulting	
Activity	Accounts -->	535050	535200	531400	530950	533410	533400	531550	532500	Totals	
022	Electrical Control Equipment	14,098	4,394	5,000	0	0	0	0			23,492
043	Substation Devices	4,224	2,197	5,010	0	0	0	0			11,431
085	Design (i.e. Engineering)	25,664		500	296		0	0	0		26,460
086	Commissioning	2,929	1,465	0	0	0	0	0			4,394
087	Field Supervision and Operations	2,188	0	0	370		0	0			2,558
	<b>Sub-Total (New Capital)</b>	<b>49,104</b>	<b>8,056</b>	<b>10,510</b>	<b>666</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>68,336</b>
085	Contingency	4,910	806	1,051	67	0	0	0	0		6,834
	<b>Sub-Total</b>	<b>54,014</b>	<b>8,862</b>	<b>11,561</b>	<b>733</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>75,169</b>
005	Vehicle Allocation (Labour & Eng'g)				20,329						20,329
005	Construction Overhead (Labour)							40,422			40,422
005	Construction Overhead (Eng. Labour)							0			0
005	Construction Overhead (Contracts)							0			0
	<b>Sub-Total</b>				<b>20,329</b>			<b>40,422</b>			<b>60,751</b>
	<b>Grand Total</b>	<b>54,014</b>	<b>8,862</b>	<b>11,561</b>	<b>21,061</b>	<b>0</b>	<b>0</b>	<b>40,422</b>	<b>0</b>	<b>0</b>	<b>135,920</b>

### 9W-Tusket New 138kV-69kV Transformer

9W-T63 Transformer Replacement IR 675		CI Number:									
		Project Number:									
		Cost Centre:		900							
		Labour		Material		Expenses		Contracts		Consulting	
Activity	Accounts -->	535050	535200	531400	530950	533410	533400	531550	532500	Totals	
003	Buildings, Structures and Grounds	1,099	0	0	0	0	0	17,500			18,599
022	Electrical Control Equipment	19,408	0	8,000	0	0	0	0			27,408
035	Wood Poles	0	0	0	0	0	0	110,000			110,000
043	Substation Devices	7,680	7,324	30,600	0	0	0	10,000			55,604
044	Substation Transformers	0	0	4,950,000	0	0	0	75,000	0		5,025,000
085	Design (i.e. Engineering)	22,752		500	148		0	8,050	30,000		61,450
086	Commissioning	15,013	0	0	0	0	0	0			15,013
087	Field Supervision and Operations	17,503	0	0	8,844		0	7,700			34,047
	<b>Sub-Total (New Capital)</b>	<b>83,454</b>	<b>7,324</b>	<b>4,989,100</b>	<b>8,992</b>	<b>0</b>	<b>0</b>	<b>228,250</b>	<b>30,000</b>	<b>0</b>	<b>5,347,120</b>
085	Contingency	8,345	732	498,910	899	0	0	22,825	3,000		534,712
	<b>Sub-Total</b>	<b>91,800</b>	<b>8,056</b>	<b>5,488,010</b>	<b>9,891</b>	<b>0</b>	<b>0</b>	<b>251,075</b>	<b>33,000</b>	<b>0</b>	<b>5,881,832</b>
005	Vehicle Allocation (Labour & Eng'g)				34,550						34,550
005	Construction Overhead (Labour)							68,700			68,700
005	Construction Overhead (Eng. Labour)							0			0
005	Construction Overhead (Contracts)							43,504			43,504
	<b>Sub-Total</b>				<b>34,550</b>			<b>112,204</b>			<b>146,754</b>
	<b>Grand Total</b>	<b>91,800</b>	<b>8,056</b>	<b>5,488,010</b>	<b>44,441</b>	<b>0</b>	<b>0</b>	<b>363,279</b>	<b>33,000</b>	<b>0</b>	<b>6,028,586</b>

# Facilities Study Report

IR-675 - Mersey Wind – Phase 2



## 30W-Souriquois Replace 138 kV-69 kV Transformer with Unit from 9W-Tusket

30W-Souriquois Replace Transformer Mersey Wind - Phase 2 IR#675		CI Number:		Project Number:		Cost Centre:		900									
		Labour		Material		Expenses		Contracts		Consulting		Totals					
Activity	Accounts -->	535050	535200	531400	530950	533410	533400	531550	532500								
003	Buildings, Structures and Grounds	0	0	0	0	0	0	26,000									26,000
022	Electrical Control Equipment	3,662	1,465	0	0	0	0	0									5,127
043	Substation Devices	4,224	2,197	18,020	0	0	0	0									24,441
044	Substation Transformers	32,256	4,560	0	0	0	0	134,000	0								170,816
085	Design (i.e. Engineering)	19,313		500	296		0	0	0								20,109
086	Commissioning	7,507	1,465	0	0	0	0	0	0								8,971
087	Field Supervision and Operations	1,914	875	0	2,140		500	4,400									9,830
<b>Sub-Total (New Capital)</b>		<b>68,876</b>	<b>10,562</b>	<b>18,520</b>	<b>2,436</b>	<b>0</b>	<b>500</b>	<b>164,400</b>	<b>0</b>								<b>265,294</b>
085	Contingency	6,888	1,056	1,852	244	0	50	16,440	0								26,529
<b>Sub-Total</b>		<b>75,764</b>	<b>11,618</b>	<b>20,372</b>	<b>2,680</b>	<b>0</b>	<b>550</b>	<b>180,840</b>	<b>0</b>								<b>291,823</b>
005	Vehicle Allocation (Labour & Eng'g)				28,515												28,515
005	Construction Overhead (Labour)							56,699									56,699
005	Construction Overhead (Eng. Labour)							0									0
005	Construction Overhead (Contracts)							31,335									31,335
<b>Sub-Total</b>					<b>28,515</b>			<b>88,033</b>									<b>116,548</b>
<b>Grand Total</b>		<b>75,764</b>	<b>11,618</b>	<b>20,372</b>	<b>31,194</b>	<b>0</b>	<b>550</b>	<b>268,873</b>	<b>0</b>								<b>408,371</b>

## Milton/Tusket AAS Modifications and Metering changes at 11V-Paradise and 13V- Gulch

AAS Repurpose & Metering Changes 11V & 13V Mersey Wind - Phase 2 IR#675		CI Number:		Project Number:		Cost Centre:		900									
		Labour		Material		Expenses		Contracts		Consulting		Totals					
Activity	Accounts -->	535050	535200	531400	530950	533410	533400	531550	532500								
022	Electrical Control Equipment	6,225	732	0	0	0	0	0									6,957
043	Substation Devices	0	0	0	0	0	0	0									0
085	Design (i.e. Engineering)	10,453		0	0		0	0	0								10,453
086	Commissioning	1,465	1,465	0	0	0	0	0	0								2,929
087	Field Supervision and Operations	0	0	0	0		0	0	0								0
<b>Sub-Total (New Capital)</b>		<b>18,142</b>	<b>2,197</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>								<b>20,339</b>
085	Contingency	1,814	220	0	0	0	0	0	0								2,034
<b>Sub-Total</b>		<b>19,957</b>	<b>2,417</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>								<b>22,373</b>
005	Vehicle Allocation (Labour & Eng'g)				7,511												7,511
005	Construction Overhead (Labour)							14,935									14,935
005	Construction Overhead (Eng. Labour)							0									0
005	Construction Overhead (Contracts)							0									0
<b>Sub-Total</b>					<b>7,511</b>			<b>14,935</b>									<b>22,446</b>
<b>Grand Total</b>		<b>19,957</b>	<b>2,417</b>	<b>0</b>	<b>7,511</b>	<b>0</b>	<b>0</b>	<b>14,935</b>	<b>0</b>								<b>44,819</b>

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## Appendix J-3 Network Upgrades Estimate – Transmission Provider Funded

### 30W-Souriquois – New 138 kV Line Terminal and 69 kV, 8 MVAR Capacitor Bank

30W-New 138kV Term. and 69kV Cap Bank Mersey Wind - Phase 2 IR#675		CI Number:		Project Number:		Cost Centre:		900			
Activity	Accounts -->	535050	535200	531400	530950	533410	533400	531550	532500	Totals	
		Labour		Material		Expenses		Contracts	Consulting		
003	Buildings, Structures and Grounds	0	0	167,525	0	0	0	496,105		663,630	
022	Electrical Control Equipment	50,350	18,309	900,000	0	0	0	110,000		1,078,659	
023	Power Equipment - Station Service	4,577	0	1,000	0	0	0	0		5,577	
035	Wood Poles	0	0	0	0	0	0	160,000		160,000	
043	Substation Devices	21,120	0	687,330	0	0	0	7,000		715,450	
061	Telephone Equipment ( / Comm Equip.)	10,000	3,662	70,000	0	0	0	73,710		157,372	
085	Design (i.e. Engineering)	131,739		1,000	1,110		0	23,000	48,500	205,349	
086	Commissioning	32,041	3,662	0	0	0	0	0		35,703	
087	Field Supervision and Operations	0	0	0	12,100		6,000	49,500		67,600	
088	Survey and Mapping	2,289		0	0		0	15,000	0	17,289	
	<b>Sub-Total (New Capital)</b>	<b>252,115</b>	<b>25,633</b>	<b>1,826,855</b>	<b>13,210</b>	<b>0</b>	<b>6,000</b>	<b>934,315</b>	<b>48,500</b>	<b>3,106,628</b>	
085	Contingency	25,212	2,563	182,686	1,321	0	600	93,432	4,850	310,663	
	<b>Sub-Total</b>	<b>277,327</b>	<b>28,196</b>	<b>2,009,541</b>	<b>14,531</b>	<b>0</b>	<b>6,600</b>	<b>1,027,747</b>	<b>53,350</b>	<b>3,417,291</b>	
005	Vehicle Allocation (Labour & Eng'g)				104,376					104,376	
005	Construction Overhead (Labour)							207,541		207,541	
005	Construction Overhead (Eng. Labour)							0		0	
005	Construction Overhead (Contracts)							178,080		178,080	
	<b>Sub-Total</b>				<b>104,376</b>			<b>385,622</b>		<b>489,997</b>	
	<b>Grand Total</b>	<b>277,327</b>	<b>28,196</b>	<b>2,009,541</b>	<b>118,907</b>	<b>0</b>	<b>6,600</b>	<b>1,413,368</b>	<b>53,350</b>	<b>3,907,288</b>	





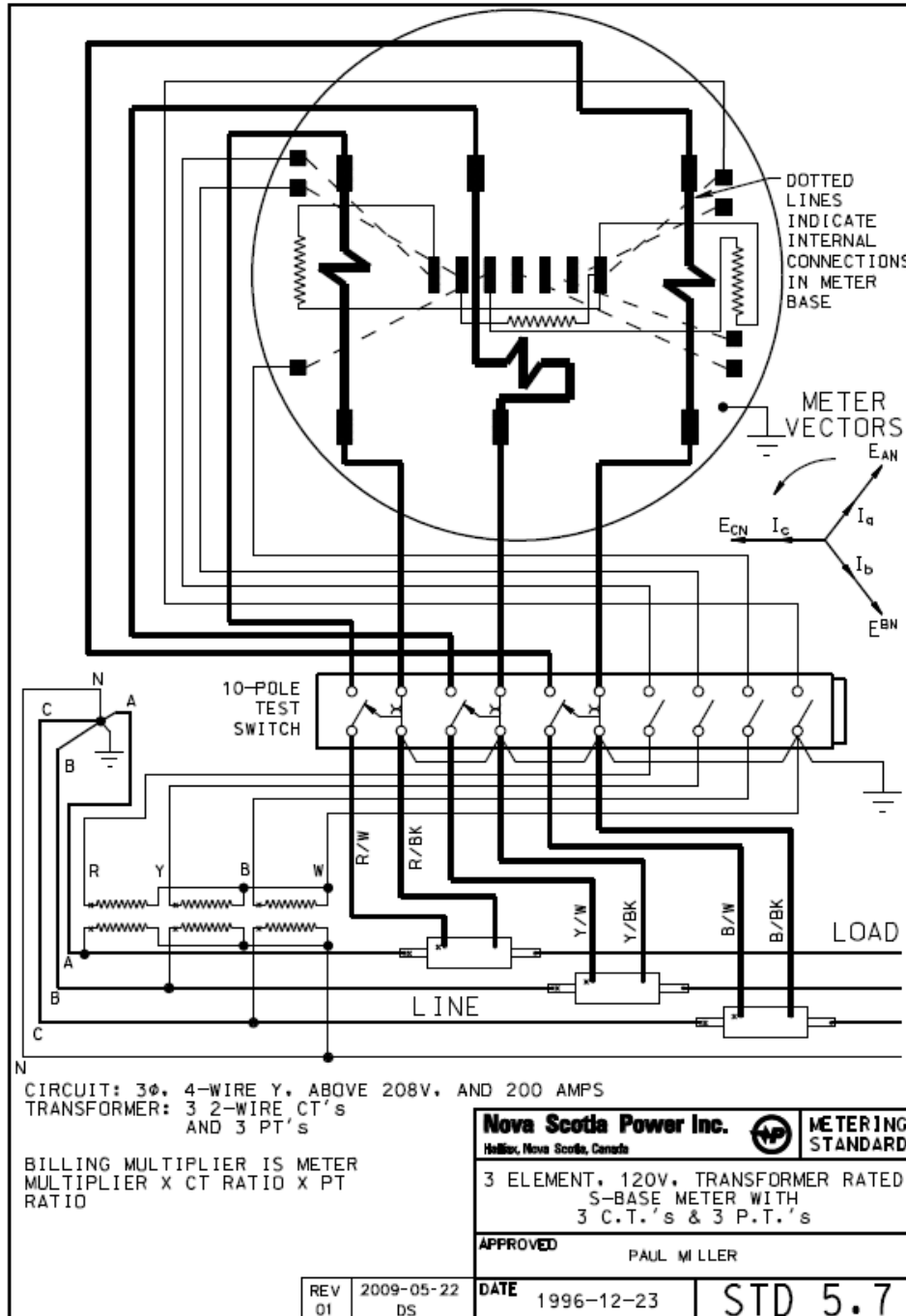
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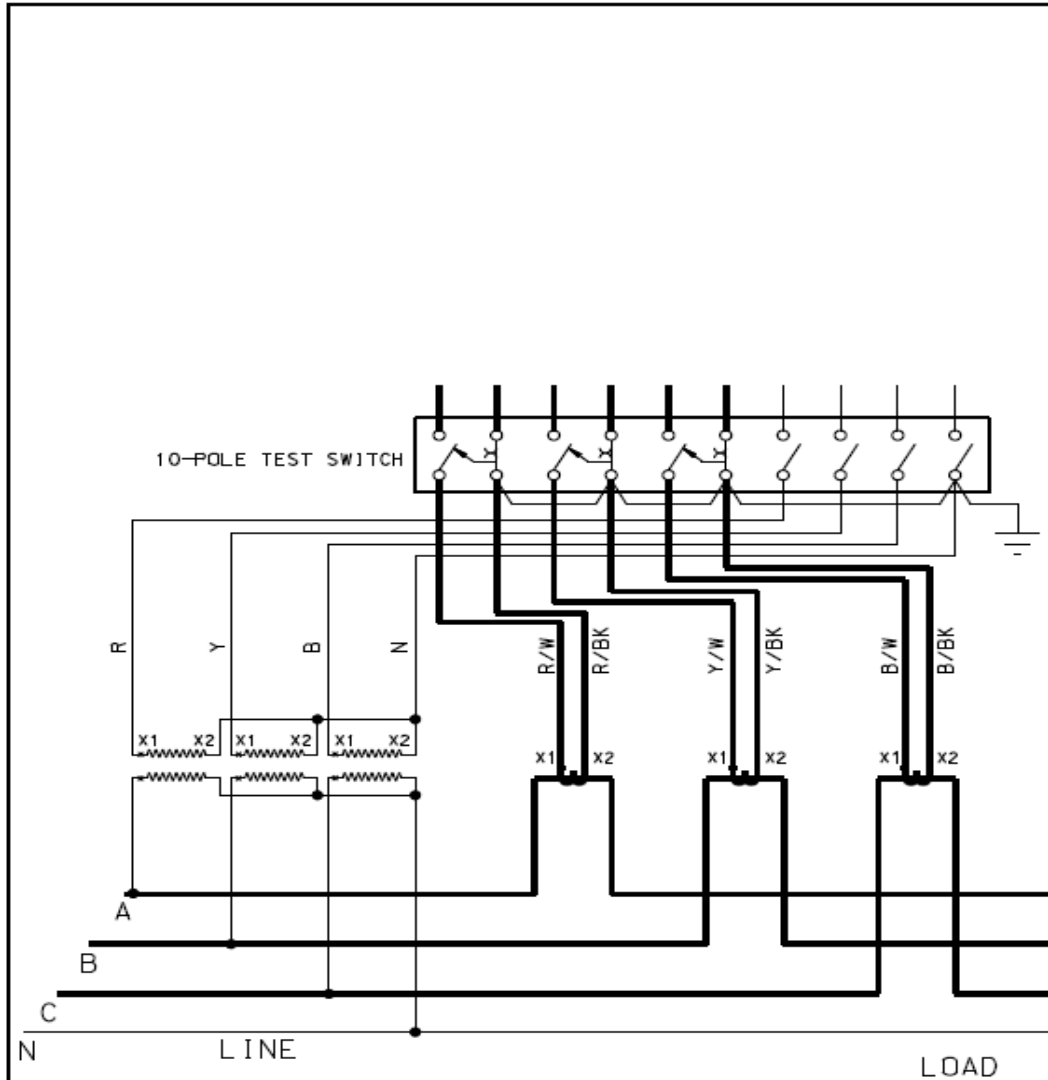
## APPENDIX L – REVENUE METERING

NSPI Standards 5.7 and 5.12



# Facilities Study Report

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**NOTES:**

1. BILLING MULTIPLIER IS METER MULTIPLIER X CT X PT RATIO.
2. REFER TO STD 5.7 FOR CONNECTIONS BETWEEN THE TEST SWITCH AND THE METER.
3. WITH INDEPENDENT POWER PRODUCERS, THE GENERATOR SIDE IS THE LINE SIDE AND NSPI IS THE LOAD SIDE.

<b>Nova Scotia Power Inc.</b> <small>Halifax, Nova Scotia, Canada</small>			<b>METERING STANDARD</b>
3 ELEMENT PRIMARY METERING RACK			
<b>APPROVED</b>		DAVE STANFORD	
<b>DATE</b>	2009-05-22	<b>STD 5.12</b>	

# Facilities Study Report

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## APPENDIX M – MINUTES OF FACILITIES STUDY REVIEW MEETING

### Notes:

- Attendees: Mohit Agarwal, Timothy Leopold, Shobhit Verma, Dan Roscoe
- Responses of questions provided by the Interconnection Customer (IC) on Jan 18th 2024 on the draft Facilities Study (FAC):
  1. We would like to have further clarity for the New Transformer Cost to be borne by Mersey River Wind Inc. Upon further discussion with the NSPSO, it was confirmed that Renewable to Retail (RTR) generator interconnections are not eligible for Network Upgrade refunds. This was an intentional addition to the GIP which went through stakeholder review and received UARB approval in the 2015 RTR Proceeding. The rationale was to avoid transferring costs (created by customers departing for the RTR Market) to the remaining NS Power customers – a key principle to be followed in the establishment of the RTR Market. Section 11.4.2 of the revised GIA reads as follows:
    - 11.4.2 Refund of Amounts Advanced for Network Upgrades for Renewable to Retail Generating Facilities:

Section 11.4.1 shall not apply to Network Upgrades made in respect of an Interconnection Customer's Generating Facility which has been designated as a Network Resource by a Licensed Retail Supplier for the purpose of supplying renewable low-impact electricity to Retail Customers pursuant to the Electricity Act, S.N.S. 2004, c. 25. If, after the effective date of this revised GIP, any portion of a Generating Facility's capacity is designated as a Network Resource by a Licensed Retail Supplier for the purpose of supplying renewable low-impact electricity to Retail Customers pursuant to the Electricity Act ("Designated Generating Facility"), the Interconnection Customer shall at that time promptly reimburse the Transmission Provider for amounts previously repaid by the Transmission Provider based on the pro rata portion of the Designated Generating Facility's capacity. Any such repayment amounts owing by the Transmission Provider to the Interconnection Customer will be reduced based on the pro rata portion of the Designated Generating Facility's capacity.

The FAC report contains the most up to date cost estimates and identifies those Network Upgrades that are the cost responsibility of the Customer and those that are NSPI's cost responsibility as follows:  
The total estimated cost to construct the required Network Upgrades and Transmission Provider's Interconnection Facilities is \$10,606,750. All Network Upgrades and TPIF have been identified as 'Non-Stand-Alone'. The estimated cost for the Interconnection Customer funded TPIF is \$81,766. The estimated cost for the Interconnection Customer funded Network Upgrades is \$6,617,696. The estimated cost for the Transmission Provider (NSPI) funded Network Upgrades is \$3,907,288.
    2. Replacement of the transformer 9W-T63 at 9W-Tusket with a larger 60/80/100 MVA (doubled) as per planning, is this requirement triggered only because injection of Mersey River Wind Inc generation or was it requirement identified before in any System Upgrade/Capital Expenditure/Financial Plan?

There are preexisting issues identified in SIS study that are managed successfully by the Milton/Tusket Automated Actions Scheme. However, after IR675, overloading of Transformer(9W-T63) was identified despite the action of the AAS at Milton/Tusket, and it wasn't sufficient to offload 9W-T63 enough to keep it within post contingency limits. As a result, replacement of the transformer with a larger unit was identified.
    3. We understand that as per GIA the applicable Network Cost in case of RTR Customer will not be refunded back, but due to this asset (transformer) integration, future customers will be benefited too. Is there any mechanism available for refund for this cost in future?

Future and existing customers will benefit from these Network Upgrades. I am not aware of any mechanism to refund this cost in the future. The BOARD is currently reviewing the current GIP and it may not be too late for Roswell to ask that this be addressed as part of the review.
    4. Cost of the whole transformer on Mersey River wind inc will hit its LCoE and it is a setback for Green Energy Integration, is there any way we can reduce it or break it in future payments?
  - Not that I am aware of.
    5. Is there any IR which is queued before IR 675 not considered in the SIS/FAC Study?

As the section 4.2 of NSPI's posted Generator Interconnection Procedure (GIP) allows for "Transmission Provider may study an Interconnection Request separately to the extent warranted by Good Utility Practice based upon the electrical remoteness of the proposed Generating Facility", the following IRs are not included in this SIS due to their significant electrical remoteness with respect to the IR675:

      - IR #662: SIS in progress, 2024/12/15 in-service date. Halifax County
      - IR #663: SIS in progress, 2024/06/15 in-service date. Withdrawn
      - IR #670: SIS in progress, 2026/02/28 in-service date. Colchester County
      - IR #669: SIS in progress, 2025/12/31 in-service date. Cumberland County
      - IR #668: SIS in progress, 2025/12/01 in-service date. Antigonish County
      - IR #618: SIS in progress, 2025/01/01 in-service date. Guysborough County