

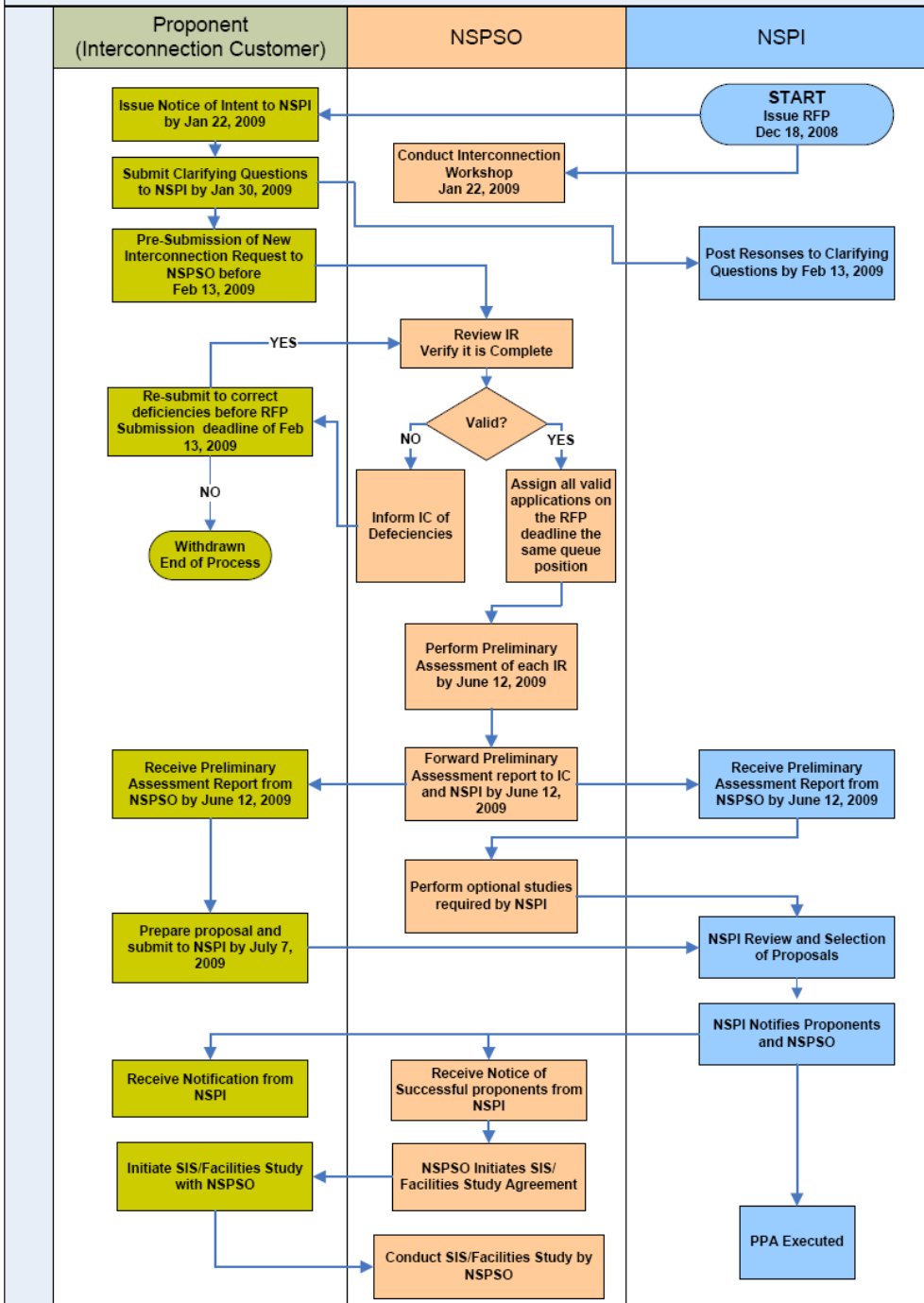
# Nova Scotia Power's Distribution Interconnection Procedures

Interconnection Workshop  
January 22, 2009

# Objectives

1. Clarify that Interconnection and RFP/PPA are distinct processes within NSPI & Show how the RFP and Interconnection Process interact.
2. What is a Generator Interconnection?
3. How do you make an interconnection request? What are the Interconnection Procedures, Requirements, Timelines, Costs, and Worksteps?
4. Who is responsible for system additions and upgrades?
5. Where do I get more information? Who can I talk to?

**1. Clarify that Interconnection and RFP/PPA are distinct processes within NSPI & Show how the RFP and Interconnection Process interact.**



## Interaction of Interconnection Process with the RFP Process

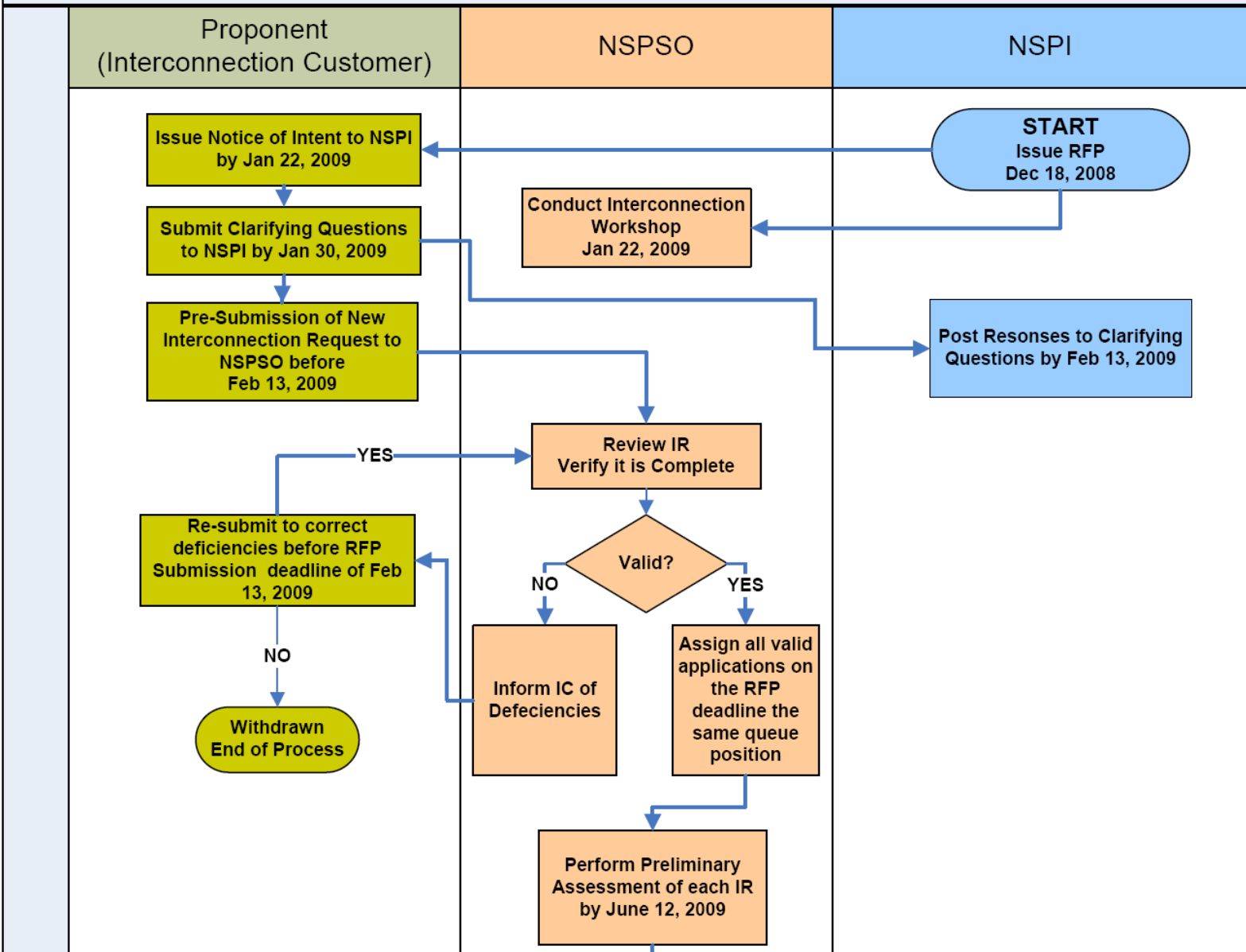
Key Interconnection Dates:

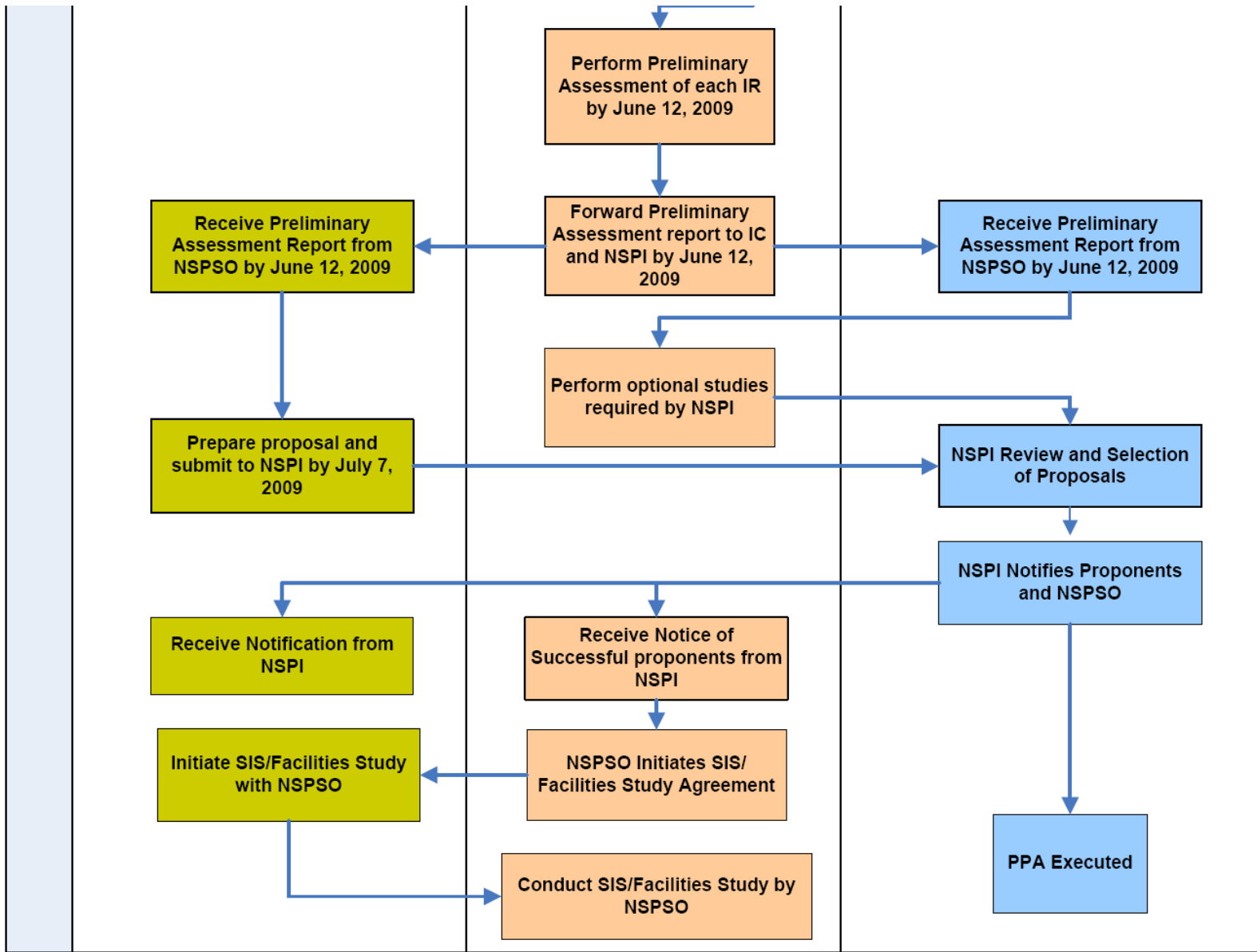
Jan 22 – Workshop

Feb 13 – RFP deadline for Interconnection Requests

June 12 – Preliminary Reviews Completed for all requests

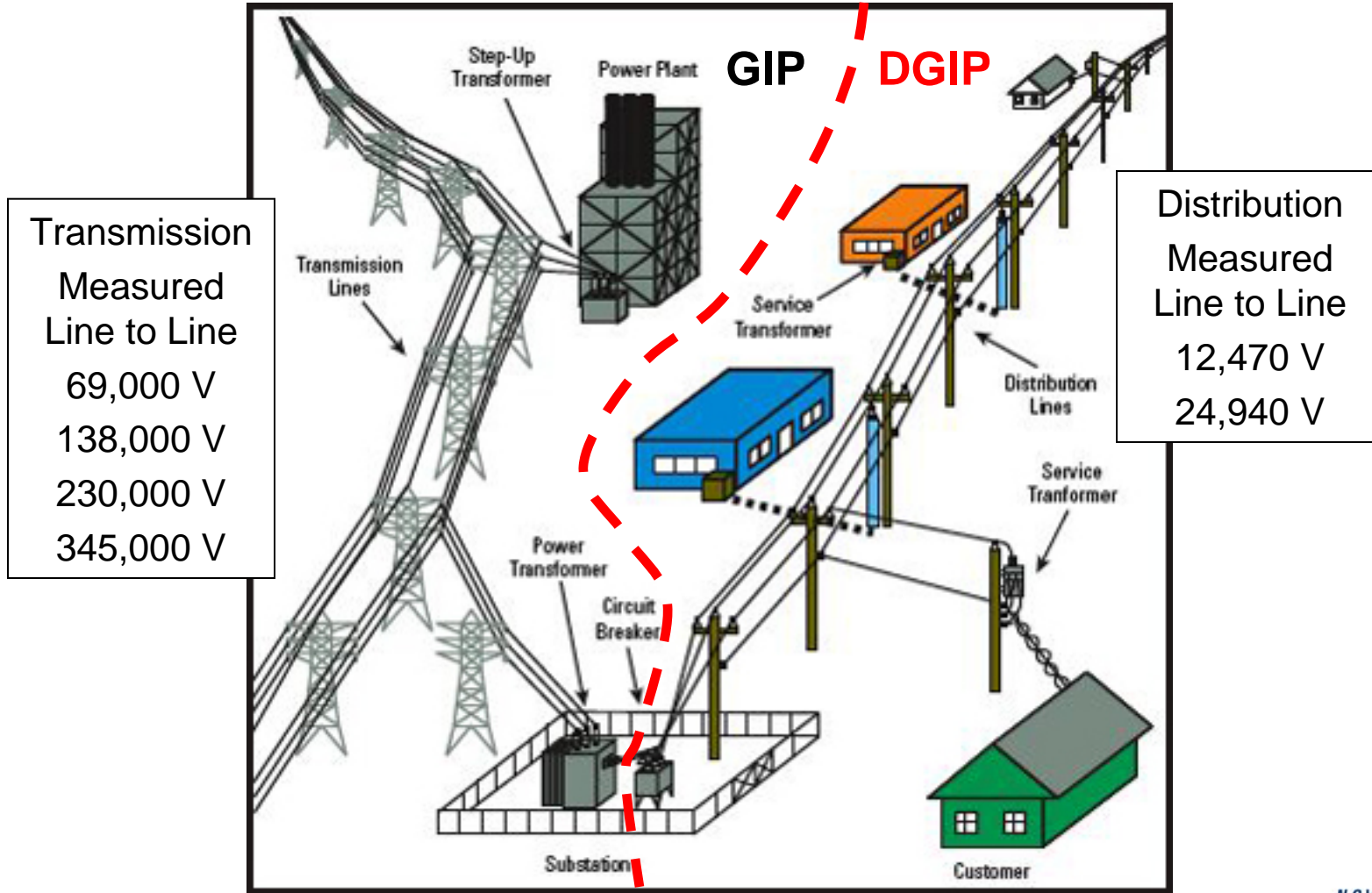
Note: The Interconnection Request must be deemed VALID by NSPSO by Feb. 13, so allow time for review and identification of deficiencies





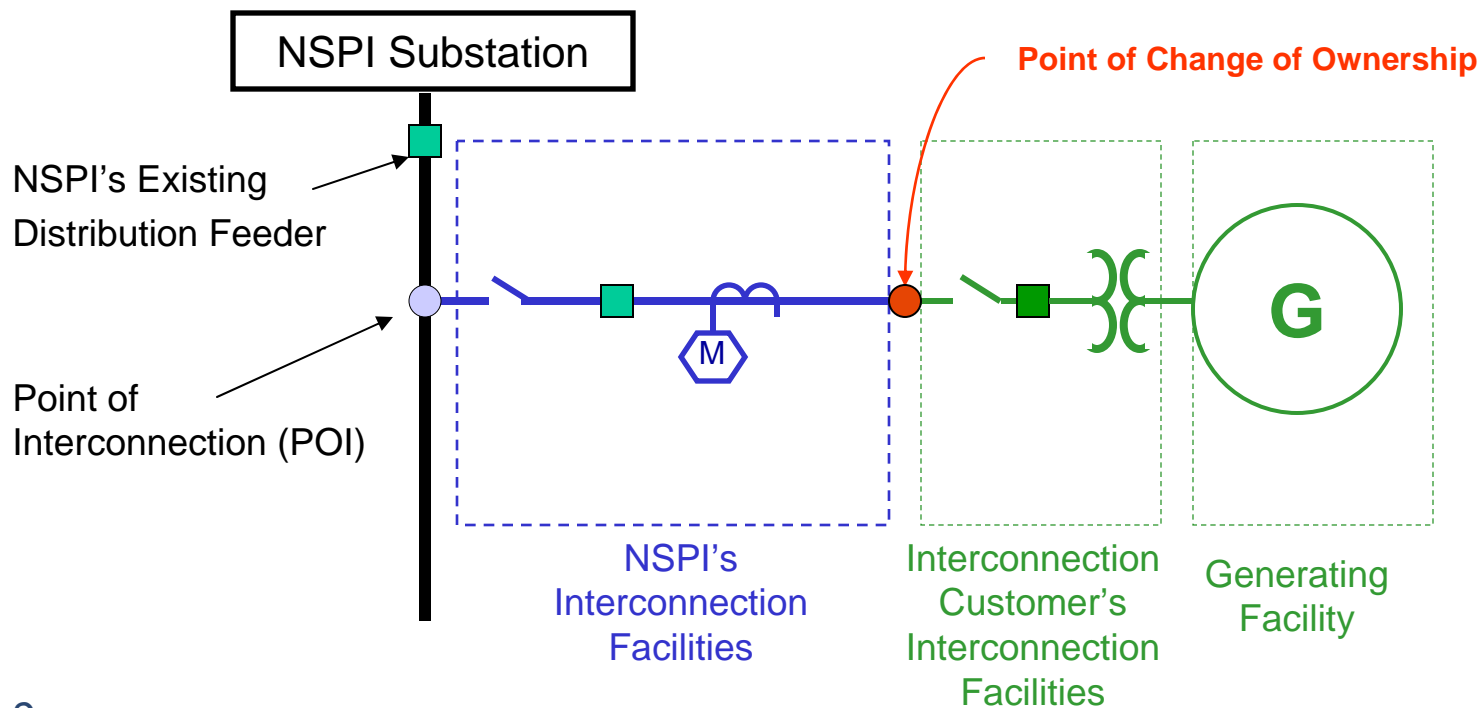
## 2. What is a Generator Interconnection?

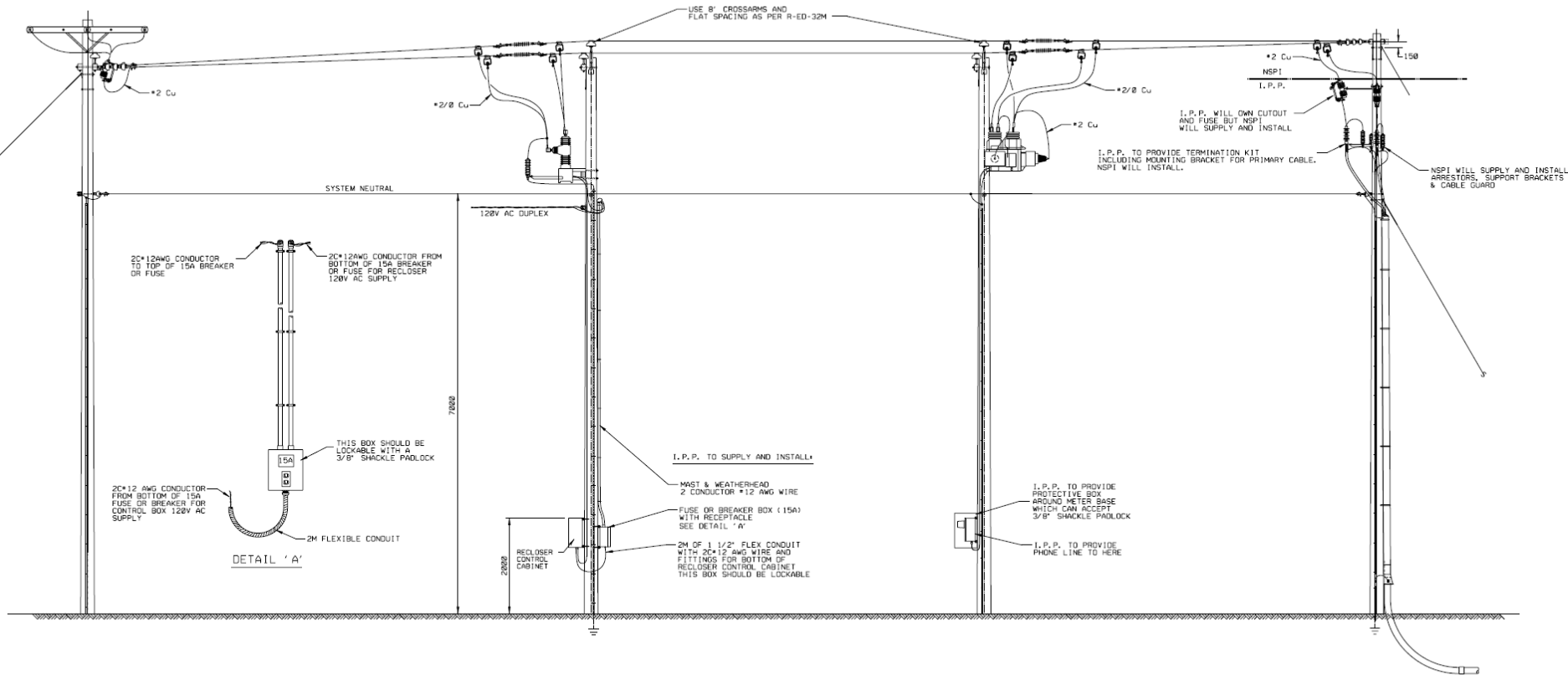
# Transmission / Distribution



# What is a Generator Interconnection?

The generator interconnection enables the Distribution System to receive electrical energy and capacity from the Generating Facility at the Point of Interconnection per the terms of the Small Generator Interconnection and Operating Agreement.





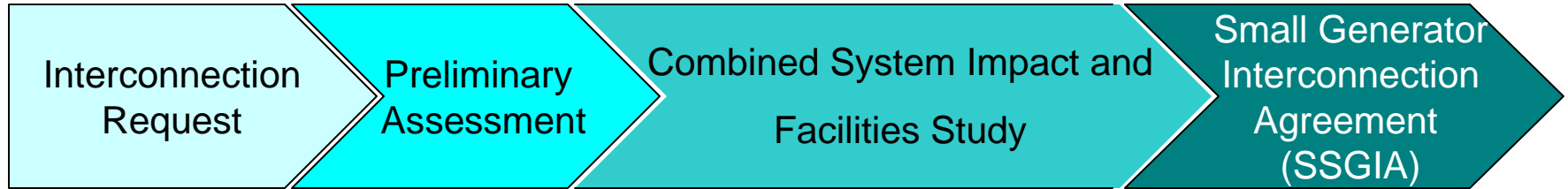
# NSPI's Interconnection Facilities

# **3. How do you make an Interconnection Request? What are the Interconnection Procedures, Requirements, Timelines, Costs & Worksteps?**

# Distribution Interconnection Procedures

- **The high level worksteps are as follows:**
  - Interconnection Request
  - Preliminary Assessment
  - Combined System Impact / Facilities Study
  - Generator Interconnection Agreement
  - Design, Construction and Commissioning
  - Commercial Operation

# Making a Distribution Interconnection Request



- Requirements:
- Completed Distribution Interconnection Request Form
  - Available on NSPI's OASIS website:  
<http://oasis.nspower.ca/>
  - \$1000 fee (certified cheque)
- A map showing the project location

The undersigned Interconnection Customer submits this request to interconnect its Generating Facility to the Distribution System. A valid Interconnection Request must include the below application form and a \$1000 fee.

Applicant Information	
Applicant	Company Name: _____ Street Address: _____
	Contact Name: _____ Unit/Suite: _____
	Phone: _____ City: _____
	Fax: _____ Province: _____
	E-Mail: _____ Country: _____
	_____ Postal / Zip Code: _____
Project Information	
Project	Name: _____ Project Location: _____
	Owner/Developer: _____
	Engineering Consultant: _____ Proposed In-Service Date: _____ yy/mm/dd
This Interconnection Request is for (check one):	
<input type="checkbox"/> A proposed new Generating Facility. <input type="checkbox"/> An increase in the generating capacity or a Material Modification of an existing Generating Facility.	
Summary of configuration	
Prime Mover (ie: wind, hydro, etc): _____	
Number and type of generators: _____	
Total project Capacity (kW): _____	
Maximum kilowatt electrical output of the proposed new Generating Facility:	
<input type="text"/> KW summer at <input type="text"/> degrees C <input type="text"/> KW winter at <input type="text"/> degrees C OR <input type="text"/> KW increase in the generating capacity of an existing Generating Facility	
This Interconnection Request is Submitted by:	
I hereby certify that, to the best of my knowledge, all the information provided in this Interconnection Request And Equipment Information Form is true and correct.	
_____ Name of Interconnection Customer (Type or Print) Title: _____ _____ Signature Date: _____	
Contact Information- Send completed form in hardcopy to:	
Nova Scotia Power Inc., 5 Long Lake Drive, Halifax, NS B3S 1N8 Attention: Interconnection Engineer	
NS Power - Internal Use	
Received By: _____ Date and Time Received: _____ _____ Signature	

1. Applicant Information

2. Project Information

3. New or Increase?

4. Type and capacity

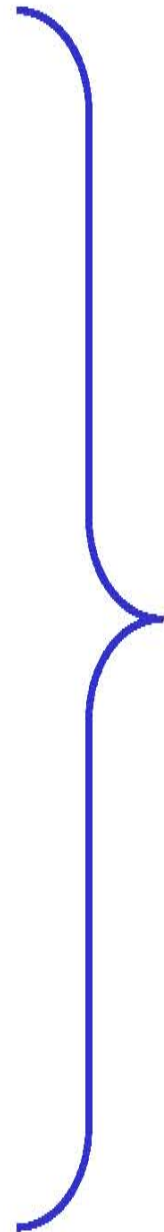
5. Signature

6. Review & Time Stamp by NSPI

GENERATING FACILITY DATA					
UNIT RATINGS					
kVA		Degrees C		Voltage	
Power Factor				Connection (e.g. wye)	
Short Circuit Ratio				Frequency (hz)	
Stator Amps at Rated kVA				Field Volts	
Max MW		Degrees C		Speed (RPM)	
COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA					
Inertia Constant	H	kW-sec/kVA	Moment-of-Inertia	WR <sup>2</sup>	lb.-ft. <sup>2</sup>
REACTANCE DATA (PER UNIT-RATED KVA)					
		DIRECT AXIS		QUADRATURE AXIS	
Synchronous – saturated	X <sub>dv</sub>		X <sub>qv</sub>		
Synchronous – unsaturated	X <sub>di</sub>		X <sub>qi</sub>		
Transient – saturated	X' <sub>dv</sub>		X' <sub>qv</sub>		
Transient – unsaturated	X' <sub>di</sub>		X' <sub>qi</sub>		
Subtransient – saturated	X'' <sub>dv</sub>		X'' <sub>qv</sub>		
Subtransient – unsaturated	X'' <sub>di</sub>		X'' <sub>qi</sub>		
Negative Sequence – saturated	X <sub>2v</sub>				
Negative Sequence – unsaturated	X <sub>2i</sub>				
Zero Sequence – saturated	X <sub>0v</sub>				
Zero Sequence – unsaturated	X <sub>0i</sub>				
Leakage Reactance	X <sub>lm</sub>				
FIELD TIME CONSTANT DATA (SEC)					
Open Circuit	T <sub>do</sub>		T <sub>qo</sub>		
Three-Phase Short Circuit Transient	T <sub>d3</sub>		T <sub>q</sub>		
Line to Line Short Circuit Transient	T <sub>d2</sub>				
Line to Neutral Short Circuit Transient	T <sub>d1</sub>				
Short Circuit Subtransient	T <sub>d</sub>		T <sub>q</sub>		
Open Circuit Subtransient	T <sub>do</sub>		T <sub>q</sub>		
ARMATURE TIME CONSTANT (SEC)					
Three Phase Short Circuit	T <sub>a3</sub>				
Line to Line Short Circuit	T <sub>a2</sub>				
Line to Neutral Short Circuit	T <sub>a1</sub>				
<b>NOTE: If information requested above is not applicable, indicate by marking "N/A."</b>					
MW CAPABILITY AND PLANT CONFIGURATION - GENERATING FACILITY DATA					
ARMATURE WINDING RESISTANCE DATA (PER UNIT)					
Positive	R1				
Negative	R2				
Zero	R0				
Rotor Short Time Thermal Capacity	I <sub>2</sub> <sup>2</sup> t				
Field Current at Rated kVA, Armature Voltage and PF					AMPS
Field Current at Rated kVA and Armature Voltage, 0 PF					AMPS
Three Phase Armature Winding Capacitance					MICROFARAD
Field Winding Resistance			OHMS		C
Armature Winding Resistance (Per Phase)			OHMS		C

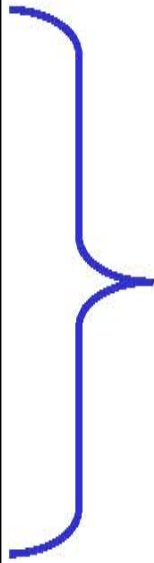
Technical Data

CURVES			
Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction curves. Designate normal and emergency Hydrogen Pressure operating range for multiple curves			
GENERATOR STEP-UP TRANSFORMER DATA			
RATINGS			
Capacity kVA	Self-cooled	<input type="text"/> kVA	Max. nameplate <input type="text"/> kVA
Voltage ratio	Generator Side	<input type="text"/> kV	System Side <input type="text"/> kV
Winding Connections	Low Voltage	<input type="checkbox"/> WYE	or <input type="checkbox"/> DELTA
	High Voltage	<input type="checkbox"/> WYE	or <input type="checkbox"/> DELTA
Fixed Taps Available	<input type="text"/>		
IMPEDANCE			
Positive	Z1 (on self-cooled rating)	<input type="text"/> %	<input type="text"/> X/R
Zero	Z0 (on self-cooled rating)	<input type="text"/> %	<input type="text"/> X/R
EXCITATION SYSTEM DATA			
Identify appropriate IEEE model block diagram of excitation system and power system stabilizer (PSS) for computer representation in power system stability simulations and the corresponding excitation system and PSS constants for use in the model.			
GOVERNOR SYSTEM DATA			
Identify appropriate IEEE model block diagram of governor system for computer representation in power system stability simulations and the corresponding governor system constants for use in the model.			
WIND GENERATORS			
Number of generators to be interconnected pursuant to this Interconnection Request:		<input type="text"/>	
Flicker co-efficient:	<input type="text"/>	Single Phase <input type="checkbox"/>	Three Phase <input type="checkbox"/>
Inverter: Manufacturer:	<input type="text"/>	Model Number	<input type="text"/>
	Model name:	<input type="text"/>	Version: <input type="text"/>
Power Factor range:	<input type="text"/>		
List of adjustable set points for the protective equipment or software:			
<input type="text"/>			
INDUCTION GENERATORS			
Field Volts:	<input type="text"/>		
Field Amperes:	<input type="text"/>		
Motoring Power (kW):	<input type="text"/>		
Neutral Grounding Resistor (If Applicable) :	<input type="text"/>		
$I_2^2t$ or K (Heating Time Constant):	<input type="text"/>		
Rotor Resistance:	<input type="text"/>		
Stator Resistance:	<input type="text"/>		
Stator Reactance:	<input type="text"/>		
Rotor Reactance:	<input type="text"/>		
Magnetizing Reactance:	<input type="text"/>		
Short Circuit Reactance:	<input type="text"/>		
Exciting Current:	<input type="text"/>		
Temperature Rise:	<input type="text"/>		
Frame Size:	<input type="text"/>		
Design Letter:	<input type="text"/>		
Reactive Power Required In Vars (No Load) :	<input type="text"/>		
Reactive Power Required In Vars (Full Load) :	<input type="text"/>		
Total Rotating Inertia, H:	<input type="text"/>		



Technical Data

<p><b>DOCUMENTATION REQUIRED - Two copies of each required.</b></p> <p>Information below to be submitted for all projects. All diagrams are to be on appropriate paper size as required for ease of reading. NSPI reserves the right to refuse drawings if they are not legible.</p>
<p>1. Electrical One-Line Diagram</p> <p>A Single-line drawing showing the electrical relationship and descriptions of the significant electrical components such as the primary switchgear, secondary switchboard, protective relays, transformers, generators, circuit breakers, with operating voltages, capacities, and protective functions of the Generating Facility, the Customer's loads, metering and the interconnection with NSPI's system.</p>
<p>2. Project Location:</p> <p>Provide area maps. Maps should show major cross streets and proposed plant location, and include the street address.</p>
<p>3. Site Plan:</p> <p>Provide site plan, showing the physical arrangement of the major equipment, including generators, transformers, primary switchgear/secondary switchboard, and control panels, the Customer's loads and the interconnection with NSPI's System. Include the civic address, references, etc.</p>
<p>4. Point of Contact:</p> <p>If the interconnection and start-up process is to be coordinated through a party or individual other than the Customer, provide the name, company, address and phone number of that individual or party with whom the utility is to coordinate the interconnection.</p>



Documentation

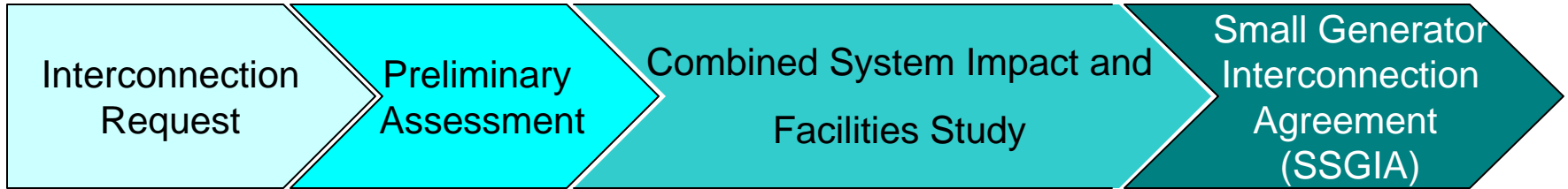
Site details

Electrical

Physical

Contact

# Preliminary Assessment



- Preliminary Assessment Study
  - Identifies available interconnection points/options
  - Identifies major issues/show stoppers
  - Magnitude of cost to interconnect (range)
  - Performed by NSPI staff/consultants
  - Fixed cost \$1000 (Submitted with Interconnection Request).

# Proposed 2 MW Distributed Generation Site

## at Antigonish: Preliminary Review



Prep. By: NSPI 07-Feb-07 Page 1 of 2

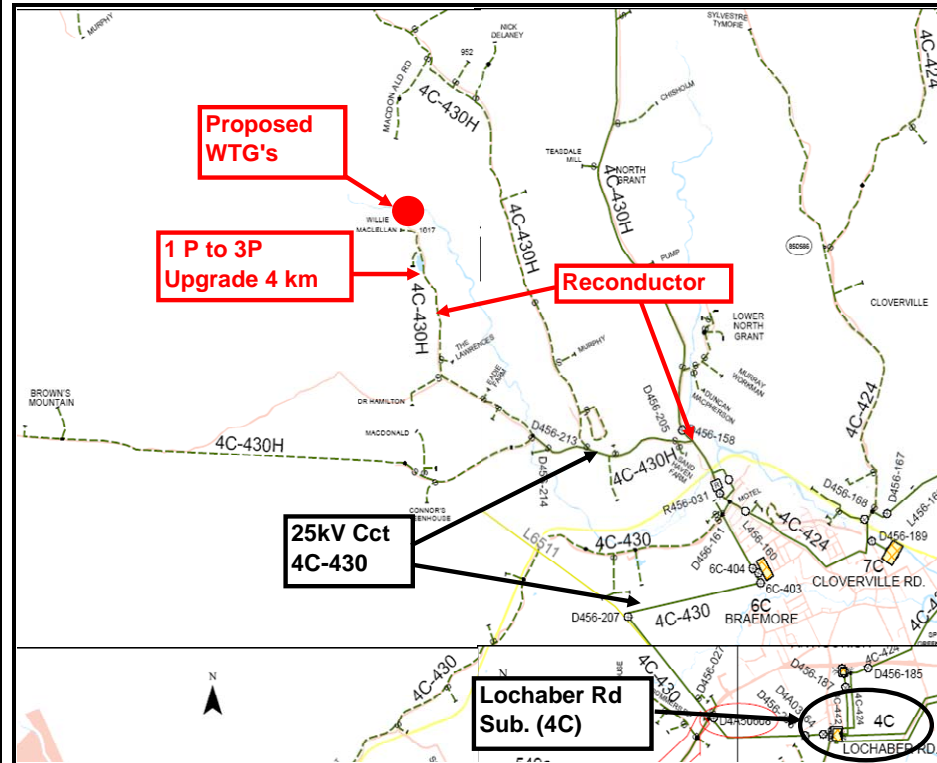
Applicant # :	#123		
WTG Site - General Location:	Antigonish		
Street Address & PID:	*****		
Total Generation (# Units & kW):	1	x 2000	Type: Inverter

# Proposed 2 MW Distributed Generation Site

## at Antigonish: Preliminary Review



NSPI: Existing Distribution System Assets Page 2 of 2



Supply Sub-station Data	
Sub-station Name	LOCHABER ROAD
Sub-station ID	4C
Transformer ID	4C-T63
Transformer HV (kV)	138
Transformer LV (kV)	26.4
Transformer Rated MVA	25/33.3//41.7

Distribution System Data	
Feeder Circuit ID	4C-430
Fixed kVAR on Cct	0
Upstream Regulators	0
Downstream Regulators	1
Upstream Xfmr kVA	0
Upstream Xfmr LV (kV)	0

Supply Sub-station Load Data	
Peak Load (MVA)	37.3
Est. Min Load (MVA)	9.3

Distribution Feeder Load Data	
Peak Load (MVA)	11.4
Est. Min Load (MVA)	2.9

Overhead Line Data for Sections between Sub-station & Generator Site													
Section	1	2	3	4	5	6	7	8	9	10	11	12	Total
Type	4/0 AL	2/0 AL	4 Cu	2 AL	4/0 AL	2/0 AL	N/A	N/A	N/A	N/A	N/A	N/A	km
km (3Φ)	6.12	2.98	-	-	-	1.00	-	-	-	-	-	-	15.10
km (2Φ)	-	-	-	-	-	-	-	-	-	-	-	-	
km (1Φ)	-	-	1.47	0.29	2.24	-	-	-	-	-	-	-	
Extension	-	-	-	-	-	1.00	-	-	-	-	-	-	

Required Circuit Modifications	
1 - 3 phase Line Upgrades (km)	4.00
2 - 3 phase Line Upgrades (km)	0.00
3 phase Line Extensions (km)	1.00
Line Reconductoring (km)	4.74
Voltage Conversions (kVA)	0
Other Upgrades / Shared Line Costs?	\$0
Sub-station Upgrades	\$0

Order of Magnitude Cost Estimate *	
	< \$125,000
	\$125,000 - \$250,000
X	\$250,000 - \$500,000
	> \$500,000

*\* This estimate is non binding on NSPI. It does not include costs for ROW easements, clearing, flicker mitigation, power factor correction, etc... as determined by the SIS at later time.*

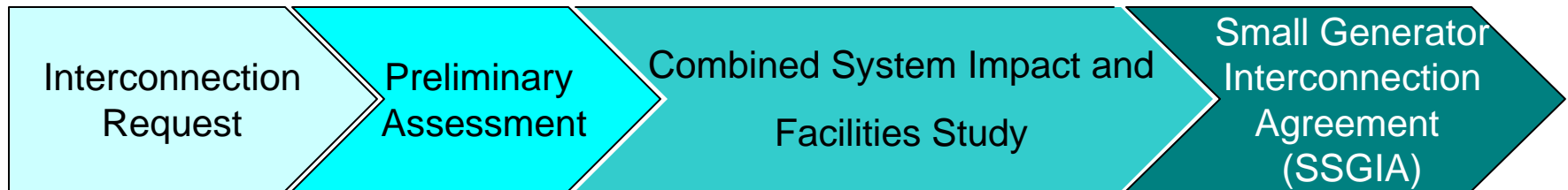
Site Fault Data after Modifications			
Fault MVA	Short Cct Ratio	X/R Ratio	Phase Angle
59.8	29.9	1.45	55.5

System Impact Study (SIS)	
	OK - SIS is Not Required
	OK - SIS is Required
X	Distribution System Issues - SIS is Required

Site Related Comments
- There has been a previous request for distributed generation to be connected to this 25kV distribution circuit 4C-430 out of Lochaber Rd. Substation (4C).

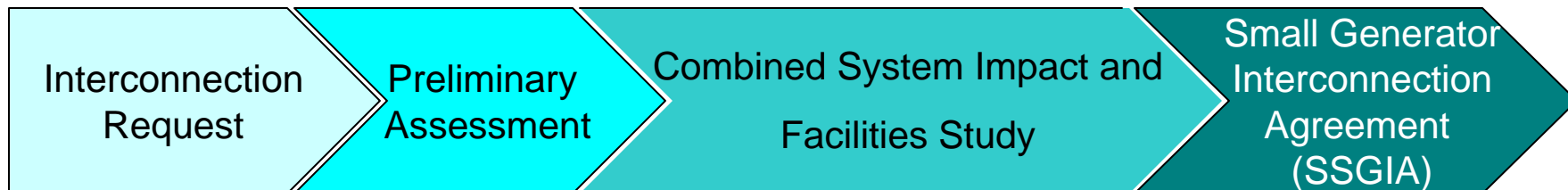
General Comments

# Combined SIS/Facilities Study



- Combined System Impact/Facilities Study
  - Detailed analysis of the impact of the project
  - Identifies technical and operational requirements
  - List of NSPI facilities required, with cost estimate, time to construct
  - Conducted by consultants to NSPI
  - \$10,000 deposit (certified cheque - P.O. not accepted)
  - Typically \$4k – \$10k, 40 Business Days

# Distribution GIA



- Authorization to Interconnect - SSGIA Covers:
  - Scope [Nova Scotia Power - Environment - Green Power- Biomass - Technology](#)
  - Inspection, Testing, Authorization, and Right of Access
  - Effective Date, Term, Termination, Disconnection, and Survival
  - Cost Responsibility, Milestones, Billing, and Payment
  - Diagrams, Contacts, Operating Conditions, SIS
  - Project milestones

## 4. Who is responsible for system additions and upgrades?

# Cost responsibility

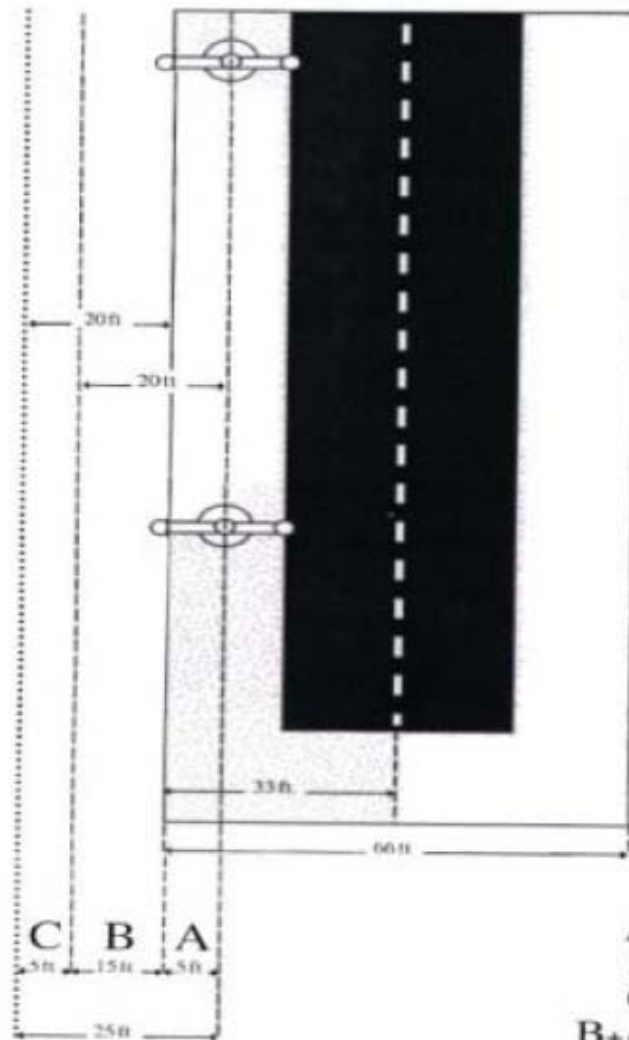
- **Generating Facility**
  - Built, owned and funded by the Customer
- **Interconnection Customer Interconnection Facilities**
  - Built, owned and funded by the Customer
- **NSPI Interconnection Facilities**
  - Built and owned by NSPI
  - Funded by the Customer

# Construction of Facilities

- NSPI process to have facilities constructed
  - Distribution extension/upgrades managed by NSPI
  - May use NSPI or contracted workforce
- Requirements prior to start of construction
  - Payment
  - Easements (ref: NSPI Easement Packages)
  - Roadways (NSPI ROW details provided in SIS)
  - Tree clearing

# Easement Requirements and Related Row Development

**Figure #1** Government Owned  
and Maintained Roadway



- A Public Easement available = 5 ft.
- B Required Easement on Private land = 15 ft.
- C Recommended additional Easement = 5 ft.
- B+A 20 ft. required Easement
- C+B Recommended Easement on Private land
- C+B+A 25 ft. of Easement, 20 ft. would be cleared, leaving 5 ft. for future Row development if poles and lines are required to be relocated.

NSPI Easement packages are available to help you obtain appropriate right of ways / easements

# Electrical Inspection – key points

- Electrical work must be performed under permit and must conform to the code standards (not the utility standards) for customer owned equipment
- Plans must be submitted to inspection department for review and all equipment must be approved by a recognized certification authority (CSA, ULC, etc)
- NSPI requires that the wind generators have a special inspection
- Nothing will be connected or energized without authorization of the inspector.
- Lead times – inspection service level is < 5 days from request – normally manage < 3 days
- Dave Clements 428-6358; Erika Smeltzer 869-5324

# 5. Where do I get more information? Who can I talk to?

# Information/Contacts

- Interconnection Information and Contact:
  - Documentation on OASIS: <http://oasis.nspower.ca/generation.shtml>
  - **John Charlton, Sr. Engineer, Interconnection.**
  - John can be reached at: (902) 428-3000 X 5416
  - Email: [john.charlton@nspower.ca](mailto:john.charlton@nspower.ca)
  
- Inspection Authority:
  - **David Clements, Chief Electrical Inspector**
  - David can be reached at: (902) 428-6358
  - Email: [David.clements@nspower.ca](mailto:David.clements@nspower.ca)



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Home > Environment > Renewable Energy > Small Renewables



## 2008 Request for Proposals ( RFP) for Small Renewable Energy

- RFP
- Power Purchase Agreement (PPA)

### Interconnection

- NSPI Major Facilities Map

### Interconnection Workshop

- January 22nd Interconnection Workshop Details **New!**

### Category B: Projects

- Distribution Generator Interconnection Process
- Standard Small Generator Interconnection Agreement (SSGIA)
- NSPI Zonal Loss Factors for Distribution Connected Projects

### ecoENERGY for Renewable Power Program

Developers are encouraged to familiarize themselves with the Government of Canada ecoENERGY for Renewable Power Program. This program provides approved developers an incentive of one cent per kilowatt-hour for up to 10 years for eligible low-impact, renewable electricity projects constructed before March 31, 2011. NSPI is not affiliated with this program.

<http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/power-electricite/index-eng.cfm>

### Renewable Energy

- Net Metering
- Hydro
- Tidal
- Wind
- Solar
- Biomass
- Small Renewables
- Generating Cleaner, Greener Energy

[http://www.nspower.ca/environment/green\\_power/small\\_renewables/smallrenewablesRFP.shtml](http://www.nspower.ca/environment/green_power/small_renewables/smallrenewablesRFP.shtml)





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**Menu**

- System Reports and Messages
- Monthly Reports
- Forecasts and Assessments
- Standards and Codes
- Calendars
- Standards of Conduct
- Wholesale Market Documents
- Regulatory Documents

**Open Access Same-time Information System (OASIS)**

The Nova Scotia Power Open Access Transmission Tariff (OATT) came into effect on November 1st, 2005. For OATT-related services use the menu on the right.

The *Electricity Act* came into effect on February 1, 2007. For wholesale market documents use the menu on the left.

**Transmission Services:**

- [OASIS Reservation Web Site](#)  
(Secure Site - registration required)

**Apply for access to OASIS**

Nova Scotia Power has contracted the New Brunswick System Operator (NBSO) to manage its OASIS reservation web site. To become a registered user of the NSP OASIS, [click here](#) and follow the steps as outlined on the NBSO site.

- [Open Access Transmission Tariff \(OATT\), including schedules and attachments](#)
- [Transmission System Information Request](#)

Questions or comments about the Nova Scotia Power OASIS site can be sent to us at [Talk To Us/Oasis](#)

PLEASE NOTE: This site contains documents that are in Adobe Acrobat format. You will need the free [Acrobat Reader software](#) to view or print them.

**OASIS**

- Transmission Customer Procedures
- Generation Interconnection Procedures

<http://oasis.nspower.ca/>



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- ▶ ENERGY EFFICIENCY
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- ▶ ABOUT NSPI

Home > Generation >



## Generation Interconnection Procedures

The following procedures, agreements and forms are required to initiate the various interconnection studies and processes required through NSP's Generator Interconnection Procedures. All completed forms should be **sent** to:

Nova Scotia Power Inc.  
5 Long Lake Drive  
Ragged Lake Business Park Halifax, NS , Canada  
B3S 1N8

**Attention:** John Charlton, Sr. Engineer, Interconnection.  
John can be reached at: (902) 428-3000 X 5416

### Transmission Interconnection Procedures (Applicable to transmission systems 69,000 volts and higher.)

- [Standard Generation Interconnection Procedures \(GIP\)](#)
- [July 2007 Update to GIP section 11.1](#)
- [Generator Interconnection Request Form](#)
- [Feasibility Study Agreement](#)
- [System Impact Study Agreement](#)
- [Facilities Study Agreement](#)
- [Optional Interconnection Study Agreement](#)
- [Standard Generator Interconnection & Operating Agreement \(GIA\)](#)

### REVISED GIP QUEUE

On Sept. 24, the UARB issued its **decision** on NSPI's request for amendments to the GIP. The resulting amended priority GIP queue is listed below:

- [Amended GIP queue](#)

### Distribution Interconnection Procedures (Applicable to distribution systems 25,000 volts and lower)

- [Distribution Generator Interconnection Process - Revised Dec, 2008](#)
- [Distribution Interconnection Request Form](#)
- [Standard Small Generator Interconnection and Operating Agreement \(SSGIA\)](#)

### OASIS

- Transmission Customer Procedures
- Generation Interconnection Procedures

<http://oasis.nspower.ca/generation.shtml>

# Objectives

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2. What is involved in getting a project interconnected?
3. How do you make an interconnection request? What are the Interconnection Procedures, Requirements, Timelines, Costs, and Worksteps?
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