

**Environment and Sustainability Standing Committee
October 6, 2011**

TO: Chair and Members of Environment and Sustainability Standing Committee

SUBMITTED BY: 
Phillip Townsend, Director, Infrastructure and Asset Management

DATE: September 19, 2011

SUBJECT: Halifax Water: Renewable Wind Energy Project Development

ORIGIN

Halifax Regional Water Commission (HRWC) Board

RECOMMENDATION

It is recommended that the Environment and Sustainability Standing Committee:

1. Request Regional Council to provide a Letter of Endorsement for the proposed project development; and
2. Request HRWC to provide frequent updates to the Environment and Sustainability Standing Committee and the Halifax Regional Municipality (HRM) staff to ensure this is a learning opportunity for HRM for Energy Project Development.

BACKGROUND

On September 7, 2011, the Nova Scotia Utilities and Review Board established Community Feed in Tariff Rates. The HRWC has some potential Wind Energy projects that it is investigating.

DISCUSSION

As per the HRWC report, following the adoption of the HRM Wind Energy Master Plan and the ComFIT rate announcements, there are revenue opportunities.

This project development is an excellent learning opportunity for HRM.

BUDGET IMPLICATIONS

There are no Budget Implications to HRM.

FINANCIAL MANAGEMENT POLICIES / BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Project and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Project and Operating reserves, as well as any relevant legislation.

COMMUNITY ENGAGEMENT

None

ALTERNATIVES

None

ATTACHMENTS

HRWC Board Report

A copy of this report can be obtained online at <http://www.halifax.ca/commcoun/cc.html> then choose the appropriate Community Council and meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: Richard MacLellan, Manager, Energy and Environment, 490-6056


Financial Approval by:



James Cooke, CGA, Director of Finance/CFO, 490-6308

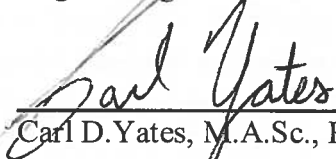
TO: Colleen Purcell, C.A., Chair, and Members of the Halifax Regional Water Commission Board

SUBMITTED BY:



Jamie Hannam, P.Eng., Director,
Engineering & Information Services

APPROVED:



Carl D. Yates, M.A.Sc., P.Eng., General Manager

DATE: September 14, 2011

SUBJECT: Renewable Wind Energy Project Development (Revised)

ORIGIN

Report to HRWC Board Meeting of June 30th, 2011 – *Renewable Wind Energy Project Development*.

RECOMMENDATION

It is recommended that the Halifax Water Board:

1. Endorse the enclosed and revised "*HRWC Wind Energy Project Development Plan*";
2. Approve in principal the selection of projects identified for the Pockwock and Lake Major Watershed areas.
3. For each project identified, approve proceeding with:
 - Phase 1 - COMFIT Project Registration/Application; and
 - Phase 2 - Issuance, acceptance and evaluation of Request for Proposals (RFP) or Expressions of Interest (EOI) for the development of the identified wind energy resource projects;
4. Provide a "*Letter of Endorsement*" indicating approval to proceed with the COMFIT applications for the projects identified.

BACKGROUND

Subsequent to the previously submitted and approved HWRC Board Report of June 30th, 2011 - Item #7 - “*Renewable Wind Energy Project Development*”, a number of changes and developments have occurred that warrant revising the original project details. These changes and developments are identified as follows:

1. *Amendments to HRM’s existing land use by-laws* have been proposed to introduce set back regulations related to the placement and operation of wind energy projects within the boundaries of the Halifax Regional Municipality. It is expected the set back regulation for larger wind turbines of the type being considered by Halifax Water would be subject to a 1,000 metre set back from any residential or commercial structure. Any projects being considered by Halifax Water would meet these new regulatory by-law requirements.

2. *Community Feed-In Tariffs* to be applied to the COMFIT program were established on September 7th, 2011 by the NSUARB. The approved tariffs are summarized below:

<u>Renewable Energy Source</u>	<u>Preliminary Tariff</u> ^(1,2)
Wind (≤50 kW)	\$0.499/kWh
Wind (>50 kW)	\$0.131/kWh
Biomass CHP	\$0.175/kWh
Run-of-River Hydro	\$0.140/kWh
In-Stream Tidal	\$0.652/kWh

(1) Ref. NSUARB Report: NSUARB-BRD-E-R-10 Dated September 7, 2011.

(2) 2011 JD Kline/Lake Major NSPI Rates \$0.06006/kWh (Rate 22M – Medium Industrial)

3. *Preliminary Interconnection System Impact Studies* have been completed by NSPI identifying the available distribution feeder capacity for each COMFIT project being considered. Available capacities have been identified as follows:

<u>Location</u>	<u>Sub-Station ID</u>	<u>Available Capacity</u>
Pockwock	137H-T61	10.1 MW
Lake Major Road	113H-T63	11.0 MW
Lake Loon Road	113H-T64	12.0 MW

DISCUSSION

Based on the proposed HRM by-law amendments for wind energy developments, the recently approved COMFIT tariffs, and the results of the “*Preliminary Interconnection System Impact Studies*” recently completed by NSPI, the original project details have been updated. These projects have been revised to optimize the available capacity on the respective local NSPI distribution and transmission systems and program eligibility. The following revised analysis provides a comparison of the project’s rated output, financial Net-Present Value (NPV) and the estimate of the Simple Payback (SPB) for each:

Option	Facility	Program	Rated Output	NPV (\$M)	SPB (Years)
PW-2	Pockwock	COMFIT	4 MW	\$4.75	14.3
PW-5	Pockwock	COMFIT	100 kW	\$0.39	11.4
LM-2a	Lake Major (Lake Loon)	COMFIT	11.5 MW	\$21.12	10.2
LM-2b	Lake Major (North Preston)	COMFIT	4.6 MW	\$8.14	11.0
LM-5	Lake Major (Plant)	COMFIT	100 kW	\$0.39	11.4

A revised financial analysis was completed for each of the identified projects. A summary of the findings from this analysis is provided in the attached document “*Wind Energy Generation Project Analysis – Project Summary*”. Also attached are the individual financial analyses for each of the identified projects.

Based on the preliminary analyses of the available wind energy resources at both the Pockwock and Lake Major Watershed areas, and based on the preliminary analyses of the various options for wind energy projects at each location, it is recommended that the HRWC Board approve in principal the selection of the following projects:

For the Pockwock Watershed Area

1. Project PW-2, 2 x 2 MW Wind Turbine Generators (WTG’s), 4 MW total installed on HRWC lands and connected to NSPI’s Hammonds Plains Sub-Station 137H, Transformer ID 137H-T61;
2. Project PW-5, 2 x 50 kW WTG’s, 100 kW total installed on HRWC lands and connected to NSPI’s Hammonds Plains Sub-Station 137H, Transformer ID 137H-T61.

For the Lake Major Watershed Area

1. Project LM-2a, 5 x 2.3 MW WTG's, 11.5 MW total installed on HRWC lands west of Lake Major and connected to NSPI's Dartmouth East Sub-Station 113H, Transformer ID 113H-T64;
2. Project LM-2b, 2 x 2.3 MW WTG's, 4.6 MW total installed on HRWC lands east of Long Lake and connected to NSPI's Dartmouth East Sub-Station 113H, Transformer ID 113H-T63;
3. Project LM-5, 2 x 50 kW WTG's, 100 kW total installed on HRWC lands west of Lake Major and connected to NSPI's Dartmouth East Sub-Station 113H, Transformer ID 113H-T64.

Subsequent to the setting of COMFIT rates by the NSUARB, and based on the preliminary analysis of the available wind energy resources at both the Pockwock and Lake Major Watershed areas, and based on the preliminary analyses of the various options for wind energy projects at each location, it is recommended that the HRWC Board approve the following for the projects identified above:

1. Phase 1 – COMFIT Project Registration and Approval

Pursue and complete a COMFIT Registration and Application for each of the identified projects. This will allow HRWC to place itself in the COMFIT and NSPI Queue for the identified projects, thereby reserving space on the local NSPI distribution system. Subsequent to the original June 30th, 2011 approval by the HRWC Board, Preliminary Interconnection System Impact Studies have been completed by NSPI at a cost of \$3,000.

2. Phase 2 – Issuance of a Request for Proposal or Expressions of Interest

Issue, accept and evaluate RFP's or EOI's submitted by interested parties for the development of the identified wind energy resource projects. This process would identify potential partners, suppliers and/or installers upon which to base more accurate project costing and implementation plans. Other than internal resources already budgeted, no additional expenditures are expected for this phase.

Once Phase 1 and 2 have been completed, and the identified projects have received *COMFIT Application Approval* from the NS Department of Energy (NSDOE), it is expected that the HRWC would then be in a position to proceed to the next step for each of the identified wind projects, that being completing a detailed business plan to validate

project viability, completing the required permitting and site assessments, completing a detailed resource assessment, and the completion of a *Combined System Impact Study (SIS)* by NSPI. These steps would be included as recommendations in subsequent submissions for each specific project identified for HRWC Board approval only after COMFIT Application Approval has been received for each project identified.

In support of the aforementioned COMFIT Applications, it is also requested that the HRWC Board issue a letter indicating HRWC Board approval and endorsement of the COMFIT projects identified.

BUDGET IMPLICATIONS

From a regulatory perspective, it is staff's assessment that any resulting wind energy project developments would be set up as an unregulated business activity; structured at minimum to be cost neutral to rate payers, and at best to result in benefits that would accrue to rate payers.

Operations

To enable work on these projects to proceed, it is estimated as much as \$159,000 could be spent by the end of the current fiscal year (March 31st, 2012) if we were to proceed aggressively with COMFIT applications for the two larger wind turbine projects. This amount is based on the following breakdown of costs:

Description	Amount
<i>Estimated COMFIT Application Related Expenditures – FY 2011/2012</i>	
- NSPI Preliminary Interconnection Assessment (3 sites)	\$3,000*
- Seaforth/EON Application Assistance	\$15,000*
- Miscellaneous Engineering Assistance	\$10,000
- NSPI Combined System Impact Study (3 sites)	\$36,000
- Aboriginal Community Engagement	\$10,000
- Municipal Community Engagement	\$10,000
- Special Places/Archaeological Assessment (3 sites)	\$75,000
<i>Sub-Total</i>	<i>\$159,000</i>

ITEM #1.1
HRWC Board
September 16, 2011

<i>Estimated Additional Pre- Installation Expenditures – FY 2012/13</i>	
- Meteorological Tower Installation (3 sites)	\$300,000
- Environmental Assessment (3 sites)	\$300,000
<i>Sub-Total</i>	<i>\$600,000</i>

* Committed Expenditures for FY 2011/2012

Estimated additional pre-installation costs include the installation of three meteorological towers to collect at least 1 years worth of on-site/hub-height wind data to allow an accurate assessment of the resource potential, and the completion of an environmental assessment for each WTG site where the installed capacity is 2 MW or larger. Depending on how aggressive Halifax Water is with respect to proceeding on these projects, this work could also be started in late FY 2011/12 and completed in late FY 2012/13, requiring the expenditure of at least part of these identified costs.

Funding for this work has not been included in the 2011/12 Operating or Capital Budgets. If the work leads to construction of assets, the costs would be capitalized. If it is determined at the end of the fiscal year that it is unlikely assets will actually be constructed, then these costs would impact the 2011/12 Operating Budget as an increase to the projected Operating deficit.

Capital

If the projects proceed, the projected capital cost would be in the range outlined in the attached “*Wind Energy Generation Project Analysis – Project Summary*” and would be brought forward through future business planning/budget processes. The projects would be debt funded through the Municipal Finance Corporation, subject to NSUARB approval and possibly HRM approval should a guarantee be sought for the debt.

A more detailed financial analysis of operating and capital budget implications, along with a detailed cash flow analysis and debt financing analysis would be prepared prior to submission for budget and funding approvals.

ATTACHMENTS

1. Wind Energy Generation Project Financial Analysis (Revised)
2. NSPI Preliminary SIS

Report Prepared by:



Jeff Knapp, P.Eng., Manager, Energy Efficiency
Engineering & IS Department, 490-5736

Financial Review by:



Cathie O'Toole, CGA, MBA, Director of Finance, 490-3572

Halifax Regional Water Commission
Wind Energy Generation Project Financial Analysis (Revised)

PRELIMINARY

Completed By: J. Knapp
 Date/Version: September 13, 2011

Project Location	Project Details	Project Costs					Generation Capacity			Financial Details					
		Development Costs (\$)	Equipment & Installation Costs (\$)	Inter-Connection Costs (\$)	Reserves (\$)	Total Project Costs (\$)	Installed Capacity (MW)	Net Capacity Factor (%)	Total Output (MWh)	Energy Rate (\$/MWh)	PV Revenues (\$)	PV Expenses (\$)	Net PV (\$)	Simple Payback (yrs)	Profitability Index (> 1.0)
Pockwock Watershed - PW-2	Two (2) x 2 MW Wind Turbine Generators - COMFIT - 1000 m HRM Set-Back Rules	\$750,000	\$8,020,000	\$490,000	\$761,485	\$10,021,485	4.00	28.5%	9,737	\$131.00	\$17,109,645	\$12,364,291	\$4,745,354	14.3	1.22
Pockwock Watershed - PW-5	Two (2) x 50 kW Wind Turbine Generators COMFIT - 1000 m HRM Set-Back Rules	\$30,000	\$540,000	\$60,000	\$53,733	\$683,733	0.10	24.6%	210	\$499.00	\$1,407,802	\$1,013,499	\$394,303	11.4	1.47
Lake Major Watershed - LM-2a (Lake Loon Road)	Five (5) x 2.3 MW Wind Turbine Generators COMFIT - 1000 m HRM Set-Back Rules	\$950,000	\$22,050,000	\$550,000	\$1,697,339	\$25,247,339	11.50	28.5%	27,993	\$131.00	\$49,190,228	\$28,067,237	\$21,122,992	10.2	1.59
Lake Major - LM-2b (North Preston)	One (2) x 2.3 MW Wind Turbine Generators COMFIT - 1000 m HRM Set-Back Rules	\$700,000	\$9,020,000	\$420,000	\$700,908	\$10,840,908	4.60	28.5%	11,197	\$131.00	\$19,676,091	\$11,531,901	\$8,144,191	11.0	1.50
Lake Major Watershed - LM-5	Two (2) x 50 kW Wind Turbine Generators COMFIT - 1000 m HRM Set-Back Rules	\$30,000	\$540,000	\$60,000	\$53,733	\$683,733	0.10	24.6%	210	\$499.00	\$1,407,802	\$1,013,499	\$394,303	11.4	1.47

- Notes:**
- 1) Capital costs derived from SEAL Report 024-036-01-11
 - 2) Revenues indexed to inflation rate = 0%
 - 3) Expenses indexed to inflation rate = 2%
 - 4) HRWC discount rate = 5.5%
 - 5) Project Life = 25 years
 - 6) Amortization period = 15 years
 - 7) Interest Rate = 5.5%

**Proposed 4 MW Distributed Generation Site at
Hammonds Plains Road: Preliminary Assessment**



Prep. By: NSPI 02-Aug-11 Page 1 of 2

Application#:	IR #286		
WTG Site - General Location:	Hammonds Plains Road		
Street Address & PID:	Pockwock: PID 00425348 & PID 00330985		
Total Generation (# Units & kW):	2	x	2000
Type:	Inverter		

Supply Sub-station Data	
Sub-station Name	HAMMONDS PLAINS
Sub-station ID	137H
Transformer ID	137H-T61
Transformer HV (kV)	138
Transformer LV (kV)	26.4
Transformer Rated MVA	25/33/42

Distribution System Data	
Feeder Circuit ID	137H-413
Fixed kVAR on Cct	600
Upstream Regulators	0
Downstream Regulators	0
Upstream Xfmr kVA	0
Upstream Xfmr LV (kV)	0

Supply Sub-station Load Data	
Peak Load (MVA)	32.5
Est. Min Load (MVA)	10.1

Distribution Feeder Load Data	
Peak Load (MVA)	10.5
Est. Min Load (MVA)	3.3

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	336 AL	1/0 AL	2/0 AL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	km
km (3Φ)	12.94	1.00	-	-	-	-	-	-	-	-	-	-	15.94
km (2Φ)	-	-	-	-	-	-	-	-	-	-	-	-	
km (1Φ)	-	-	-	-	-	-	-	-	-	-	-	-	
Extension	-	-	2.00	-	-	-	-	-	-	-	-	-	

Required Circuit Modifications	
1 - 3 phase Line Upgrades (km)	0.00
2 - 3 phase Line Upgrades (km)	0.00
3 phase Line Extensions (km)	2.00
Line Reconductoring (km)	0.00
Voltage Conversions (kVA Demand)	0
Other Upgrades / Shared Line Costs	\$0
Sub-station Upgrades	\$0

Order of Magnitude Cost Estimate *	
	< \$175,000
X	\$175,000 - \$250,000
	\$250,000 - \$325,000
	> \$325,000
* 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
67.3	16.8	2.15	65.0

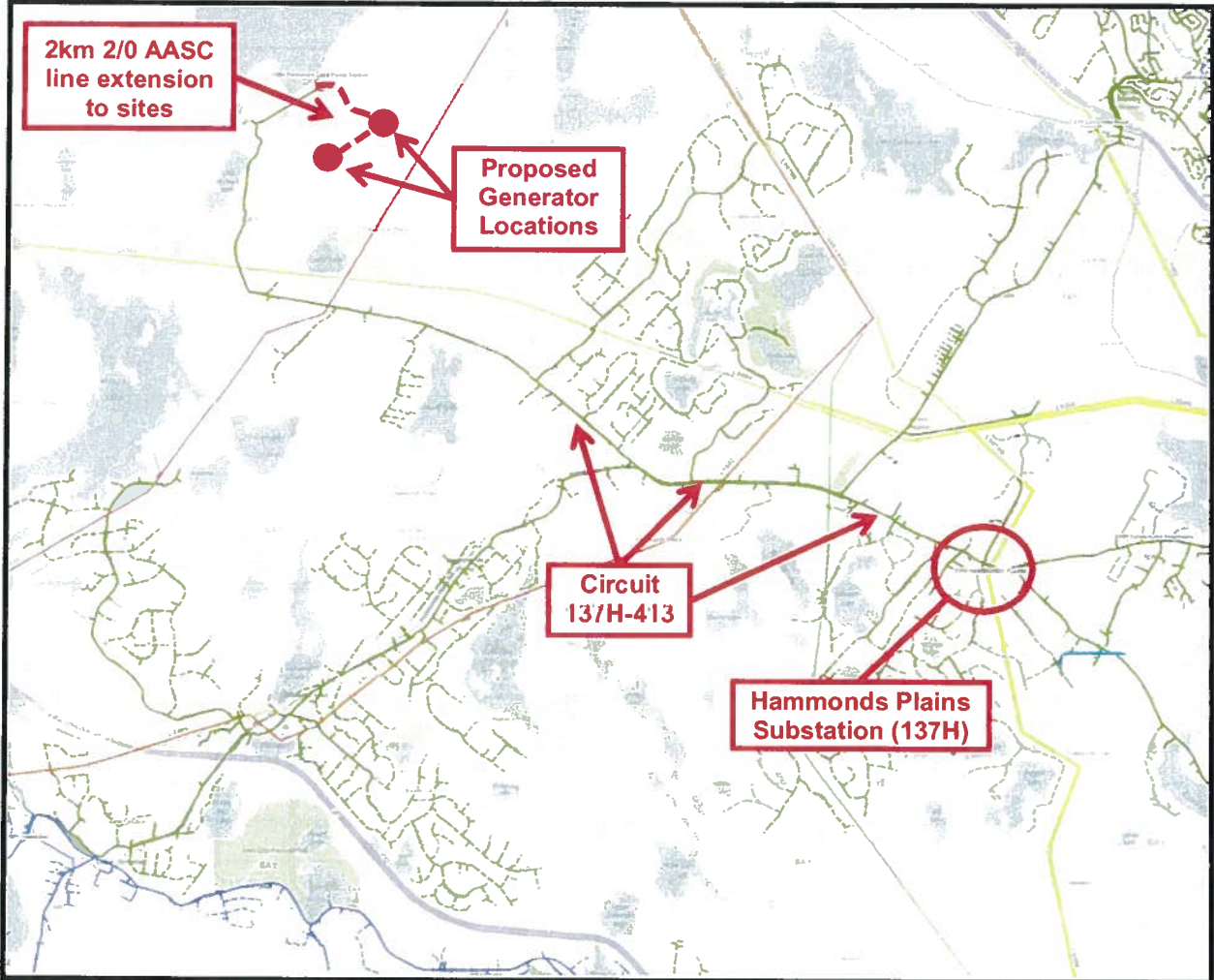
System Impact Study (SIS)	
	OK - SIS is Not Required
X	OK - SIS is Required
	Exceeds Flicker Criteria

Proposed 4 MW Distributed Generation Site at Hammonds Plains Road: Preliminary Assessment



NSPI: Existing Distribution System Assets

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Site Related Comments

- A line extension of 2km was assumed to extend circuit 137H-413 to the generator sites
- IC is responsible for providing easements for line extensions
- There are no other committed distributed generation projects in this area ahead of IR 286 in the Queue
- There may be voltage criteria violations with this amount of generation 16km from Substation 137H.
- The route shown above follows existing roads identified by the IC in their Interconnection Request.

General Comments

**Proposed 4 MW Distributed Generation Site at
Lake Major Rd: Preliminary Assessment**



Prep. By: NSPI 02-Aug-11 Page 1 of 2

Application#:	#285
WTG Site - General Location:	Lake Major Rd
Street Address & PID:	North Preston, New Road Settlement: PID 00315259
Total Generation (# Units & kW):	2 x 2000 Type: Inverter

Supply Sub-station Data	
Sub-station Name	DARTMOUTH EAST
Sub-station ID	113H
Transformer ID	113H-T63
Transformer HV (kV)	138
Transformer LV (kV)	26.4
Transformer Rated MVA	25/33.3/41.5

Distribution System Data	
Feeder Circuit ID	113H-433
Fixed kVAR on Cct	0
Upstream Regulators	0
Downstream Regulators	0
Upstream Xfmr kVA	0
Upstream Xfmr LV (kV)	0

Supply Sub-station Load Data	
Peak Load (MVA)	39.0
Est. Min Load (MVA)	11.0

Distribution Feeder Load Data	
Peak Load (MVA)	11.0
Est. Min Load (MVA)	3.1

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	336 AL	4/0 AL	1/0 AL	1/0 AL	2/0 AL	N/A	N/A	N/A	N/A	N/A	N/A	km
km (3Φ)	1.17	0.03	0.02	4.52	-	-	-	-	-	-	-	-	8.18
km (2Φ)	-	-	-	-	-	-	-	-	-	-	-	-	
km (1Φ)	-	-	-	-	0.44	-	-	-	-	-	-	-	
Extension	-	-	-	-	-	2.00	-	-	-	-	-	-	

Required Circuit Modifications	
1 - 3 phase Line Upgrades (km)	0.44
2 - 3 phase Line Upgrades (km)	0.00
3 phase Line Extensions (km)	2.00
Line Reconductoring (km)	0.00
Voltage Conversions (kVA Demand)	0
Other Upgrades / Shared Line Costs	\$0
Sub-station Upgrades	\$0

Order of Magnitude Cost Estimate *	
	< \$175,000
X	\$175,000 - \$250,000
	\$250,000 - \$325,000
	> \$325,000
* 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
85.3	21.3	1.41	54.7

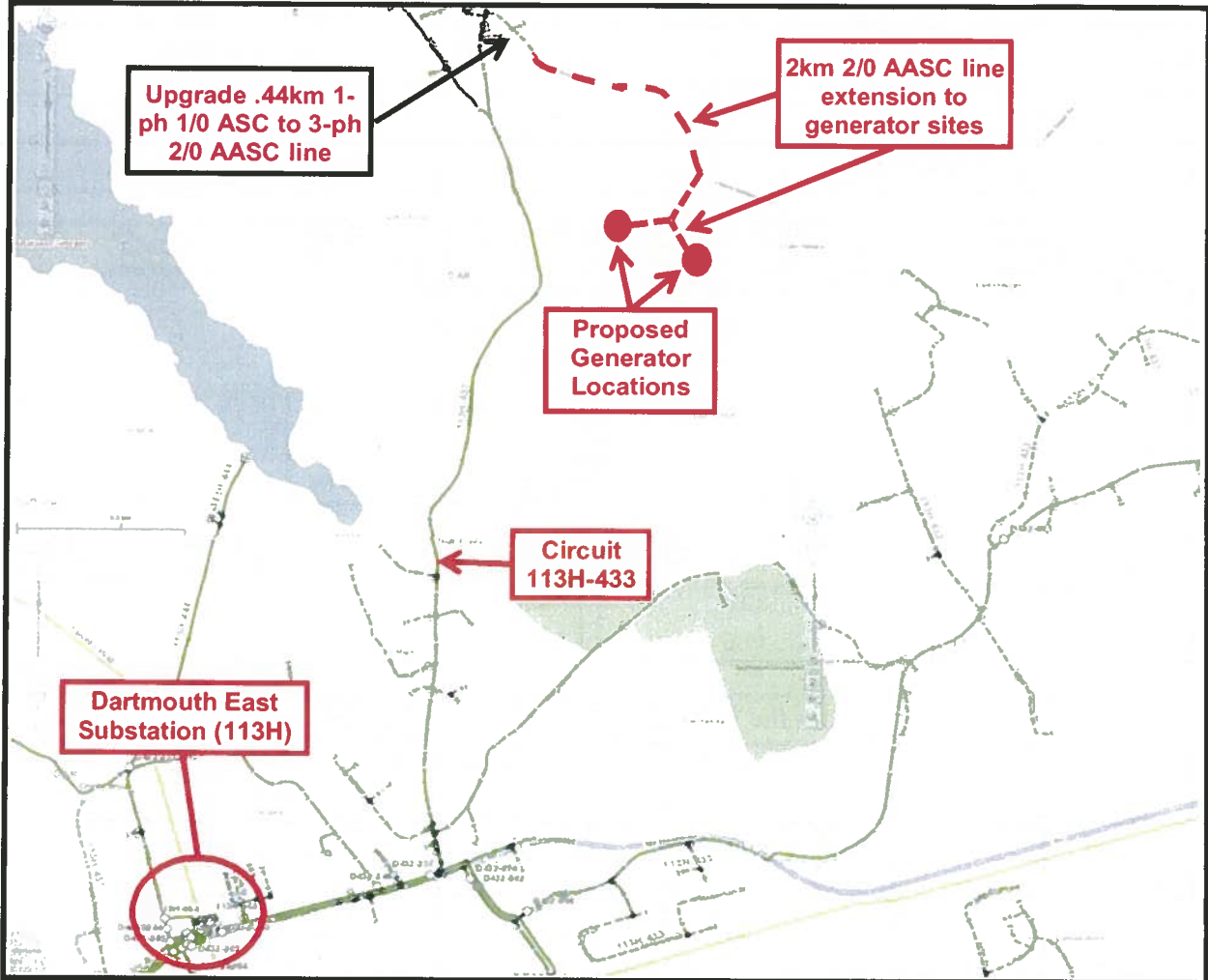
System Impact Study (SIS)	
	OK - SIS is Not Required
X	OK - SIS is Required
	Exceeds Flicker Criteria

**Proposed 4 MW Distributed Generation Site at
Lake Major Rd: Preliminary Assessment**



NSPI: Existing Distribution System Assets

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Site Related Comments

- .44km of 1-ph to 3-ph upgrades & 2km of new line is required to extend 113H-433 to the generator sites
- The IC is responsible for providing easements for line extensions, and for any sections of 1-phase line that require upgrade to 3-phase that do not have an existing easement.
- The route shown above follows existing roads identified by the IC in their Interconnection Request
- There are no other committed distributed generation projects in this area ahead of IR 285 in the Queue

General Comments

Proposed 4 MW Distributed Generation Site at Lake Loon Road: Preliminary Assessment



Prep. By: NSPI 02-Aug-11 Page 1 of 2

Application#:	#284		
WTG Site - General Location:	Lake Loon Road		
Street Address & PID:	Preston: PID 00653691		
Total Generation (# Units & kW):	2	x	2000
Type:	Inverter		

Supply Sub-station Data	
Sub-station Name	DARTMOUTH EAST
Sub-station ID	113H
Transformer ID	113H-T64
Transformer HV (kV)	138
Transformer LV (kV)	26.4
Transformer Rated MVA	25/33/42

Distribution System Data	
Feeder Circuit ID	113H-444
Fixed kVAR on Cct	0
Upstream Regulators	0
Downstream Regulators	0
Upstream Xfmr kVA	0
Upstream Xfmr LV (kV)	0

Supply Sub-station Load Data	
Peak Load (MVA)	44.0
Est. Min Load (MVA)	12.0

Distribution Feeder Load Data	
Peak Load (MVA)	11.0
Est. Min Load (MVA)	3.0

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	750 UG	4/0 AL	336 AL	1/0 AL	2/0 AL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	km
km (3Φ)	0.10	0.16	0.84	1.20	-	-	-	-	-	-	-	-	3.05
km (2Φ)	-	-	-	-	-	-	-	-	-	-	-	-	
km (1Φ)	-	-	-	-	-	-	-	-	-	-	-	-	
Extension	-	-	-	-	0.75	-	-	-	-	-	-	-	

Required Circuit Modifications	
1 - 3 phase Line Upgrades (km)	0.00
2 - 3 phase Line Upgrades (km)	0.00
3 phase Line Extensions (km)	0.75
Line Reconductoring (km)	0.00
Voltage Conversions (kVA Demand)	0
Other Upgrades / Shared Line Costs	\$0
Sub-station Upgrades	\$0

Order of Magnitude Cost Estimate *	
<input checked="" type="checkbox"/>	< \$150,000
<input type="checkbox"/>	\$150,000 - \$225,000
<input type="checkbox"/>	\$225,000 - \$300,000
<input type="checkbox"/>	> \$300,000
* 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
157.3	39.3	2.53	68.4

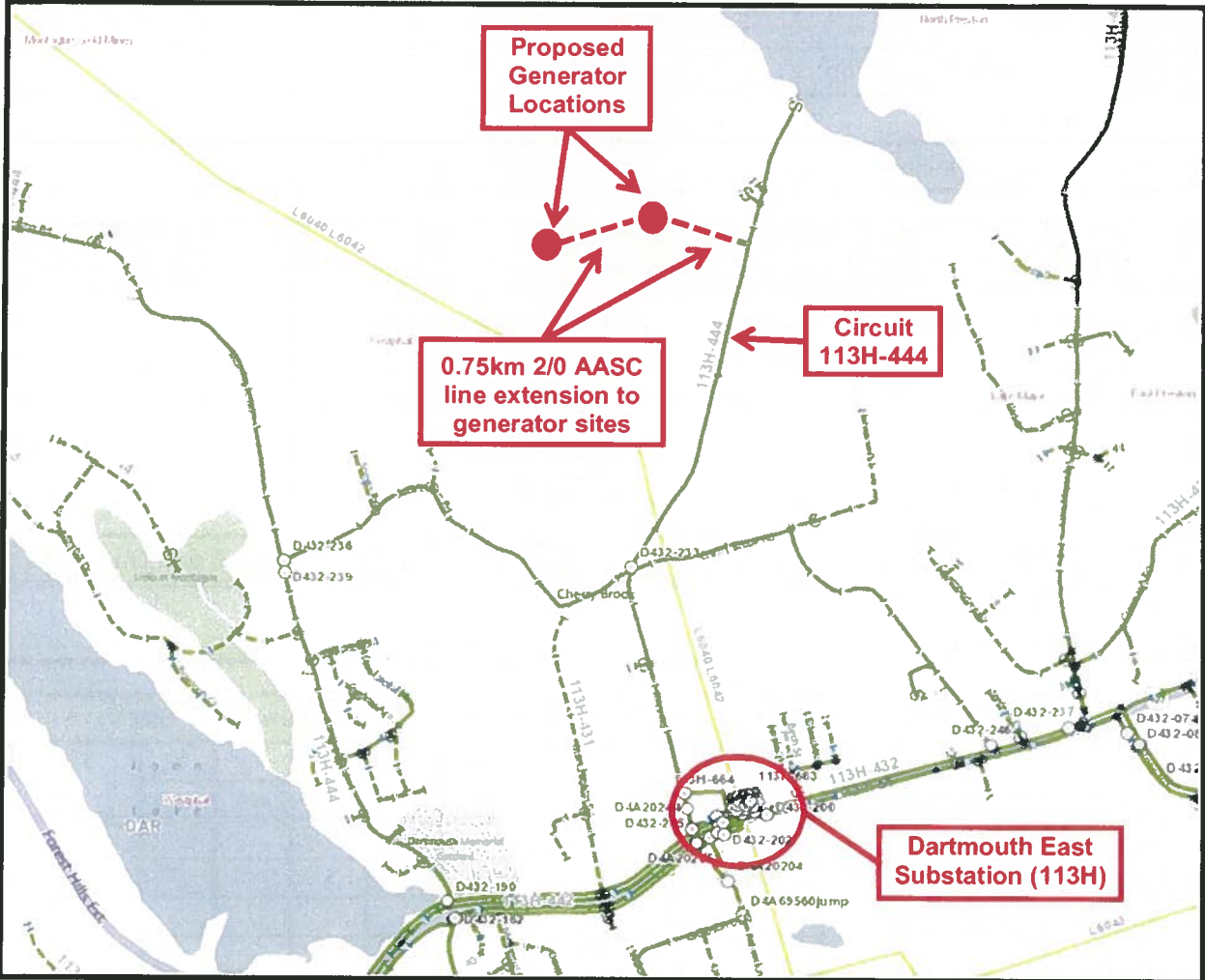
System Impact Study (SIS)	
<input type="checkbox"/>	OK - SIS is Not Required
<input checked="" type="checkbox"/>	OK - SIS is Required
<input type="checkbox"/>	Exceeds Flicker Criteria

Proposed 4 MW Distributed Generation Site at Lake Loon Road: Preliminary Assessment



NSPI: Existing Distribution System Assets

Page 2 of 2



Site Related Comments

- A line extension of 0.75km was assumed to extend 113H-444 to the generator sites
- IC is responsible for providing easements for line extensions
- There are no other committed distributed generation projects in this area ahead of IR 284 in the Queue

General Comments